

BID PROPOSAL INSTRUCTIONS

ABOUT IDOT PROPOSALS: All proposals are potential bidding proposals. Each proposal contains all certifications and affidavits, a proposal signature sheet and a proposal bid bond.

PREQUALIFICATION

Any contractor who desires to become pre-qualified to bid on work advertised by IDOT must submit the properly completed pre-qualification forms to the Bureau of Construction no later than 4:30 p.m. prevailing time twenty-one days prior to the letting of interest. This pre-qualification requirement applies to first time contractors, contractors renewing expired ratings, contractors maintaining continuous pre-qualification or contractors requesting revised ratings. To be eligible to bid, existing pre-qualification ratings must be effective through the date of letting.

WHO CAN BID ?

Bids will be accepted from only those companies that request and receive written Authorization to Bid from IDOT's Central Bureau of Construction.

REQUESTS FOR AUTHORIZATION TO BID

Contractors wanting to bid on items included in a particular letting must submit the properly completed "Request for Authorization to Bid/or Not For Bid Status" (BDE 124) and the ORIGINAL "Affidavit of Availability" (BC 57) to the proper office no later than 4:30 p.m. prevailing time, three (3) days prior to the letting date.

WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?

When a prospective prime bidder submits a "Request for Authorization to Bid/or Not For Bid Status"(BDE 124) he/she must indicate at that time which items are being requested For Bidding purposes. Only those items requested For Bidding will be analyzed. After the request has been analyzed, the bidder will be issued an **Authorization to Bid or Not for Bid Report**, approved by the Central Bureau of Construction and the Chief Procurement Officer that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Authorization to Bid or Not for Bid Report** will indicate the reason for denial.

ABOUT AUTHORIZATION TO BID

Firms that have not received an Authorization to Bid or Not For Bid Report within a reasonable time of complete and correct original document submittal should contact the Department as to the status. Firms unsure as to authorization status should call the Prequalification Section of the Bureau of Construction at the number listed at the end of these instructions.

ADDENDA AND REVISIONS

It is the bidder's responsibility to determine which, if any, addenda or revisions pertain to any project they may be bidding. Failure to incorporate all relevant addenda or revisions may cause the bid to be declared unacceptable.

Each addendum or revision will be included with the Electronic Plans and Proposals. Addenda and revisions will also be placed on the Addendum/Revision Checklist and each subscription service subscriber will be notified by e-mail of each addendum and revision issued.

The Internet is the Department's primary way of doing business. The subscription service emails are an added courtesy the Department provides. It is suggested that bidders check IDOT's website at <http://www.idot.illinois.gov/doing-business/procurements/construction-services/construction-bulletins/transportation-bulletin/index#TransportationBulletin> before submitting final bid information.

IDOT IS NOT RESPONSIBLE FOR ANY E-MAIL FAILURES.

Addenda questions may be directed to the Contracts Office at (217)782-7806 or DOT.DE-Contracts@Illinois.gov

Technical questions about downloading these files may be directed to Tim Garman at (217)524-1642 or Timothy.Garman@illinois.gov.

STANDARD GUIDELINES FOR SUBMITTING PAPER BIDS

- All pages should be single sided.
- Use the Cover Page that is provided in the Bid Proposal (posted on the IDOT Web Site) as the first page of your submitted bid. It has the item number in large bold type in the upper left-hand corner and lines provided for your company name and address in the upper right-hand corner.
- Do not use report covers, presentation folders or special bindings and do not staple multiple times on left side like a book. Use only 1 staple in the upper left hand corner. Make sure all elements of your bid are stapled together including the bid bond or guaranty check (if required).
- **Do not include any certificates of eligibility, your authorization to bid, Addendum Letters or affidavit of availability.**
- Do not include the Subcontractor Documentation with your bid (pages i – iii and pages a – g). This documentation is required only if you are awarded the project.
- Use the envelope cover sheet (provided with the proposal) as the cover for the proposal envelope.
- Do not rely on overnight services to deliver your proposal prior to 10 AM on letting day. It will not be read if it is delivered after 10 AM.
- Do not submit your Substance Abuse Prevention Program (SAPP) with your bid. If you are awarded the contract this form is to be submitted to the district engineer at the pre-construction conference.

BID SUBMITTAL CHECKLIST

- Cover page** (the sheet that has the item number on it) – This should be the first page of your bid proposal, **followed by your bid (the Schedule of Prices/Pay Items)**. If you are using special software or CBID to generate your schedule of prices, do not include the blank pages of the schedule of prices that came with the proposal package.
- Page 4 (Item 9)** – Check “YES” if you will use a subcontractor(s) with an annual value over \$50,000. Include the subcontractor(s) name, address, general type of work to be performed and the dollar amount. If you will use subcontractor(s) but are uncertain who or the dollar amount; check “YES” but leave the lines blank.
- After page 4** – Insert the following documents: Cost Adjustments for Steel, Bituminous and Fuel (if applicable) and the Contractor Letter of Assent (if applicable). The general rule should be, if you don’t know where it goes, put it after page 4.
- Page 10 (Paragraph J)** – Check “YES” or “NO” whether your company has any business in Iran.
- Page 10 (Paragraph K)** – (Not applicable to federally funded projects) List the name of the apprenticeship and training program sponsor holding the certificate of registration from the US Department of Labor. If no applicable program exists, please indicate the work/job category. **Do not include certificates with your bid.** Keep the certificates in your office in case they are requested by IDOT.
- Page 11 (Paragraph L)** – Your State Board of Elections certificate of registration is no longer required with your bid.
- Page 11 (Paragraph M)** – Indicate if your company has hired a lobbyist in connection with the job for which you are submitting the bid proposal.
- Page 12 (Paragraph C)** – This is a work sheet to determine if a completed Form A is required. It is not part of the form and you do not need to make copies for each completed Form A.
- Pages 14-17 (Form A)** – One Form A (4 pages) is required for each applicable person in your company. Copies of the forms can be used and only need to be changed when the information changes. The certification signature and date must be original for each letting. **Do not staple the forms together.** If you answered “NO” to all of the questions in Paragraph C (page 12), complete the first section (page 14) with your company information and then sign and date the Not Applicable statement on page 17.
- Page 18 (Form B)** - If you check “YES” to having other current or pending contracts it is acceptable to use the phrase, “See Affidavit of Availability on file”. **Ownership Certification** (at the bottom of the page) - Check N/A if the Form A(s) you submitted accounts for 100 percent of the company ownership. Check YES if any percentage of ownership falls outside of the parameters that require reporting on the Form A. Checking NO indicates that the Form A(s) you submitted is not correct and you will be required to submit a revised Form A.
- Page 20 (Workforce Projection)** – Be sure to include the Duration of the Project. It is acceptable to use the phrase “Per Contract Specifications”.

- Proposal Bid Bond** – (Insert after the proposal signature page) Submit your Proposal Bid Bond (if applicable) using the current Proposal Bid Bond form provided in the proposal package. The Power of Attorney page should be stapled to the Proposal Bid Bond. If you are using an electronic bond, include your bid bond number on the Proposal Bid Bond and attach the Proof of Insurance printed from the Surety’s Web Site.
- Disadvantaged Business Utilization Plan and/or Good Faith Effort – Do Not Submit with Bid** The bidder shall submit a Disadvantaged Business Utilization Plan on completed Department forms SBE 2025 and 2026. (1) The final Utilization Plan must be submitted within five calendar days after the date of the letting. (2) To meet the five day requirement, the bidder may send the Utilization Plan electronically by scanning and sending to DOT.DBE.UP@illinois.gov or faxing to (217) 785-1524. The subject line must include the bid Item Number and the Letting date. The Utilization Plan should be sent as one .pdf file, rather than multiple files and emails for the same Item Number. It is the responsibility of the bidder to obtain confirmation of email or fax delivery.

Alternatively, the Utilization Plan may be sent by certified mail or delivery service within the five calendar day period. If a question arises concerning the mailing date of a Utilization Plan, the mailing date will be established by the U.S. Postal Service postmark on the certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service. It is the responsibility of the bidder to ensure the postmark or receipt date is affixed within the five days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Utilization Plan is to be submitted to:

Illinois Department of Transportation
 Bureau of Small Business Enterprises
 Contract Compliance Section
 2300 South Dirksen Parkway, Room 319
 Springfield, Illinois 62764

The Bid Letting is now available in streaming Audio/Video from the IDOT Web Site. A link to the stream will be placed on the main page of the current letting on the day of the Letting. The stream will not begin until 10 AM.

Following the Letting, the As-Read Tabulation of Bids will be posted by the end of the day. You will find the link on the main Web page for the current letting.

QUESTIONS: pre-letting up to execution of the contract

Contractor pre-qualification	217-782-3413
Small Business, Disadvantaged Business Enterprise (DBE)	217-785-4611
Contracts, Bids, Letting process or Internet downloads	217-782-7806
Estimates Unit.....	217-785-3483
Aeronautics.....	217-785-8515
IDNR (Land Reclamation, Water Resources, Natural Resources).....	217-782-6302

QUESTIONS: following contract execution

Subcontractor documentation, payments	217-782-3413
Railroad Insurance	217-785-0275

RETURN WITH BID

1

Proposal Submitted By
Name
Address
City

Letting January 20, 2017

NOTICE TO PROSPECTIVE BIDDERS

This proposal can be used for bidding purposes by only those companies that request and receive written AUTHORIZATION TO BID from IDOT's Central Bureau of Construction.

BIDDERS NEED NOT RETURN THE ENTIRE PROPOSAL

Notice to Bidders, Specifications, Proposal, Contract and Contract Bond



**Illinois Department
of Transportation**

Springfield, Illinois 62764

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Route FAP 346
Project ACNHPP-0346(019)
District 1 Construction Funds**

PLEASE MARK THE APPROPRIATE BOX BELOW:

- A Bid Bond is included.
- A Cashier's Check or a Certified Check is included
- An Annual Bid Bond is included or is on file with IDOT.

Prepared by

Checked by

F

Page intentionally left blank

RETURN WITH BID



PROPOSAL

TO THE DEPARTMENT OF TRANSPORTATION

1. Proposal of _____

Taxpayer Identification Number (Mandatory) _____

For the improvement identified and advertised for bids in the Invitation for Bids as:

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Project ACNHPP-0346(019)
Route FAP 346
District 1 Construction Funds**

This project consists of intersection reconstruction, replacement of the bridge carrying the Union Pacific Railroad over IL 132 (SN 049-0106), retaining walls and traffic signal modernization at IL 132 and US 41 in the Village of Gurnee.

2. The undersigned bidder will furnish all labor, material and equipment to complete the above described project in a good and workmanlike manner as provided in the contract documents provided by the Department of Transportation. This proposal will become part of the contract and the terms and conditions contained in the contract documents will govern performance and payments.

RETURN WITH BID

3. **ASSURANCE OF EXAMINATION AND INSPECTION/WAIVER.** The undersigned bidder further declares that he/she has carefully examined the proposal, plans, specifications, addenda form of contract and contract bond, and special provisions, and that he/she has inspected in detail the site of the proposed work, and that he/she has familiarized themselves with all of the local conditions affecting the contract and the detailed requirements of construction, and understands that in making this bid proposal he/she waives all right to plead any misunderstanding regarding the same.

4. **EXECUTION OF CONTRACT AND CONTRACT BOND.** The undersigned bidder further agrees to execute a contract for this work and present the same to the department within fifteen (15) days after the contract has been mailed to him/her. The undersigned further agrees that he/she and his/her surety will execute and present within fifteen (15) days after the contract has been mailed to him/her contract bond satisfactory to and in the form prescribed by the Department of Transportation, in the penal sum of the full amount of the contract, or as specified in the special provisions, guaranteeing the faithful performance of the work in accordance with the terms of the contract.

5. **PROPOSAL GUARANTY.** Accompanying this proposal is either a bid bond on the department form, executed by a corporate surety company satisfactory to the department, or a proposal guaranty check consisting of a bank cashier's check or a properly certified check for not less than 5 per cent of the amount bid or for the amount specified in the following schedule:

<u>Amount of Bid</u>		<u>Proposal Guaranty</u>	<u>Amount of Bid</u>		<u>Proposal Guaranty</u>	
Up to	\$5,000	\$150	\$2,000,000	to	\$3,000,000	\$100,000
\$5,000	to \$10,000	\$300	\$3,000,000	to	\$5,000,000	\$150,000
\$10,000	to \$50,000	\$1,000	\$5,000,000	to	\$7,500,000	\$250,000
\$50,000	to \$100,000	\$3,000	\$7,500,000	to	\$10,000,000	\$400,000
\$100,000	to \$150,000	\$5,000	\$10,000,000	to	\$15,000,000	\$500,000
\$150,000	to \$250,000	\$7,500	\$15,000,000	to	\$20,000,000	\$600,000
\$250,000	to \$500,000	\$12,500	\$20,000,000	to	\$25,000,000	\$700,000
\$500,000	to \$1,000,000	\$25,000	\$25,000,000	to	\$30,000,000	\$800,000
\$1,000,000	to \$1,500,000	\$50,000	\$30,000,000	to	\$35,000,000	\$900,000
\$1,500,000	to \$2,000,000	\$75,000	over		\$35,000,000	\$1,000,000

Bank cashier's checks or properly certified checks accompanying bid proposals will be made payable to the Treasurer, State of Illinois.

If a combination bid is submitted, the proposal guaranties which accompany the individual bid proposals making up the combination will be considered as also covering the combination bid.

The amount of the proposal guaranty check is _____ \$(_____). If this proposal is accepted and the undersigned will fail to execute a contract bond as required herein, it is hereby agreed that the amount of the proposal guaranty will become the property of the State of Illinois, and shall be considered as payment of damages due to delay and other causes suffered by the State because of the failure to execute said contract and contract bond; otherwise, the bid bond will become void or the proposal guaranty check will be returned to the undersigned.

Attach Cashier's Check or Certified Check Here

In the event that one proposal guaranty check is intended to cover two or more bid proposals, the amount must be equal to the sum of the proposal guaranties which would be required for each individual bid proposal. If the guaranty check is placed in another bid proposal, state below where it may be found.

The proposal guaranty check will be found in the bid proposal for:

Item _____

Section No. _____

County _____

Mark the proposal cover sheet as to the type of proposal guaranty submitted.

RETURN WITH BID

6. **COMBINATION BIDS.** The undersigned bidder further agrees that if awarded the contract for the sections contained in the following combination, he/she will perform the work in accordance with the requirements of each individual contract comprising the combination bid specified in the schedule below, and that the combination bid shall be prorated against each section in proportion to the bid submitted for the same. If an error is found to exist in the gross sum bid for one or more of the individual sections included in a combination, the combination bid shall be corrected as provided in the specifications.

When a combination bid is submitted, the schedule below must be completed in each proposal comprising the combination.

If alternate bids are submitted for one or more of the sections comprising the combination, a combination bid must be submitted for each alternate.

Schedule of Combination Bids

Combination No.	Sections Included in Combination	Combination Bid	
		Dollars	Cents

7. **SCHEDULE OF PRICES.** The undersigned bidder submits herewith, in accordance with the rules and instructions, a schedule of prices for the items of work for which bids are sought. The unit prices bid are in U.S. dollars and cents, and all extensions and summations have been made. The bidder understands that the quantities appearing in the bid schedule are approximate and are provided for the purpose of obtaining a gross sum for the comparison of bids. If there is an error in the extension of the unit prices, the unit prices will govern. Payment to the contractor awarded the contract will be made only for actual quantities of work performed and accepted or materials furnished according to the contract. The scheduled quantities of work to be done and materials to be furnished may be increased, decreased or omitted as provided elsewhere in the contract.
8. **AUTHORITY TO DO BUSINESS IN ILLINOIS.** Section 20-43 of the Illinois Procurement Code (the Code) (30 ILCS 500/20-43) provides that a person (other than an individual acting as a sole proprietor) must be a legal entity authorized to transact business or conduct affairs in the State of Illinois prior to submitting the bid.
9. **EXECUTION OF CONTRACT:** The Department of Transportation will, in accordance with the rules governing Department procurements, execute the contract and shall be the sole entity having the authority to accept performance and make payments under the contract. Execution of the contract by the Chief Procurement Officer (CPO) or the State Purchasing Officer (SPO) is for approval of the procurement process and execution of the contract by the Department. Neither the CPO nor the SPO shall be responsible for administration of the contract or determinations respecting performance or payment there under except as otherwise permitted in the Code.
10. **The services of a subcontractor will be used.**

Check box Yes
 Check box No

For known subcontractors with subcontracts with an annual value of more than \$50,000, the contract shall include their name, address, general type of work to be performed, and the dollar allocation for each subcontractor.
 (30 ILCS 500/20-120)

ILLINOIS DEPARTMENT OF TRANSPORTATION
 SCHEDULE OF PRICES
 CONTRACT
 NUMBER -

60K80

State Job # - C-91-603-10

Project Number
 ACNHPP-0346/019/

Route
 FAP 346

County Name - LAKE - -

Code - 97 - -

District - 1 - -

Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
A2002920	T-CELTIS OCCID 2-1/2	EACH	6.000				
A2006568	T-QUERCUS BICL CL 7'	EACH	6.000				
A2008470	T-ULMUS AMER PRNC 2.5	EACH	7.000				
D2002384	E-PINUS FLEXILIS 7'	EACH	9.000				
E20210G1	V-PARTHEN QUIN EM 1G	EACH	155.000				
K0026610	TRANSP SALV TREES	EACH	38.000				
K0029642	WEED CONT PRE-EM HBCD	GALLON	1.000				
X0100009	BOR EX EMB OTHR FILLS	CU YD	11,175.000				
X0321315	REMOVE STONE PAVERS	SQ FT	970.000				
X0324085	EM VEH P S LSC 20 3C	FOOT	1,273.000				
X0324993	SEP JT W/SLEEP SLAB	FOOT	356.000				
X0326148	TEMP WP 60 CL4 15 MA	EACH	5.000				
X0326458	PAVEMENT REPL SPL	SQ YD	220.000				
X0327978	CONC PAVER PAVEMENT	SQ YD	108.000				
X0327979	PAVMT MRKG REM GRIND	SQ FT	1,000.000				

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X0327980	PAVMT MRKG REM WTR BL	SQ FT	2,466.000				
X0900035	STRUCTURE MARKR SIGNS	EACH	4.000				
X0900036	ASPHALT WATERPROOFING	SQ YD	366.000				
X1200097	CASING PIPE OC 28 DIP	FOOT	8.000				
X1200098	SM STL PIP CLVRTS 24	FOOT	148.000				
X1400182	FAC T SUPER R CAB	EACH	1.000				
X1400208	SCMAA&P DMA 18 & 55	EACH	1.000				
X3400001	REM/SLV L RT BK WALLS	L SUM	1.000				
X3800005	DECK PROTECT BALLAST	CU YD	146.000				
X3800006	TRACK MATL FOR UPRR	FOOT	10,285.000				
X4022000	TEMP ACCESS- COM ENT	EACH	5.000				
X4023000	TEMP ACCESS- ROAD	EACH	4.000				
X4400110	TEMP PAVT REMOVAL	SQ YD	352.000				
X4402805	ISLAND REMOVAL	SQ FT	3,648.000				
X5030290	STAIN CONC STRUCTURES	SQ FT	7,700.000				

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X5538400	SS CLEANED 30	FOOT	60.000				
X5538600	SS CLEANED 36	FOOT	60.000				
X5538800	SS CLEANED 48	FOOT	60.000				
X5538900	SS CLEANED 54	FOOT	60.000				
X5539000	SS CLEANED 60	FOOT	60.000				
X5539100	SS CLEANED 72	FOOT	60.000				
X5539542	SS CLEANED EQRS 42	FOOT	60.000				
X5800110	MEMBRANE WATERPRF SPL	SQ FT	11,170.000				
X5860110	GRANULAR BACKFILL STR	CU YD	1,383.000				
X6010810	P UNDERDRAIN 4 MOD SP	FOOT	402.000				
X6640050	CH LK FENCE 42 ATS SP	FOOT	93.000				
X6640300	CH LK FENCE REMOV	FOOT	978.000				
X6640304	CH LK FENCE REM & RE	FOOT	365.000				
X6700410	ENGR FLD OFF A SPL	CAL MO	32.000				
X7010216	TRAF CONT & PROT SPL	L SUM	1.000				

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X7010238	CHANGE MESSAGE SN SPL	CAL MO	24.000				
X7030025	WET REF TEM TP T3 L&S	SQ FT	473.000				
X7030030	WET REF TEM TAPE T3 4	FOOT	17,897.000				
X7030040	WET REF TEM TAPE T3 6	FOOT	2,039.000				
X7030055	WET REF TEM TPE T3 24	FOOT	185.000				
X7040125	PIN TEMP CONC BARRIER	EACH	30.000				
X8300100	LT POLE ALUM W/MA IO	EACH	1.000				
X8620200	UNINTER POWER SUP SPL	EACH	1.000				
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000				
Z0018500	DRAINAGE STR CLEANED	EACH	5.000				
Z0018800	DRAINAGE SYSTEM	L SUM	1.000				
Z0026400	FUR PLAC SAND FILL	CU YD	1,839.000				
Z0030850	TEMP INFO SIGNING	SQ FT	414.000				
Z0033020	LUM SFTY CABLE ASMBLY	EACH	14.000				
Z0033028	MAINTAIN LIGHTING SYS	CAL MO	12.000				

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Z0041600	PLUG EX INLETS	EACH	34.000				
Z0046304	P UNDR FOR STRUCT 4	FOOT	750.000				
Z0046306	P UNDR FOR STRUCT 6	FOOT	380.000				
Z0048665	RR PROT LIABILITY INS	L SUM	1.000				
Z0056608	STORM SEW WM REQ 12	FOOT	50.000				
Z0062456	TEMP PAVEMENT	SQ YD	352.000				
Z0069700	SUB-BALLAST	CU YD	9,170.000				
Z0073510	TEMP TR SIGNAL TIMING	EACH	1.000				
Z0076100	TRACK REMOVAL	FOOT	6,717.000				
Z0076300	TRACK WORK	FOOT	6,315.000				
Z0076600	TRAINEES	HOUR	500.000		0.800		400.000
Z0076604	TRAINEES TPG	HOUR	500.000		15.000		7,500.000
20100110	TREE REMOV 6-15	UNIT	327.000				
20100210	TREE REMOV OVER 15	UNIT	47.000				
20100500	TREE REMOV ACRES	ACRE	3.000				

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20101000	TEMPORARY FENCE	FOOT	750.000				
20200100	EARTH EXCAVATION	CU YD	49,415.000				
20201200	REM & DISP UNS MATL	CU YD	5,625.000				
20700220	POROUS GRAN EMBANK	CU YD	4,074.000				
20800150	TRENCH BACKFILL	CU YD	492.000				
21001000	GEOTECH FAB F/GR STAB	SQ YD	3,620.000				
21101615	TOPSOIL F & P 4	SQ YD	17,609.000				
21101645	TOPSOIL F & P 12	SQ YD	1,557.000				
21101685	TOPSOIL F & P 24	SQ YD	197.000				
21101805	COMPOST F & P 2	SQ YD	1,557.000				
25000210	SEEDING CL 2A	ACRE	4.000				
25000400	NITROGEN FERT NUTR	POUND	159.000				
25000600	POTASSIUM FERT NUTR	POUND	159.000				
25200110	SODDING SALT TOLERANT	SQ YD	527.000				
25200200	SUPPLE WATERING	UNIT	400.000				

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28000250	TEMP EROS CONTR SEED	POUND	765.000				
28000305	TEMP DITCH CHECKS	FOOT	52.000				
28000400	PERIMETER EROS BAR	FOOT	615.000				
28000510	INLET FILTERS	EACH	63.000				
28001100	TEMP EROS CONTR BLANK	SQ YD	11,500.000				
30300001	AGG SUBGRADE IMPROVE	CU YD	1,400.000				
31200502	STAB SUBBASE HMA 4.5	SQ YD	2,542.000				
35501316	HMA BASE CSE 8	SQ YD	67.000				
40300200	BIT MATLS PR CT	TON	3.000				
40603335	HMA SC "D" N50	TON	7.000				
42000411	PCC PVT 9 1/2 JOINTD	SQ YD	10,715.000				
42000501	PCC PVT 10 JOINTED	SQ YD	2,161.000				
42001300	PROTECTIVE COAT	SQ YD	16,886.000				
42300400	PCC DRIVEWAY PAVT 8	SQ YD	242.000				
42400200	PC CONC SIDEWALK 5	SQ FT	17,171.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
 SCHEDULE OF PRICES
 CONTRACT
 NUMBER -

60K80

State Job # - C-91-603-10

Project Number
 ACNHPP-0346/019/

Route
 FAP 346

County Name - LAKE - -

Code - 97 - -

District - 1 - -

Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
42400410	PC CONC SIDEWALK 8	SQ FT	886.000				
42400800	DETECTABLE WARNINGS	SQ FT	282.000				
44000100	PAVEMENT REM	SQ YD	8,923.000				
44000200	DRIVE PAVEMENT REM	SQ YD	480.000				
44000500	COMB CURB GUTTER REM	FOOT	3,903.000				
44000600	SIDEWALK REM	SQ FT	13,968.000				
44200966	CL B PATCH T1 10	SQ YD	5.000				
44200976	CL B PATCH T4 10	SQ YD	172.000				
50100300	REM EXIST STRUCT N1	EACH	1.000				
50100400	REM EXIST STRUCT N2	EACH	1.000				
50200100	STRUCTURE EXCAVATION	CU YD	4,323.000				
50300225	CONC STRUCT	CU YD	2,639.000				
50300254	RUBBED FINISH	SQ FT	3,740.000				
50300285	FORM LINER TEX SURF	SQ FT	7,700.000				
50500105	F & E STRUCT STEEL	L SUM	1.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
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60K80

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County Name - LAKE - -

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Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
50500505	STUD SHEAR CONNECTORS	EACH	776.000				
50800105	REINFORCEMENT BARS	POUND	348,120.000				
50800205	REINF BARS, EPOXY CTD	POUND	168,030.000				
50901720	BICYCLE RAILING	FOOT	685.000				
50901760	PIPE HANDRAIL	FOOT	148.000				
51200959	FUR M S PILE 14X0.312	FOOT	5,760.000				
51202305	DRIVING PILES	FOOT	5,760.000				
51203200	TEST PILE MET SHELLS	EACH	2.000				
51204650	PILE SHOES	EACH	144.000				
51500100	NAME PLATES	EACH	3.000				
51603000	DRILLED SHAFT IN SOIL	CU YD	779.000				
52100400	STEEL BEARING ASSMBLY	EACH	12.000				
52100530	ANCHOR BOLTS 1 1/4	EACH	16.000				
52100540	ANCHOR BOLTS 1 1/2	EACH	8.000				
52100560	ANCHOR BOLTS 2	EACH	16.000				

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State Job # - C-91-603-10

County Name - LAKE - -

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Section Number - 125X-N&J-SB-B

Project Number
 ACNHPP-0346/019/

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
52100580	ANCHOR BOLTS 2 1/2	EACH	8.000				
52200020	TEMP SOIL RETEN SYSTM	SQ FT	22,800.000				
52200105	FUR SOLDIER PILES WS	FOOT	1,802.000				
52200200	DRILL SET SLD PI SOIL	CU FT	12,714.000				
52200250	UNTREATED TIMBER LAG	SQ FT	7,870.000				
5423A030	P CUL CL A 3 30 TEMP	FOOT	80.000				
550A0050	STORM SEW CL A 1 12	FOOT	617.000				
550A0070	STORM SEW CL A 1 15	FOOT	35.000				
550A0090	STORM SEW CL A 1 18	FOOT	83.000				
550A0340	STORM SEW CL A 2 12	FOOT	729.000				
550A0360	STORM SEW CL A 2 15	FOOT	220.000				
550A0410	STORM SEW CL A 2 24	FOOT	92.000				
55100500	STORM SEWER REM 12	FOOT	207.000				
58700300	CONCRETE SEALER	SQ FT	6,610.000				
59100100	GEOCOMPOSITE WALL DR	SQ YD	1,634.000				

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Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
60108204	PIPE UNDERDR T 2 4	FOOT	3,831.000				
60200805	CB TA 4 DIA T8G	EACH	4.000				
60201105	CB TA 4 DIA T11F&G	EACH	5.000				
60201340	CB TA 4 DIA T24F&G	EACH	31.000				
60203905	CB TA 5 DIA T1F CL	EACH	2.000				
60250200	CB ADJUST	EACH	2.000				
60252800	CB RECONST	EACH	3.000				
60255500	MAN ADJUST	EACH	10.000				
60257900	MAN RECONST	EACH	9.000				
60265700	VV ADJUST	EACH	7.000				
60266600	VALVE BOX ADJ	EACH	3.000				
60500050	REMOV CATCH BAS	EACH	5.000				
60500060	REMOV INLETS	EACH	40.000				
60600605	CONC CURB TB	FOOT	298.000				
60603800	COMB CC&G TB6.12	FOOT	786.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
60605000	COMB CC&G TB6.24	FOOT	4,706.000				
60618740	CONC MED TM2.12	SQ FT	868.000				
60620000	CONC MED TSB6.24	SQ FT	3,350.000				
60623800	CONC BAR MED	SQ FT	970.000				
66400305	CH LK FENCE 6	FOOT	800.000				
66700205	PERM SURV MKRS T1	EACH	6.000				
66900200	NON SPL WASTE DISPOSL	CU YD	1,180.000				
66900450	SPL WASTE PLNS/REPORT	L SUM	1.000				
66900530	SOIL DISPOSAL ANALY	EACH	3.000				
67100100	MOBILIZATION	L SUM	1.000				
70103815	TR CONT SURVEILLANCE	CAL DA	51.000				
70300150	SHRT TRM PAVT MK REM	SQ FT	7,356.000				
70400100	TEMP CONC BARRIER	FOOT	1,125.000				
70400200	REL TEMP CONC BARRIER	FOOT	200.000				
70600255	IMP ATTN TEMP FRN TL2	EACH	2.000				

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Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
70600260	IMP ATTN TEMP FRN TL3	EACH	1.000				
70600320	IMP ATTN REL FRD TL2	EACH	2.000				
72000100	SIGN PANEL T1	SQ FT	183.000				
72000200	SIGN PANEL T2	SQ FT	24.000				
72400310	REMOV SIGN PANEL T1	SQ FT	128.000				
72400320	REMOV SIGN PANEL T2	SQ FT	96.000				
72400710	RELOC SIGN PANEL T1	SQ FT	106.000				
72400720	RELOC SIGN PANEL T2	SQ FT	93.000				
72900100	METAL POST TY A	FOOT	326.000				
72900200	METAL POST TY B	FOOT	101.000				
78008200	POLYUREA PM T1 LTR-SY	SQ FT	1,259.000				
78008210	POLYUREA PM T1 LN 4	FOOT	10,425.000				
78008230	POLYUREA PM T1 LN 6	FOOT	4,092.000				
78008240	POLYUREA PM T1 LN 8	FOOT	1,583.000				
78008250	POLYUREA PM T1 LN 12	FOOT	386.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
78008270	POLYUREA PM T1 LN 24	FOOT	290.000				
78100100	RAISED REFL PAVT MKR	EACH	139.000				
78300200	RAISED REF PVT MK REM	EACH	103.000				
81028200	UNDRGRD C GALVS 2	FOOT	946.000				
81028210	UNDRGRD C GALVS 2 1/2	FOOT	530.000				
81028220	UNDRGRD C GALVS 3	FOOT	466.000				
81028230	UNDRGRD C GALVS 3 1/2	FOOT	15.000				
81028240	UNDRGRD C GALVS 4	FOOT	1,243.000				
81100510	CON AT ST 1.5 GS PVC	FOOT	320.000				
81100805	CON AT ST 3 PVC GALVS	FOOT	15.000				
81300220	JUN BX SS AS 6X6X4	EACH	4.000				
81300730	JUN BX SS AS 16X14X6	EACH	4.000				
81400100	HANDHOLE	EACH	9.000				
81400200	HD HANDHOLE	EACH	3.000				
81400300	DBL HANDHOLE	EACH	3.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
81603081	UD 3#2#4GXLP USE 1.5 P	FOOT	2,783.000				
81702130	EC C XLP USE 1C 6	FOOT	400.000				
81702410	EC C XLP USE 3-1C 4	FOOT	400.000				
81800300	A CBL 3-1C2 MESS WIRE	FOOT	520.000				
82102400	LUM SV HOR MT 400W	EACH	6.000				
82107200	UNDERPAS LUM 100W HPS	EACH	8.000				
83050775	LT P A 47.5MH 10DA	EACH	3.000				
83600200	LIGHT POLE FDN 24D	FOOT	91.000				
83800205	BKWY DEV TR B 15BC	EACH	13.000				
84100110	REM TEMP LIGHT UNIT	EACH	5.000				
84200500	REM LT UNIT SALV	EACH	1.000				
84200804	REM POLE FDN	EACH	9.000				
84400105	RELOC EX LT UNIT	EACH	9.000				
87301215	ELCBL C SIGNAL 14 2C	FOOT	2,671.000				
87301225	ELCBL C SIGNAL 14 3C	FOOT	4,588.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
87301245	ELCBL C SIGNAL 14 5C	FOOT	5,154.000				
87301255	ELCBL C SIGNAL 14 7C	FOOT	1,795.000				
87301305	ELCBL C LEAD 14 1PR	FOOT	10,218.000				
87301900	ELCBL C EGRDC 6 1C	FOOT	1,917.000				
87502440	TS POST GALVS 10	EACH	4.000				
87502480	TS POST GALVS 14	EACH	1.000				
87502500	TS POST GALVS 16	EACH	7.000				
87502520	TS POST GALVS 18	EACH	1.000				
87700230	S MAA & P 38	EACH	1.000				
87700300	S MAA & P 52	EACH	1.000				
87702470	S MAA & P DMA 30 & 42	EACH	1.000				
87702900	STL COMB MAA&P 34	EACH	1.000				
87702910	STL COMB MAA&P 36	EACH	1.000				
87800100	CONC FDN TY A	FOOT	52.000				
87800415	CONC FDN TY E 36D	FOOT	78.000				

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Section Number - 125X-N&J-SB-B

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
87900200	DRILL EX HANDHOLE	EACH	6.000				
88000105	FLASH BEACON INSTALL	EACH	1.000				
88030020	SH LED 1F 3S MAM	EACH	8.000				
88030050	SH LED 1F 3S BM	EACH	4.000				
88030100	SH LED 1F 5S BM	EACH	2.000				
88030110	SH LED 1F 5S MAM	EACH	5.000				
88055150	OPSH LED 1F 3S BM	EACH	10.000				
88055160	OPSH LED 1F 3S MAM	EACH	4.000				
88102717	PED SH LED 1F BM CDT	EACH	16.000				
88200410	TS BACKPLATE L F PLAS	EACH	17.000				
88500100	INDUCTIVE LOOP DETECT	EACH	25.000				
88600100	DET LOOP T1	FOOT	1,223.000				
88600700	PREFORM DETECT LOOP	FOOT	511.000				
88800100	PED PUSH-BUTTON	EACH	14.000				
89000100	TEMP TR SIG INSTALL	EACH	1.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
89501400	REL EM VEH PR SYS D U	EACH	5.000				
89501410	REL EM VEH PR SYS P U	EACH	1.000				
89502375	REMOV EX TS EQUIP	EACH	1.000				
89502380	REMOV EX HANDHOLE	EACH	8.000				
89502382	REMOV EX DBL HANDHOLE	EACH	2.000				
89502385	REMOV EX CONC FDN	EACH	10.000				

CONTRACT NUMBER

60K80

THIS IS THE TOTAL BID

\$ _____

NOTES:

1. Each PAY ITEM should have a UNIT PRICE and a TOTAL PRICE.
2. The UNIT PRICE shall govern if no TOTAL PRICE is shown or if there is a discrepancy between the product of the UNIT PRICE multiplied by the QUANTITY.
3. If a UNIT PRICE is omitted, the TOTAL PRICE will be divided by the QUANTITY in order to establish a UNIT PRICE.
4. A bid may be declared UNACCEPTABLE if neither a unit price nor a total price is shown.

RETURN WITH BID

STATE REQUIRED ETHICAL STANDARDS GOVERNING CONTRACT PROCUREMENT: ASSURANCES, CERTIFICATIONS AND DISCLOSURES

I. GENERAL

A. Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

B. In order to comply with the provisions of Article 50 and to carry out the duty established therein, all bidders are to adhere to ethical standards established for the procurement process, and to make such assurances, disclosures and certifications required by law. Except as otherwise required in subsection III, paragraphs J-M, by execution of the Proposal Signature Sheet, the bidder indicates that each of the mandated assurances have been read and understood, that each certification is made and understood, and that each disclosure requirement has been understood and completed.

C. In addition to all other remedies provided by law, failure to comply with any assurance, failure to make any disclosure or the making of a false certification shall be grounds for the CPO to void the contract, and may result in the suspension or debarment of the bidder or subcontractor. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

I acknowledge, understand and accept these terms and conditions.

II. ASSURANCES

The assurances hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder.

A. Conflicts of Interest

Section 50-13. Conflicts of Interest.

(a) Prohibition. It is unlawful for any person holding an elective office in this State, holding a seat in the General Assembly, or appointed to or employed in any of the offices or agencies of state government and who receives compensation for such employment in excess of 60% of the salary of the Governor of the State of Illinois, or who is an officer or employee of the Capital Development Board or the Illinois State Toll Highway Authority, or who is the spouse or minor child of any such person to have or acquire any contract, or any direct pecuniary interest in any contract therein, whether for stationery, printing, paper, or any services, materials, or supplies, that will be wholly or partially satisfied by the payment of funds appropriated by the General Assembly of the State of Illinois or in any contract of the Capital Development Board or the Illinois State Toll Highway Authority.

(b) Interests. It is unlawful for any firm, partnership, association or corporation, in which any person listed in subsection (a) is entitled to receive (i) more than 7 1/2% of the total distributable income or (ii) an amount in excess of the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(c) Combined interests. It is unlawful for any firm, partnership, association, or corporation, in which any person listed in subsection (a) together with his or her spouse or minor children is entitled to receive (i) more than 15%, in the aggregate, of the total distributable income or (ii) an amount in excess of 2 times the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(d) Securities. Nothing in this Section invalidates the provisions of any bond or other security previously offered or to be offered for sale or sold by or for the State of Illinois.

(e) Prior interests. This Section does not affect the validity of any contract made between the State and an officer or employee of the State or member of the General Assembly, his or her spouse, minor child or any combination of those persons if that contract was in existence before his or her election or employment as an officer, member, or employee. The contract is voidable, however, if it cannot be completed within 365 calendar days after the officer, member, or employee takes office or is employed. The current salary of the Governor is \$177,412.00. Sixty percent of the salary is \$106,447.20.

RETURN WITH BID

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-13, or that an effective exemption has been issued by the Board of Ethics to any individual subject to the Section 50-13 prohibitions pursuant to the provisions of Section 50-20 of the Code. Information concerning the exemption process is available from the Department upon request.

B. Negotiations

Section 50-15. Negotiations.

It is unlawful for any person employed in or on a continual contractual relationship with any of the offices or agencies of State government to participate in contract negotiations on behalf of that office or agency with any firm, partnership, association, or corporation with whom that person has a contract for future employment or is negotiating concerning possible future employment.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-15, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

C. Inducements

Section 50-25. Inducement.

Any person who offers or pays any money or other valuable thing to any person to induce him or her not to provide a submission to a vendor portal or to bid for a State contract or as recompense for not having bid on a State contract is guilty of a Class 4 felony. Any person who accepts any money or other valuable thing for not bidding for a State contract, not making a submission to a vendor portal, or who withholds a bid or submission to a vendor portal in consideration of the promise for the payment of money or other valuable thing is guilty of a Class 4 felony.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-25, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

D. Revolving Door Prohibition

Section 50-30. Revolving door prohibition.

CPOs, SPOs, procurement compliance monitors, their designees whose principal duties are directly related to State procurement, and executive officers confirmed by the Senate are expressly prohibited for a period of 2 years after terminating an affected position from engaging in any procurement activity relating to the State agency most recently employing them in an affected position for a period of at least 6 months. The prohibition includes, but is not limited to: lobbying the procurement process; specifying; bidding; proposing bid, proposal, or contract documents; on their own behalf or on behalf of any firm, partnership, association, or corporation. This Section applies only to persons who terminate an affected position on or after January 15, 1999.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-30, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

E. Reporting Anticompetitive Practices

Section 50-40. Reporting anticompetitive practices.

When, for any reason, any vendor, bidder, contractor, CPO, SPO, designee, elected official, or State employee suspects collusion or other anticompetitive practice among any bidders, offerors, contractors, proposers, or employees of the State, a notice of the relevant facts shall be transmitted to the Attorney General and the CPO.

The bidder assures the Department that it has not failed to report any relevant facts concerning the practices addressed in Section 50-40 which may involve the contract for which the bid or submission to a vendor portal is submitted.

F. Confidentiality

Section 50-45. Confidentiality.

Any CPO, SPO, designee, or executive officer who willfully uses or allows the use of specifications, competitive bid documents, proprietary competitive information, proposals, contracts, or selection information to compromise the fairness or integrity of the procurement, bidding, or contract process shall be subject to immediate dismissal, regardless of the Personnel code, any contract, or any collective bargaining agreement, and may in addition be subject to criminal prosecution.

The bidder assures the Department that it has no knowledge of any fact relevant to the practices addressed in Section 50-45 which may involve the contract for which the bid is submitted.

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G. Insider Information

Section 50-50. Insider information.

It is unlawful for any current or former elected or appointed State official or State employee to knowingly use confidential information available only by virtue of that office or employment for actual or anticipated gain for themselves or another person.

The bidder assures the Department that it has no knowledge of any facts relevant to the practices addressed in Section 50-50 which may involve the contract for which the bid is submitted.

I acknowledge, understand and accept these terms and conditions for the above assurances.

III. CERTIFICATIONS

The certifications hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

A. Bribery

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50-5.

B. Felons

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code and every vendor's submission to a vendor portal shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

RETURN WITH BID

C. Debt Delinquency

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

D. Prohibited Bidders, Contractors and Subcontractors

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with Section 50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

E. Section 42 of the Environmental Protection Act

Section 50-14 Environmental Protection Act violations.

The bidder or contractor or subcontractor, respectively, certifies in accordance with Section 50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

F. Educational Loan

Section 3 of the Educational Loan Default Act, 5 ILCS 385/3.

Pursuant to the Educational Loan Default Act no State agency shall contract with an individual for goods or services if that individual is in default on an educational loan.

The bidder, if an individual as opposed to a corporation, partnership or other form of business organization, certifies that the bidder is not in default on an educational loan as provided in Section 3 of the Act.

G. Bid-Rigging/Bid Rotating

Section 33E-11 of the Criminal Code of 2012, 720 ILCS 5/3BE-11.

(a) Every bid submitted to and public contract executed pursuant to such bid by the State or a unit of local government shall contain a certification by the prime contractor that the prime contractor is not barred from contracting with any unit of State or local government as a result of a violation of either Section 33E-3 or 33E-4 of this Article.

(b) A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

A violation of Section 33E-3 would be represented by a conviction of the crime of bid-rigging which, in addition to Class 3 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be barred for 5 years from the date of conviction from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

The bidder certifies that it is not barred from contracting with the Department by reason of a violation of either Section 33E-3 or Section 33E-4.

RETURN WITH BID

H. International Anti-Boycott

Section 5 of the International Anti-Boycott Certification Act provides every contract entered into by the State of Illinois for the manufacture, furnishing, or purchasing of supplies, material, or equipment or for the furnishing of work, labor, or services, in an amount exceeding the threshold for small purchases according to the purchasing laws of this State or \$10,000.00, whichever is less, shall contain certification, as a material condition of the contract, by which the contractor agrees that neither the contractor nor any substantially-owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the U.S. Export Administration Act of 1979 or the regulations of the U.S. Department of Commerce promulgated under that Act.

The bidder makes the certification set forth in Section 5 of the Act.

I. Drug Free Workplace

The Illinois "Drug Free Workplace Act" applies to this contract and it is necessary to comply with the provisions of the "Act" if the contractor is a corporation, partnership, or other entity (including a sole proprietorship) which has 25 or more employees.

The bidder certifies that if awarded a contract in excess of \$5,000 it will provide a drug free workplace in compliance with the provisions of the Act.

J. Disclosure of Business Operations in Iran

Section 50-36 of the Code provides that each bid, offer, or proposal submitted for a State contract shall include a disclosure of whether or not the Company acting as the bidder, offeror, or proposing entity, or any of its corporate parents or subsidiaries, within the 24 months before submission of the bid, offer, or proposal had business operations that involved contracts with or provision of supplies or services to the Government of Iran, companies in which the Government of Iran has any direct or indirect equity share, consortiums or projects commissioned by the Government of Iran, or companies involved in consortiums or projects commissioned by the Government of Iran and either of the following conditions apply:

- (1) More than 10% of the Company's revenues produced in or assets located in Iran involve oil-related activities or mineral-extraction activities; less than 75% of the Company's revenues produced in or assets located in Iran involve contracts with or provision of oil-related or mineral-extraction products or services to the Government of Iran or a project or consortium created exclusively by that government; and the Company has failed to take substantial action.
- (2) The Company has, on or after August 5, 1996, made an investment of \$20 million or more, or any combination of investments of at least \$10 million each that in the aggregate equals or exceeds \$20 million in any 12-month period, which directly or significantly contributes to the enhancement of Iran's ability to develop petroleum resources of Iran.

The terms "Business operations", "Company", "Mineral-extraction activities", "Oil-related activities", "Petroleum resources", and "Substantial action" are all defined in the Code.

Failure to make the disclosure required by the Code may cause the bid, offer or proposal to be considered not responsive. The disclosure will be considered when evaluating the bid or awarding the contract. The name of each Company disclosed as doing business or having done business in Iran will be provided to the State Comptroller.

Check the appropriate statement:

Company has no business operations in Iran to disclose.

Company has business operations in Iran as disclosed on the attached document.

RETURN WITH BID

K. Apprenticeship and Training Certification (Does not apply to federal aid projects)

In accordance with the provisions of Section 30-22 (6) of the Code, the bidder certifies that it is a participant, either as an individual or as part of a group program, in the approved apprenticeship and training programs applicable to each type of work or craft that the bidder will perform with its own forces. The bidder further certifies for work that will be performed by subcontract that each of its subcontractors submitted for approval either (a) is, at the time of such bid, participating in an approved, applicable apprenticeship and training program; or (b) will, prior to commencement of performance of work pursuant to this contract, begin participation in an approved apprenticeship and training program applicable to the work of the subcontract. The Department, at any time before or after award, may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. Applicable apprenticeship and training programs are those that have been approved and registered with the United States Department of Labor. The bidder shall list in the space below, the official name of the program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the bidder is a participant and that will be performed with the bidder's forces. Types of work or craft work that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category that does not have an applicable apprenticeship or training program. **The bidder is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project as reported on the Construction Employee Workforce Projection (Form BC-1256) and returned with the bid is accounted for and listed.**

Additionally, Section 30-22 of the Code requires that the bidder certify that an Illinois office be maintained as the primary place of employment for persons employed for this contract.

NA-FEDERAL

The requirements of these certifications and disclosures are a material part of the contract, and the contractor shall require these certification provisions to be included in all approved subcontracts. In order to fulfill this requirement, it shall not be necessary that an applicable program sponsor be currently taking, or that it will take applications for apprenticeship, training or employment during the performance of the work of this contract.

RETURN WITH BID

L. Political Contributions and Registration with the State Board of Elections

Sections 20-160 and 50-37 of the Code regulate political contributions from business entities and any affiliated entities or affiliated persons bidding on or contracting with the state. Generally under Section 50-37, any business entity, and any affiliated entity or affiliated person of the business entity, whose current year contracts with all state agencies exceed an awarded value of \$50,000, are prohibited from making any contributions to any political committees established to promote the candidacy of the officeholder responsible for the awarding of the contracts or any other declared candidate for that office for the duration of the term of office of the incumbent officeholder or a period 2 years after the termination of the contract, whichever is longer. Any business entity and affiliated entities or affiliated persons whose state contracts in the current year do not exceed an awarded value of \$50,000, but whose aggregate pending bids and proposals on state contracts exceed \$50,000, either alone or in combination with contracts not exceeding \$50,000, are prohibited from making any political contributions to any political committee established to promote the candidacy of the officeholder responsible for awarding the pending contract during the period beginning on the date the invitation for bids or request for proposals or any other procurement opportunity is issued and ending on the day after the date of award or selection if the entity was not awarded or selected. Section 20-160 requires certification of registration of affected business entities in accordance with procedures found in Section 9-35 of The Election Code.

By submission of a bid, the contractor business entity acknowledges and agrees that it has read and understands Sections 20-160 and 50-37 of the Code, and that it makes the following certification:

The undersigned bidder certifies that it has registered as a business with the State Board of Elections and acknowledges a continuing duty to update the registration in accordance with the above referenced statutes. If the business entity is required to register, the CPO shall verify that it is in compliance on the date the bid or proposal is due. The CPO shall not accept a bid or proposal if the business entity is not in compliance with the registration requirements.

These requirements and compliance with the above referenced statutory sections are a material part of the contract, and any breach thereof shall be cause to void the contract under Section 50-60 of the Code. This provision does not apply to Federal-aid contracts.

M. Lobbyist Disclosure

Section 50-38 of the Code requires that any bidder or offeror on a State contract that hires a person required to register under the Lobbyist Registration Act to assist in obtaining a contract shall:

- (i) Disclose all costs, fees, compensation, reimbursements, and other remunerations paid or to be paid to the lobbyist related to the contract,
- (ii) Not bill or otherwise cause the State of Illinois to pay for any of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration, and
- (iii) Sign a verification certifying that none of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration were billed to the State.

This information, along with all supporting documents, shall be filed with the agency awarding the contract and with the Secretary of State. The CPO shall post this information, together with the contract award notice, in the online Procurement Bulletin.

Pursuant to Subsection (c) of this Section, no person or entity shall retain a person or entity to attempt to influence the outcome of a procurement decision made under the Code for compensation contingent in whole or in part upon the decision or procurement. Any person who violates this subsection is guilty of a business offense and shall be fined not more than \$10,000.

Bidder acknowledges that it is required to disclose the hiring of any person required to register pursuant to the Illinois Lobbyist Registration Act (25 ILCS 170) in connection with this contract.

Bidder has not hired any person required to register pursuant to the Illinois Lobbyist Registration Act in connection with this contract.

Or

Bidder has hired the following persons required to register pursuant to the Illinois Lobbyist Registration Act in connection with the contract:

Name and address of person: _____
All costs, fees, compensation, reimbursements and other remuneration paid to said person: _____

I acknowledge, understand and accept these terms and conditions for the above certifications.

RETURN WITH BID

IV. DISCLOSURES

- A. The disclosures hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. The bidder further certifies that the Department has received the disclosure forms for each bid.

The CPO may void the bid, or contract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Code. Furthermore, the CPO may void the contract and the surety providing the performance bond shall be responsible for completion of the contract.

B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Code provides that all bids of more than \$50,000 and all submissions to a vendor portal shall be accompanied by disclosure of the financial interests of the bidder. This disclosed information for the successful bidder, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the contract. Furthermore, pursuant to Section 5-5, the Procurement Policy Board may review a proposal, bid, or contract and issue a recommendation to void a contract or reject a proposal or bid based on any violation of the Code or the existence of a conflict of interest as provided in subsections (b) and (d) of Section 50-35.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the bidding entity or its parent entity, whichever is less, unless the contractor or bidder is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each individual making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each individual making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.

The current annual salary of the Governor is \$177,412.00.

In addition, all disclosures shall indicate any other current or pending contracts, proposals, leases, or other ongoing procurement relationships the bidding entity has with any other unit of state government and shall clearly identify the unit and the contract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification. **The forms must be included with each bid.**

C. Disclosure Form Instructions

Form A Instructions for Financial Information & Potential Conflicts of Interest

If the bidder is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. If a bidder is not subject to Federal 10K reporting, the bidder must determine if any individuals are required by law to complete a financial disclosure form. To do this, the bidder should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on Form A must be signed and dated by an individual that is authorized to execute contracts for the bidding company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES ___ NO ___
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES ___ NO ___
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the bidding entity's or parent entity's distributive income? YES ___ NO ___
4. Does anyone in your organization receive greater than 5% of the bidding entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES ___ NO ___

(Note: Only one set of forms needs to be completed per individual per bid even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The bidder must determine each individual in the bidding entity or the bidding entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by an individual that is authorized to execute contracts for your organization. The individual signing can be, but does not have to be, the individual for which the form is being completed. The bidder is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT of Form A must be signed and dated by an individual that is authorized to execute contracts for your company.

RETURN WITH BID

Form B: Instructions for Identifying Other Contracts & Procurement Related Information

Disclosure Form B must be completed for each bid submitted by the bidding entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the bidder to ignore Form B. Form B must be completed, checked, and dated or the bidder may be considered nonresponsive and the bid will not be accepted.*

The Bidder shall identify, by checking Yes or No on Form B, whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the bidder only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the bidder must do one of the following:

Option I: If the bidder did not submit an Affidavit of Availability to obtain authorization to bid, the bidder must list all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Do not include IDOT contracts. Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included. Bidders who submit Affidavits of Availability are suggested to use Option II.

Option II: If the bidder is required and has submitted an Affidavit of Availability in order to obtain authorization to bid, the bidder may write or type "See Affidavit of Availability" which indicates that the Affidavit of Availability is incorporated by reference and includes all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. For any contracts that are not covered by the Affidavit of Availability, the bidder must identify them on Form B or on an attached sheet(s). These might be such things as leases.

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ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A Financial Information & Potential Conflicts of Interest Disclosure

Contractor Name
Legal Address
City, State, Zip
Telephone Number Email Address Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). Vendors desiring to enter into a contract with the State of Illinois must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for bids in excess of \$50,000, and for all open-ended contracts. A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

- 1. Disclosure of Financial Information. The individual named below has an interest in the BIDDER (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. (Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)

FOR INDIVIDUAL (type or print information)
NAME:
ADDRESS
Type of ownership/distributable income share:
stock sole proprietorship Partnership other: (explain on separate sheet):
% or \$ value of ownership/distributable income share:

- 2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes ___ No ___

If your answer is yes, please answer each of the following questions.

- 1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No ___
2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor provide the name the State agency for which you are employed and your annual salary.

RETURN WITH BID

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor? Yes ___ No ___
4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15% in aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes ___ No ___

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment for services in the previous 2 years.

Yes ___ No ___

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No ___
2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of the spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. _____
-
3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess 100% of the annual salary of the Governor? Yes ___ No ___
4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or any minor children entitled to receive (i) more than 15% in the aggregate of the total distributable income from your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes ___ No ___

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years. Yes ___ No ___

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___ No ___

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United State of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years. Yes ___ No ___

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___ No ___

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government. Yes ___ No ___

RETURN WITH BID

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___ No ___

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes ___ No ___

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes ___ No ___

3. Communication Disclosure.

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): _____

RETURN WITH BID

4. Suspension or Debarment Disclosure. For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: suspension or debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): _____

Nature of disclosure: _____

APPLICABLE STATEMENT

This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.

Completed by: _____ Date _____
Signature of Individual or Authorized Representative

NOT APPLICABLE STATEMENT

Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.

This Disclosure Form A is submitted on behalf of the CONTRACTOR listed on the previous page.

_____ Date _____
Signature of Authorized Representative

The bidder has a continuing obligation to supplement these disclosures under Sec. 50-35 of the Code.

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ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B Other Contracts & Financial Related Information Disclosure

Contractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for all bids.

DISCLOSURE OF OTHER CONTRACTS AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The BIDDER shall identify whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes ___ No ___

If "No" is checked, the bidder only needs to complete the signature box on this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature of Authorized Representative, Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership.

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)

RETURN WITH BID

SPECIAL NOTICE TO CONTRACTORS

The following requirements of the Illinois Department of Human Rights Act are applicable to bidders on all construction contracts advertised by the Illinois Department of Transportation:

CONSTRUCTION EMPLOYEE UTILIZATION PROJECTION

- (a) All bidders on construction contracts shall complete and submit, along with and as part of their bids, a Bidder's Employee Utilization Form (Form BC-1256) setting forth a projection and breakdown of the total workforce intended to be hired and/or allocated to such contract work by the bidder including a projection of minority and female employee utilization in all job classifications on the contract project.
- (b) The Department of Transportation shall review the Employee Utilization Form, and workforce projections contained therein, of the contract awardee to determine if such projections reflect an underutilization of minority persons and/or women in any job classification in accordance with the Equal Employment Opportunity Clause and Title 44, Illinois Administrative Code, Section 750.120. If it is determined that the contract awardee's projections reflect an underutilization of minority persons and/or women in any job classification, it shall be advised in writing of the manner in which it is underutilizing and such awardee shall be considered to be in breach of the contract unless, prior to commencement of work on the contract project, it submits revised satisfactory projections or an acceptable written affirmative action plan to correct such underutilization including a specific timetable geared to the completion stages of the contract.
- (c) The Department of Transportation shall provide to the Department of Human Rights a copy of the contract awardee's Employee Utilization Form, a copy of any required written affirmative action plan, and any written correspondence related thereto. The Department of Human Rights may review and revise any action taken by the Department of Transportation with respect to these requirements.

RETURN WITH BID

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Project ACNHPP-0346(019)
Route FAP 346
District 1 Construction Funds**

PART II. WORKFORCE PROJECTION - continued

- B. Included in "Total Employees" under Table A is the total number of **new hires** that would be employed in the event the undersigned bidder is awarded this contract.

The undersigned bidder projects that: (number) _____ new hires would be recruited from the area in which the contract project is located; and/or (number) _____ new hires would be recruited from the area in which the bidder's principal office or base of operation is located.

- C. Included in "Total Employees" under Table A is a projection of numbers of persons to be employed directly by the undersigned bidder as well as a projection of numbers of persons to be employed by subcontractors.

The undersigned bidder estimates that (number) _____ persons will be directly employed by the prime contractor and that (number) _____ persons will be employed by subcontractors.

PART III. AFFIRMATIVE ACTION PLAN

- A. The undersigned bidder understands and agrees that in the event the foregoing minority and female employee utilization projection included under **PART II** is determined to be an underutilization of minority persons or women in any job category, and in the event that the undersigned bidder is awarded this contract, he/she will, prior to commencement of work, develop and submit a written Affirmative Action Plan including a specific timetable (geared to the completion stages of the contract) whereby deficiencies in minority and/or female employee utilization are corrected. Such Affirmative Action Plan will be subject to approval by the contracting agency and the **Illinois Department of Human Rights**.
- B. The undersigned bidder understands and agrees that the minority and female employee utilization projection submitted herein, and the goals and timetable included under an Affirmative Action Plan if required, are deemed to be part of the contract specifications.

Company _____ Telephone Number _____

Address _____

NOTICE REGARDING SIGNATURE

The Bidder's signature on the Proposal Signature Sheet will constitute the signing of this form. The following signature block needs to be completed only if revisions are required.

Signature: _____ Title: _____ Date: _____

- Instructions: All tables must include subcontractor personnel in addition to prime contractor personnel.
- Table A - Include both the number of employees that would be hired to perform the contract work and the total number currently employed (Table B) that will be allocated to contract work, and include all apprentices and on-the-job trainees. The "Total Employees" column should include all employees including all minorities, apprentices and on-the-job trainees to be employed on the contract work.
 - Table B - Include all employees currently employed that will be allocated to the contract work including any apprentices and on-the-job trainees currently employed.
 - Table C - Indicate the racial breakdown of the total apprentices and on-the-job trainees shown in Table A.

RETURN WITH BID

ADDITIONAL FEDERAL REQUIREMENTS

In addition to the Required Contract Provisions for Federal-Aid Construction Contracts (FHWA 1273), all bidders make the following certifications.

- A. By the execution of this proposal, the signing bidder certifies that the bidding entity has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted bid. This statement made by the undersigned bidder is true and correct under penalty of perjury under the laws of the United States.
- B. CERTIFICATION, EQUAL EMPLOYMENT OPPORTUNITY:
1. Have you participated in any previous contracts or subcontracts subject to the equal opportunity clause. YES _____ NO _____
 2. If answer to #1 is yes, have you filed with the Joint Reporting Committee, the Director of OFCC, any Federal agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements of those organizations? YES _____ NO _____

RETURN WITH BID

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Project ACNHPP-0346(019)
Route FAP 346
District 1 Construction Funds**

PROPOSAL SIGNATURE SHEET

The undersigned bidder hereby makes and submits this bid on the subject Proposal, thereby assuring the Department that all requirements of the Invitation for Bids and rules of the Department have been met, that there is no misunderstanding of the requirements of paragraph 3 of this Proposal, and that the contract will be executed in accordance with the rules of the Department if an award is made on this bid.

(IF AN INDIVIDUAL)

Firm Name _____
Signature of Owner _____
Business Address _____

(IF A CO-PARTNERSHIP)

Firm Name _____
By _____
Business Address _____
Name and Address of All Members of the Firm: _____

(IF A CORPORATION)

Corporate Name _____
By _____
Signature of Authorized Representative _____
Typed or printed name and title of Authorized Representative _____
Attest _____
Signature _____
(IF A JOINT VENTURE, USE THIS SECTION FOR THE MANAGING PARTY AND THE SECOND PARTY SHOULD SIGN BELOW)
Business Address _____

(IF A JOINT VENTURE)

Corporate Name _____
By _____
Signature of Authorized Representative _____
Typed or printed name and title of Authorized Representative _____
Attest _____
Signature _____
Business Address _____

If more than two parties are in the joint venture, please attach an additional signature sheet.



This Annual Proposal Bid Bond shall become effective at 12:01 AM (CDST) on _____ and shall be valid until _____ 11:59 PM (CDST).

KNOW ALL PERSONS BY THESE PRESENTS, That We _____

as PRINCIPAL, and _____

as SURETY, and held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in the bid proposal under "Proposal Guaranty" in effect on the date of the Invitation for Bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that whereas, the PRINCIPAL may submit bid proposal(s) to the STATE OF ILLINOIS, acting through the Department of Transportation, for various improvements published in the Transportation Bulletin during the effective term indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal(s) of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL has caused this instrument to be signed by its officer _____ day of _____ A.D., _____

In TESTIMONY WHEREOF, the said SURETY has caused this instrument to be signed by its officer _____ day of _____ A.D., _____

(Company Name)

(Company Name)

By _____
(Signature and Title)

By _____
(Signature of Attorney-in-Fact)

Notary for PRINCIPAL

Notary for SURETY

STATE OF _____
COUNTY OF _____

STATE OF _____
COUNTY OF _____

Signed and attested before me on _____ (date)

Signed and attested before me on _____ (date)

by _____
(Name of Notary Public)

by _____
(Name of Notary Public)

(Seal) _____
(Signature of Notary Public)

(Seal) _____
(Signature of Notary Public)

(Date Commission Expires)

(Date Commission Expires)

In lieu of completing the above section of the Annual Proposal Bid Bond form, the Principal may file an Electronic Bid Bond. By signing the proposal(s) the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

Electronic Bid Bond ID #	Company/Bidder Name	Signature and Title
--------------------------	---------------------	---------------------

This bond may be terminated, at Surety's request, upon giving not less than thirty (30) days prior written notice of the cancellation/termination of the bond. Said written notice shall be issued to the Illinois Department of Transportation, Chief Contracts Official, 2300 South Dirksen Parkway, Springfield, Illinois, 62764, and shall be served in person, by receipted courier delivery or certified or registered mail, return receipt requested. Said notice period shall commence on the first calendar day following the Department's receipt of written cancellation/termination notice. Surety shall remain firmly bound to all obligations herein for proposals submitted prior to the cancellation/termination. Surety shall be released and discharged from any obligation(s) for proposals submitted for any letting or date after the effective date of cancellation/termination.



Return with Bid

Division of Highways
Proposal Bid Bond

Item No. _____

Letting Date _____

KNOW ALL PERSONS BY THESE PRESENTS, That We _____

as PRINCIPAL, and _____

as SURETY, and held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in the bid proposal under "Proposal Guaranty" in effect on the date of the Invitation for Bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that whereas, the PRINCIPAL has submitted a bid proposal to the STATE OF ILLINOIS, acting through the Department of Transportation, for the improvement designated by the Transportation Bulletin Item Number and Letting Date indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL has caused this instrument to be signed by its officer _____ day of _____ A.D., _____

In TESTIMONY WHEREOF, the said SURETY has caused this instrument to be signed by its officer _____ day of _____ A.D., _____

(Company Name)

(Company Name)

By _____ (Signature and Title)

By _____ (Signature of Attorney-in-Fact)

Notary for PRINCIPAL

Notary for SURETY

STATE OF _____
COUNTY OF _____

STATE OF _____
COUNTY OF _____

Signed and attested before me on _____ (date)
by _____

Signed and attested before me on _____ (date)
by _____

(Name of Notary Public)

(Name of Notary Public)

(Seal) _____ (Signature of Notary Public)

(Seal) _____ (Signature of Notary Public)

(Date Commission Expires)

(Date Commission Expires)

In lieu of completing the above section of the Proposal Bid Bond form, the Principal may file an Electronic Bid Bond. By signing the proposal the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

Electronic Bid Bond ID # _____ Company/Bidder Name _____ Signature and Title _____

(1) Policy

It is public policy that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal or State funds. Consequently the requirements of 49 CFR Part 26 apply to this contract.

(2) Obligation

The contractor agrees to ensure that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with Federal or State funds. The contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and the Special Provision to ensure that said businesses have the maximum opportunity to compete for and perform under this contract. The contractor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

(3) Project and Bid Identification

Complete the following information concerning the project and bid:

Route _____	Total Bid _____
Section _____	Contract DBE Goal _____ (Percent) _____ (Dollar Amount)
Project _____	
County _____	
Letting Date _____	
Contract No. _____	
Letting Item No. _____	

(4) Assurance

I, acting in my capacity as an officer of the undersigned bidder (or bidders if a joint venture), hereby assure the Department that on this project my company : (check one)

- Meets or exceeds contract award goals and has provided documented participation as follows:
Disadvantaged Business Participation _____ percent

Attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

- Failed to meet contract award goals and has included good faith effort documentation to meet the goals and that my company has provided participation as follows:

Disadvantaged Business Participation _____ percent

The contract goals should be accordingly modified or waived. Attached is all information required by the Special Provision in support of this request including good faith effort. Also attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

Company

By _____

Title _____

Date _____

The "as read" Low Bidder is required to comply with the Special Provision.

Submit only one utilization plan for each project. The utilization plan shall be submitted in accordance with the special provision.

Bureau of Small Business Enterprises
2300 South Dirksen Parkway
Springfield, Illinois 62764

Local Let Projects
Submit forms to the
Local Agency

PROPOSAL ENVELOPE



PROPOSALS

for construction work advertised for bids by the
Illinois Department of Transportation

Item No.	Item No.	Item No.

Submitted By:

Name:
Address:
Phone No.

Bidders should use an IDOT proposal envelope or affix this form to the front of a 10" x 13" envelope for the submittal of bids. If proposals are mailed, they should be enclosed in a second or outer envelope addressed to:

Engineer of Design and Environment - Room 326
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, Illinois 62764

NOTICE

Individual bids, including Bid Bond and/or supplemental information if required, should be securely stapled.

CONTRACTOR OFFICE COPY OF CONTRACT SPECIFICATIONS

NOTICE

None of the following material needs to be returned with the bid package unless the special provisions require documentation and/or other information to be submitted.

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Project ACNHPP-0346(019)
Route FAP 346
District 1 Construction Funds**



Illinois Department of Transportation

SUBCONTRACTOR DOCUMENTATION

Public Acts 96-0795, 96-0920, and 97-0895 enacted substantial changes to the provisions of the Code (30 ILCS 500). Among the changes are provisions affecting subcontractors. The Contractor awarded this contract will be required as a material condition of the contract to implement and enforce the contract requirements applicable to subcontractors that entered into a contractual agreement with a total value of \$50,000 or more with a person or entity who has a contract subject to the Code and approved in accordance with article 108.01 of the Standard Specifications for Road and Bridge Construction.

If the Contractor seeks approval of subcontractors to perform a portion of the work, and approval is granted by the Department, the Contractor shall provide a copy of the subcontract to the Illinois Department of Transportation's CPO upon request within 15 calendar days after execution of the subcontract.

Financial disclosures required pursuant to Sec. 50-35 of the Code must be submitted for all applicable subcontractors. The subcontract shall contain the certifications required to be made by subcontractors pursuant to Article 50 of the Code. This Notice to Bidders includes a document incorporating all required subcontractor certifications and disclosures for use by the Contractor in compliance with this mandate. The document is entitled State Required Ethical Standards Governing Subcontractors.

RETURN WITH SUBCONTRACT

STATE ETHICAL STANDARDS GOVERNING SUBCONTRACTORS

Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

The certifications hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed should the Department approve the subcontractor. The CPO may terminate or void the contract approval if it is later determined that the bidder or subcontractor rendered a false or erroneous certification. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

A. Bribery

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract to which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50-5.

B. Felons

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

RETURN WITH SUBCONTRACT

C. Debt Delinquency

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

D. Prohibited Bidders, Contractors and Subcontractors

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

E. Section 42 of the Environmental Protection Act

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

The undersigned, on behalf of the subcontracting company, has read and understands the above certifications and makes the certifications as required by law.

_____ Name of Subcontracting Company		
_____ Authorized Officer	_____ Date	

RETURN WITH SUBCONTRACT
SUBCONTRACTOR DISCLOSURES

I. DISCLOSURES

- A.** The disclosures hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed. The subcontractor further certifies that the Department has received the disclosure forms for each subcontract.

The CPO may void the bid, contract, or subcontract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be scuspended or debarred for violations of the Code. Furthermore, the CPO may void the contract.

B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Code provides that all subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, shall be accompanied by disclosure of the financial interests of the subcontractor. This disclosed information for the subcontractor, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the Prime Contractor's contract. Furthermore, pursuant to this Section, the Procurement Policy Board may recommend to allow or void a contract or subcontract based on a potential conflict of interest.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the subcontracting entity or its parent entity, whichever is less, unless the subcontractor is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each individual making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each individual making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.

The current annual salary of the Governor is \$177,412.00.

In addition, all disclosures shall indicate any other current or pending contracts, subcontracts, proposals, leases, or other ongoing procurement relationships the subcontracting entity has with any other unit of state government and shall clearly identify the unit and the contract, subcontract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification.

C. Disclosure Form Instructions

Form A Instructions for Financial Information & Potential Conflicts of Interest

If the subcontractor is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. If a subcontractor is not subject to Federal 10K reporting, the subcontractor must determine if any individuals are required by law to complete a financial disclosure form. To do this, the subcontractor should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on the second page of Form A must be signed and dated by an individual that is authorized to execute contracts for the subcontracting company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES ___ NO ___
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES ___ NO ___
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the subcontracting entity's or parent entity's distributive income? YES ___ NO ___

(Note: Distributive income is, for these purposes, any type of distribution of profits. An annual salary is not distributive income.)

4. Does anyone in your organization receive greater than 5% of the subcontracting entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES ___ NO ___

(Note: Only one set of forms needs to be completed per individual per subcontract even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The subcontractor must determine each individual in the subcontracting entity or the subcontracting entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by an individual that is authorized to execute contracts for your organization. The individual signing can be, but does not have to be, the individual for which the form is being completed. The subcontractor is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT on page 2 of Form A must be signed and dated by an individual that is authorized to execute contracts for your company.

RETURN WITH SUBCONTRACT

Form B: Instructions for Identifying Other Contracts & Procurement Related Information

Disclosure Form B must be completed for each subcontract submitted by the subcontracting entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the subcontractor to ignore Form B. Form B must be completed, checked, and dated or the subcontract will not be approved.*

The Subcontractor shall identify, by checking Yes or No on Form B, whether it has any pending contracts, subcontracts, leases, bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the subcontractor only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the subcontractor must list all non-IDOT State of Illinois agency pending contracts, subcontracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts or subcontracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included.

**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**Form A
Subcontractor: Financial
Information & Potential Conflicts
of Interest Disclosure**

Subcontractor Name		
Legal Address		
City, State, Zip		
Telephone Number	Email Address	Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). Subcontractors desiring to enter into a subcontract of a State of Illinois contract must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, and for all open-ended contracts. **A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.**

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

1. Disclosure of Financial Information. The individual named below has an interest in the SUBCONTRACTOR (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. **(Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)**

FOR INDIVIDUAL (type or print information)	
NAME:	_____
ADDRESS	_____
Type of ownership/distributable income share:	
stock _____ sole proprietorship _____ Partnership _____ other: (explain on separate sheet):	
% or \$ value of ownership/distributable income share:	_____

2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes ___ No ___

If your answer is yes, please answer each of the following questions.

1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No ___

2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, provide the name the State agency for which you are employed and your annual salary. _____

RETURN WITH SUBCONTRACT

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?
Yes ___ No ___

4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?
Yes ___ No ___

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment services in the previous 2 years.

Yes ___ No ___

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority?
Yes ___ No ___

2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of your spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. _____

3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?
Yes ___ No ___

4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?
Yes ___ No ___

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years.
Yes ___ No ___

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter.
Yes ___ No ___

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United States of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years.
Yes ___ No ___

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter.
Yes ___ No ___

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government.
Yes ___ No ___

RETURN WITH SUBCONTRACT

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___ No ___

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes ___ No ___

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes ___ No ___

3 Communication Disclosure.

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): _____

RETURN WITH SUBCONTRACT

4. Suspension or Debarment Disclosure. For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: suspension or debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): _____

Nature of disclosure: _____

APPLICABLE STATEMENT

This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.

Completed by: _____ Date _____
Signature of Individual or Authorized Officer

NOT APPLICABLE STATEMENT

Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.

This Disclosure Form A is submitted on behalf of the SUBCONTRACTOR listed on the previous page.

_____ Date _____
Signature of Authorized Officer

RETURN WITH SUBCONTRACT

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B Subcontractor: Other Contracts & Financial Related Information Disclosure

Form with fields: Subcontractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, and for all open-ended contracts.

DISCLOSURE OF OTHER CONTRACTS, SUBCONTRACTS, AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The SUBCONTRACTOR shall identify whether it has any pending contracts, subcontracts, including leases, bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes ___ No ___ If "No" is checked, the subcontractor only needs to complete the signature box on this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature box with fields: Signature of Authorized Officer, Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)



NOTICE TO BIDDERS

- 1. TIME AND PLACE OF OPENING BIDS.** Sealed proposals for the improvement described herein will be received by the Department of Transportation. Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). Paper-based bids are to be submitted to the Chief Procurement Officer for the Department of Transportation in care of the Chief Contracts Official at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 a.m. January 20, 2017. All bids will be gathered, sorted, publicly opened and read in the auditorium at the Department of Transportation's Harry R. Hanley Building shortly after 10:00 a.m.
- 2. DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 60K80
LAKE County
Section 125X-N&J-SB-B
Project ACNHPP-0346(019)
Route FAP 346
District 1 Construction Funds**

This project consists of intersection reconstruction, replacement of the bridge carrying the Union Pacific Railroad over IL 132 (SN 049-0106), retaining walls and traffic signal modernization at IL 132 and US 41 in the Village of Gurnee.

- 3. INSTRUCTIONS TO BIDDERS.** (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.

(b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.
- 4. AWARD CRITERIA AND REJECTION OF BIDS.** This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

By Order of the
Illinois Department of Transportation

Randall S. Blankenhorn,
Secretary

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2017

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS and frequently used RECURRING SPECIAL PROVISIONS.

ERRATA Standard Specifications for Road and Bridge Construction (Adopted 4-1-16) (Revised 1-1-17)

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CHECK
 SHEET FOR
 RECURRING SPECIAL
 PROVISIONS

Adopted January 1, 2017

The following RECURRING SPECIAL PROVISIONS indicated by an "X" are applicable to this contract and are included by reference:

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STATE OF ILLINOIS SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction", adopted April 1, 2016, the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids, and the "Supplemental Specifications and Recurring Special Provisions" indicated on the Check Sheet included herein which apply to and govern the construction of FAP Route 346 (US 41), Project ACNHPP-0346(019), Section 125X-N&J-SB-B, Lake County, Contract No. 60K80, and in case of conflict with any part, or parts, of said Specifications, the said Special Provisions shall take precedence and shall govern.

LOCATION OF PROJECT

This project begins at a point on the centerline of IL 132 approximately 651 feet west of the centerline of US 41 and extends in an easterly direction for a distance of 1,715 feet to a point approximately 1,064 feet past the US 41 intersection with IL 132.

DESCRIPTION OF PROJECT

The work to be performed under this contract consists of removing and replacing the existing UPRR Bridge and associated track work. The new bridge will provide additional clearance over IL 132. The work also includes construction of a temporary shoofly embankment, track and shoofly bridge to be used while the existing bridge is being replaced. Additional improvements include reconstruction, widening and resurfacing of the existing IL 132 roadway facility to a 4 lane cross section and turning lanes/median, widening on the SB US 41 ramp, new islands on three of the four US 41 ramp terminals at IL 132, earth excavation, pavement markings, traffic control and protection, retaining walls, erosion control protection, lighting, traffic signals and all other miscellaneous work necessary to complete this improvement as shown in the Plans and as specified herein.

The material, fabrication, and construction shall comply with the IDOT specifications for the following: roads, drainage facilities, storm sewer, sidewalks, landscaping, and retaining walls not within the UPRR right of way. The material, fabrication, and construction shall also comply with the UPRR specifications which are contained in Section B for the following: Main Bridge, Shoofly Bridge, Shoofly Embankment, Shoofly Track, and Retaining Walls and Culverts within the UPRR right of way. However, if UPRR specifications needed for any item of work are not available, the appropriate IDOT specification sections shall be applicable.

Where there are different requirements for the same condition or component between IDOT documents and UPRR documents, the IDOT Standard Specifications, Supplemental Specifications, Special Provisions, and Contract Plan Set take precedence over the UPRR General Conditions and Specifications.

COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS

This contract overlaps with other concurrent and/or future contracts as listed below. The Contractor will be governed by Article 105.08 of the Standard Specifications. The Contractor shall cooperate with the other contractors in the phasing and performance of his work so as not to delay, interrupt or hinder the progress or completion of work being performed by the other contractors.

No additional compensation will be allowed this Contractor for compliance with the above requirements, nor for any delays or inconvenience resulting from the activities of the other contractors.

Contract No. 62B73 Improvement: IL 132 from Ferndale to Estes Street

Add the following to Article 105.08:

The Contractor shall identify all such activities at the beginning of the contract and coordinate the sequence and timing of their execution and completion with the other Contractors through the Engineer. All of these work items shall be identified as separate line items in the Contractor's proposed Construction Progress Schedule. The Contractor shall submit to the Resident Engineer a daily work schedule for the purpose of coordinating the Contractor's activities for the next working day. The daily work schedule must be submitted by 3:00 p.m. the day prior. This schedule is necessary and shall be used by the Engineer to schedule inspections, material testing and checking of layout as part of the following day's work. Failure to submit a schedule may result in uninspected work and therefore considered unacceptable.

The daily schedule shall include the Contractor's or Sub-Contractor's planned work for that day including the location, description, scheduled work hours and pay items of work to be performed. The schedule shall also include any material testing requests, layout check requests and all traffic control measures to be implemented for that day's work.

Additional compensation or the extension of contract time will not be allowed for work items where progress is affected due to the lack of coordination with other Contractors or failure to submit daily work schedules by the Contractor.

STATUS OF UTILITIES (D-1)

Effective: June 1, 2016

Utility companies and/or municipal owners located within the construction limits of this project have provided the following information in regard to their facilities and the proposed improvements. The tables below contain a description of specific conflicts to be resolved and/or facilities which will require some action on the part of the Department's contractor to proceed with work. Each table entry includes an identification of the action necessary and, if applicable, the estimated duration required for the resolution.

UTILITIES TO BE ADJUSTED

Conflicts noted below have been identified by following the suggested staging plan included in the contract. The company has been notified of all conflicts and will be required to obtain the necessary permits to complete their work; in some instances resolution will be a function of the construction staging. The responsible agency must relocate or complete new installations as noted in the action column; this work has been deemed necessary to be complete for the Department's contractor to then work in the stage under which the item has been listed.

Pre-Stage

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	ACTION
IL 132 Sta. 14+70, 33' Lt. to Sta. 16+80 35'Lt. Sta. 28+20 Transverse Crossing	Water Main	Watermains in conflict with new roadway footprint of IL 132.	Village of Gurnee	Watermains to be abandon and relocated. Complete 0 Days Total
Union Pacific Mainline Sta. 96+00, 25' Lt. To Sta. 121+00, 40' Lt IL 132 Sta. 14+70, 33' Lt. to Sta. 31+50 35'Lt. and several Transverse Crossings.	Underground Fiberoptic	Existing AT&T lines are in conflict with the new footprint of IL 132 as well as the proposed bridge work.	AT&T Long Distance	Contractor for AT&T Long Distance will abandoned and install new fiber 6 Months 180 Days Total
IL 132 Sta. 14+70, 33' Lt. to Sta. 31+50 35'Lt. and several Transverse Crossings.	Underground Conduit	Existing AT&T lines are in conflict with the new footprint of IL 132 as well as the proposed bridge work.	AT&T	Contractor for AT&T will install new lines. 90 Days Total

Union Pacific Mainline Sta. 96+00, 24' Lt. To Sta. 121+00, 40' Lt	Underground Fiberoptic	Existing fiberoptic line is conflicted with the proposed shoofly relocation and will be relocated and lowered.	Sprint	Contractor for Sprint will abandoned and install new fiber 180 Days Total
Union Pacific Mainline Sta. 96+00, 20' Rt. To Sta. 121+00, 40' Rt	Underground Fiberoptic	Existing fiberoptic line is conflicted with the proposed shoofly relocation and will be relocated and lowered.	Teleport /Communications subsidiary of AT&T.	Contractor for Teleport /Communications will abandoned and install new fiber 180 Days Total
Union Pacific Mainline Sta. 96+00, 25' Lt. To Sta. 121+00, 40' Lt	Underground Fiberoptic	Existing fiberoptic line is conflicted with the proposed shoofly relocation and will be relocated and lowered.	CenturyLink	Contractor for CenturyLink will abandoned and install new fiber 180 Days Total
IL 132 Sta. 14+70, 32' Lt. to Sta. 20+51, 153' Lt. Sta. 25+30, 55' lt. to Sta. 31+85, 40' Lt. Sta. 27+80 Transverse Crossing	Overhead Electric	Power pole are in conflict with the new roadway footprint.	ComEd	Com Ed contractor to install new pole line and to pull new wires and make cutover. 1 Month 30 Days Total
IL 132 Sta. 14+70, 32' Lt. to Sta. 17+80, 40' Lt.	Overhead Cable Line	Power pole are in conflict with the new roadway footprint.	Comcast	Comcast contractor to pull new wires and make cutover. 30 Days Total

Sta. 17+80, 40' lt. to Sta. 23+55, 40' Lt.	Underground Cable Line	Existing Comcast lines are in conflict with the new footprint of IL 132 as well as the proposed bridge work.	Comcast	Comcast contractor will install new lines 20 Days Total
Sta. 23+55, 40' lt. to Sta. 31+85, 40' Lt.	Overhead Cable Line	Power pole are in conflict with the new roadway footprint.	Comcast	Comcast contractor to pull new wires and make cutover. 30 Days Total

No conflicts to be resolved (or if there are conflicts they are to be listed as noted above)

Pre-Stage: 6 Months Total Installation

Stage 1: _____ Days Total Installation

Stage 2: _____ Days Total Installation

The following contact information is what was used during the preparation of the plans as provided by the Agency/Company responsible for resolution of the conflict.

Agency/Company Responsible to Resolve Conflict	Name of contact	Address	Phone	e-mail address
Village of Gurnee	Scott Drabicki, P.E., Village Engineer	325 N. O'Plaine Road Gurnee, IL 60031	(847) 599-7582	ScottD@village.gurnee.il.us
AT&T Long Distance	Carl Donahue	866 Rock Creek Rd Plano, IL 60545	(847) 420-9115	
AT&T	Hector Garcia	1000 Commerce Dr Oak Brook, IL 60523	(630) 573-5465	
Sprint	James Burton	5600 N. River Road, Suite 200 Rosemont, IL 60018	(708)-955-6659	

Teleport/Communications subsidiary of AT&T.	Bobby Akhter	4513 Western Ave. Lisle, IL 60532	(630)-719-1483	
CenturyLink	Kirk Thoelke	11111 Dorsett Road Maryland Heights, MO	(636)-887-4752	
ComEd	Angela Harrell		(630) 576-6185	
Comcast	Robert Schuller	688 Industrial Drive Elmhurst, IL 60126	(630) 600-6349	

UTILITIES TO BE WATCHED AND PROTECTED

The areas of concern noted below have been identified by following the suggested staging plan included for the contract. The information provided is not a comprehensive list of all remaining utilities, but those which during coordination were identified as ones which might require the Department's contractor to take into consideration when making the determination of the means and methods that would be required to construct the proposed improvement. In some instances the contractor will be responsible to notify the owner in advance of the work to take place so necessary staffing on the owners part can be secured.

Pre-Stage

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER	ACTION
IL 132 Sta 16+50 Transverse Crossing. Sta. 22+30, 65 Rt. to Sta. 28+00 45' Rt.	Underground Gas Main	There are no conflicts as the mains have already been relocated.	North Shore Gas 3001 Grand Avenue Waukegan, IL 60085 Stephen Warmington (847) 263-4666	Gas Main shall be protected from damage by the Contractor during construction.
Transverse Crossings throughout corridor Sta. 14+70 to Sta. 31+50	Water Main	Watermains in conflict with new roadway footprint of IL 132.	Scott Drabicki, P.E., Village Engineer Village of Gurnee 325 N. O'Plaine Road Gurnee, IL 60031 (847) 599-7582	Water Main shall be protected from damage by the Contractor during construction.

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER	ACTION

Stage 2

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER	ACTION

The following contact information is what was used during the preparation of the plans as provided by the owner of the facility.

Agency/Company Responsible to Resolve Conflict	Name of contact	Address	Phone	e-mail address

The above represents the best information available to the Department and is included for the convenience of the bidder. The days required for conflict resolution should be taken into account in the bid as this information has also been factored into the timeline identified for the project when setting the completion date. The applicable portions of the Standard Specifications for Road and Bridge Construction shall apply.

Estimated duration of time provided in the action column for the first conflicts identified will begin on the date of the executed contract regardless of the status of the utility relocations. The responsible agencies will be working toward resolving subsequent conflicts in conjunction with contractor activities in the number of days noted.

The estimated relocation dates must be part of the progress schedule submitted by the contractor. A utility kickoff meeting will be scheduled between the Department, the Department's contractor and the utility companies. The Department's contractor is responsible for contacting J.U.L.I.E. prior to any and all excavation work.

RESTRICTION ON WORKING DAYS AFTER A COMPLETION DATE

Effective: January 21, 2003

Revised: January 1, 2007

All temporary lane closures during the period governed by working days after a completion date will not be permitted during the hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m. Monday through Friday.

All lane closure signs shall not be erected any earlier than one-half (1/2) hour before the starting hours listed above. Also, these signs should be taken down within one-half (1/2) hour after the closure is removed.

Failure to Open Traffic Lanes to Traffic: Should the Contractor fail to completely open and keep open all the traffic lanes to traffic in accordance with the limitations specified above, the Contractor shall be liable and shall pay to the Department the amount of \$250 per lane blocked, not as a penalty but as liquidated and ascertained damages, for each and every 15 minute interval or a portion thereof that a lane is blocked outside the allowable time limitations. The Department may deduct such damages from any monies due the Contractor. These damages shall apply during the period governed by working days after a completion date and any extensions of that contract time.

COMPLETION DATE PLUS WORKING DAYS

Effective: September 30, 1985

Revised: January 1, 2007

Revise Article 108.05 (b) of the Standard Specifications as follows:

“When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on May 17, 2019 except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within five working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the working days allowed for cleanup work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.”

Article 108.09 or the Special Provision for “Failure to Complete the Work on Time”, if included in this contract, shall apply to both the completion date and the number of working days.

PUBLIC CONVENIENCE AND SAFETY (DISTRICT 1)

Effective: May 1, 2012

Revised: July 15, 2012

Add the following to the end of the fourth paragraph of Article 107.09:

“If the holiday is on a Saturday or Sunday, and is legally observed on a Friday or Monday, the length of Holiday Period for Monday or Friday shall apply.”

Add the following sentence after the Holiday Period table in the fourth paragraph of Article 107.09:

“The Length of Holiday Period for Thanksgiving shall be from 5:00 AM the Wednesday prior to 11:59 PM the Sunday After”

Delete the fifth paragraph of Article 107.09 of the Standard Specifications:

“On weekends, excluding holidays, roadways with Average Daily Traffic of 25,000 or greater, all lanes shall be open to traffic from 3:00 P.M. Friday to midnight Sunday except where structure construction or major rehabilitation makes it impractical.”

MAINTENANCE OF ROADWAYS

Effective: September 30, 1985

Revised: November 1, 1996

Beginning on the date that work begins on this project, the Contractor shall assume responsibility for normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance shall include all repair work deemed necessary by the Engineer, but shall not include snow removal operations. Traffic control and protection for maintenance of roadways will be provided by the Contractor as required by the Engineer.

If items of work have not been provided in the contract, or otherwise specified for payment, such items, including the accompanying traffic control and protection required by the Engineer, will be paid for in accordance with Article 109.04 of the Standard Specifications.

AGGREGATE SURFACE COURSE FOR TEMPORARY ACCESS

Effective: April 1, 2001

Revised: January 2, 2007

Revise Article 402.10 of the Standard Specifications to read:

“402.10 For Temporary Access. The contractor shall construct and maintain aggregate surface course for temporary access to private entrances, commercial entrances and roads according to Article 402.07 and as directed by the Engineer.

The aggregate surface course shall be constructed to the dimensions and grades specified below, except as modified by the plans or as directed by the Engineer.

- (a) Private Entrance. The minimum width shall be 12 ft. (3.6 m). The minimum compacted thickness shall be 6 in. (150 mm). The maximum grade shall be eight percent, except as required to match the existing grade.
- (b) Commercial Entrance. The minimum width shall be 24 ft. (7.2 m). The minimum compacted thickness shall be 9 in. (230 mm). The maximum grade shall be six percent, except as required to match the existing grade.
- (c) Road. The minimum width shall be 24 ft. (7.2 m). The minimum compacted thickness shall be 9 in. (230 mm). The grade and elevation shall be the same as the removed pavement, except as required to meet the grade of any new pavement constructed.

Maintaining the temporary access shall include relocating and/or regrading the aggregate surface course for any operation that may disturb or remove the temporary access. The same type and gradation of material used to construct the temporary access shall be used to maintain it.

When use of the temporary access is discontinued, the aggregate shall be removed and utilized in the permanent construction or disposed of according to Article 202.03.”

Add the following to Article 402.12 of the Standard Specifications:

“Aggregate surface course for temporary access will be measured for payment as each for every private entrance, commercial entrance or road constructed for the purpose of temporary access. If a residential drive, commercial entrance, or road is to be constructed under multiple stages, the aggregate needed to construct the second or subsequent stages will not be measured for payment but shall be included in the cost per each of the type specified.”

Revise the second paragraph of Article 402.13 of the Standard Specifications to read:

“Aggregate surface course for temporary access will be paid for at the contract unit price per each for TEMPORARY ACCESS (PRIVATE ENTRANCE), TEMPORARY ACCESS (COMMERCIAL ENTRANCE) or TEMPORARY ACCESS (ROAD).

Partial payment of the each amount bid for temporary access, of the type specified, will be paid according to the following schedule:

- (a) Upon construction of the temporary access, sixty percent of the contract unit price per each, of the type constructed, will be paid.
- (b) Subject to the approval of the Engineer for the adequate maintenance and removal of the temporary access, the remaining forty percent of the pay item will be paid upon the permanent removal of the temporary access.”

CLEANING EXISTING DRAINAGE STRUCTURES

Effective: September 30, 1985

Revised: December 1, 2011

All existing storm sewers, pipe culverts, manholes, catch basins and inlets shall be considered as drainage structures insofar as the interpretation of this Special Provision is concerned. When specified for payment, the location of drainage structures to be cleaned will be shown on the plans.

All existing drainage structures which are to be adjusted or reconstructed shall be cleaned according to Article 602.15 of the Standard Specifications. This work will be paid for according to accordance with Article 602.16 of the Standard Specifications.

All other existing drainage structures which are specified to be cleaned on the plans will be cleaned according to Article 602.15 of the Standard Specifications.

Basis of Payment: This work will be paid for at the contract unit price each for DRAINAGE STRUCTURES TO BE CLEANED, and at the contract unit price per foot (meter) for STORM SEWERS TO BE CLEANED, of the diameter specified.

TRAFFIC CONTROL AND PROTECTION (ARTERIALS)

Effective: February 1, 1996

Revised: March 1, 2011

Specific traffic control plan details and Special Provisions have been prepared for this contract. This work shall include all labor, materials, transportation, handling and incidental work necessary to furnish, install, maintain and remove all traffic control devices required as indicated in the plans and as approved by the Engineer.

When traffic is to be directed over a detour route, the Contractor shall furnish, erect, maintain and remove all applicable traffic control devices along the detour route according to the details shown in the plans.

Method of Measurement: All traffic control (except "Traffic Control and Protection (Expressways)" and temporary pavement markings) indicated on the traffic control plan details and specified in the Special Provisions will be measured for payment on a lump sum basis.

Basis of Payment: All traffic control and protection will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION (SPECIAL).

Temporary pavement markings will be paid for separately unless shown on a Standard.

TEMPORARY INFORMATION SIGNING

Effective: November 13, 1996

Revised: January 2, 2007

Description.

This work shall consist of furnishing, installing, maintaining, relocating for various states of construction and eventually removing temporary informational signs. Included in this item may be ground mount signs, skid mount signs, truss mount signs, bridge mount signs, and overlay sign panels which cover portions of existing signs.

Materials.

Materials shall be according to the following Articles of Section 1000 - Materials:

	<u>Item</u>	<u>Article/Section</u>
a.)	Sign Base (Notes 1 & 2)	1090
b.)	Sign Face (Note 3)	1091
c.)	Sign Legends	1092
d.)	Sign Supports	1093
e.)	Overlay Panels (Note 4)	1090.02

Note 1. The Contractor may use 5/8 inch (16 mm) instead of 3/4 inch (19 mm) thick plywood.

Note 2. Type A sheeting can be used on the plywood base.

Note 3. All sign faces shall be Type A except all orange signs shall meet the requirements of Article 1106.01

Note 4. The overlay panels shall be 0.08 inch (2 mm) thick.

GENERAL CONSTRUCTION REQUIRMENTS

Installation.

The sign sizes and legend sizes shall be verified by the Contractor prior to fabrication.

Signs which are placed along the roadway and/or within the construction zone shall be installed according to the requirements of Article 701.14 and Article 720.04. The signs shall be 7 ft. (2.1 m) above the near edge of the pavement and shall be a minimum of 2 ft. (600 mm) beyond the edge of the paved shoulder. A minimum of two (2) posts shall be used.

The attachment of temporary signs to existing sign structures or sign panels shall be approved by the Engineer. Any damage to the existing signs due to the Contractor's operations shall be repaired or signs replaced, as determined by the Engineer, at the Contractor's expense.

Signs which are placed on overhead bridge structures shall be fastened to the handrail with stainless steel bands. These signs shall rest on the concrete parapet where possible. The Contractor shall furnish mounting details for approval by the Engineer.

Method of Measurement.

This work shall be measured for payment in square feet (square meters) edge to edge (horizontally and vertically).

All hardware, posts or skids, supports, bases for ground mounted signs, connections, which are required for mounting these signs will be included as part of this pay item.

Basis of Payment.

This work shall be paid for at the contract unit price per square foot (square meter) for TEMPORARY INFORMATION SIGNING.

TRAFFIC CONTROL PLAN

Effective: September 30, 1985

Revised: January 1, 2007

Traffic Control shall be according to the applicable sections of the Standard Specifications, the Supplemental Specifications, the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways", any special details and Highway Standards contained in the plans, and the Special Provisions contained herein.

Special attention is called to Article 107.09 of the Standard Specifications and the following Highway Standards, Details, Quality Standard for Work Zone Traffic Control Devices, Recurring Special Provisions and Special Provisions contained herein, relating to traffic control.

The Contractor shall contact the District One Bureau of Traffic at least 72 hours in advance of beginning work.

STANDARDS:

701011	701101
701106	701311
701427	701456
701601	701606
701701	701801
701901	704001

DETAILS:

TC-10	Traffic Control and Protection for Sideroads, Intersections, and Driveways
TC-11	Raised Reflective Pavement Markers (Snow Plow Resistant)
TC-13	District One Typical Pavement Markings
TC-14	Traffic Control and Protection at Turn Bays (to remain open to traffic)
TC-16	Pavement Marking Letters and Symbols for Traffic Staging
TC-08	Entrance and Exit Ramp Closure details
TC-21	Detour Signing for Closing State Highways
TC-22	Arterial Road Information Sign

KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY)

Effective: January 22, 2003

Revised: February 20, 2015

The Contractor shall provide the necessary traffic control devices to warn the public and to delineate the work zone as required in these Special Provisions, the Standard Specifications, the State Standards, and the District Details.

Arterial lane closures shall be in accordance with the Standard Specifications, Highway Standards, District Details, and the direction of the Engineer. The Contractor shall request and gain approval from the Illinois Department of Transportation's Arterial Traffic Control Supervisor at 847-705-4470 seventy-two (72) hours in advance of all long-term (24 hrs. or longer) lane closures. This advance notification is calculated based on a Monday through Friday workweek and shall not include weekends or state holidays.

Arterial lane closures not shown in the staging plans will not be permitted during **peak traffic volume hours**.

Peak traffic volume hours are defined as weekdays (Monday through Friday) from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM.

Private vehicles shall not be parked in the work zone. Contractor's equipment and/or vehicles shall not be parked on the shoulders or in the median during non-working hours. The parking of equipment and/or vehicles on State right-of-way will only be permitted at locations approved by the Engineer in accordance with Articles 701.08 and 701.11 of the Standard Specifications.

Should the Contractor fail to completely open and keep open all the traffic lanes to traffic in accordance with the limitations specified above, the Contractor shall be liable to the Department for the amount of:

One lane or ramp blocked = \$ (Designer to calculate based on Traffic Volumes, but use \$1,000 minimum.)

Two lanes blocked = \$ (If applicable, designer to calculate based on Traffic Volumes, but use \$2,500 minimum.)

Not as a penalty but as liquidated and ascertained damages for each and every 15 minute interval or a portion thereof that a lane is blocked outside the allowable time limitations. Such damages may be deducted by the Department from any monies due the Contractor. These damages shall apply during the contract time and during any extensions of the contract time.

DRAINAGE AND INLET PROTECTION UNDER TRAFFIC (DISTRICT 1)

Effective: April 1, 2011

Revised: April 2, 2011

Add the following to Article 603.02 of the Standard Specifications:

- “(i) Temporary Hot-Mix Asphalt (HMA) Ramp (Note 1)
- 1030 (j) Temporary Rubber Ramps (Note 2)

Note 1. The HMA shall have maximum aggregate size of 3/8 in. (95 mm).

Note 2. The rubber material shall be according to the following.

Property	Test Method	Requirement
Durometer Hardness, Shore A	ASTM D 2240	75 ±15
Tensile Strength, psi (kPa)	ASTM D 412	300 (2000) min
Elongation, percent	ASTM D 412	90 min
Specific Gravity	ASTM D 792	1.0 - 1.3
Brittleness, °F (°C)	ASTM D 746	40 (-40)°

Revise Article 603.07 of the Standard Specifications to read:

“603.07 Protection Under Traffic. After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.

When castings are under traffic before the final surfacing operation has been started, properly sized temporary ramps shall be placed around the drainage and/or utility castings according to the following methods.

- (a) Temporary Asphalt Ramps. Temporary hot-mix asphalt ramps shall be placed around the casting, flush with its surface and decreasing to a featheredge in a distance of 2 ft. (600 mm) around the entire surface of the casting.

(b) Temporary Rubber Ramps. Temporary rubber ramps shall only be used on roadways with permanent posted speeds of 40 mph or less and when the height of the casting to be protected meets the proper sizing requirements for the rubber ramps as shown below.

Dimension	Requirement
Inside Opening	Outside dimensions of casting + 1 in. (25 mm)
Thickness at inside edge	Height of casting \pm 1/4 in. (6 mm)
Thickness at outside edge	1/4 in. (6 mm) max.
Width, measured from inside opening to outside edge	8 1/2 in. (215 mm) min

Placement shall be according to the manufacturer's specifications.

Temporary ramps for castings shall remain in place until surfacing operations are undertaken within the immediate area of the structure. Prior to placing the surface course, the temporary ramp shall be removed. Excess material shall be disposed of according to Article 202.03."

GROUND TIRE RUBBER (GTR) MODIFIED ASPHALT BINDER (D-1)

Effective: June 26, 2006

Revised: April 1, 2016

Add the following to the end of Article 1032.05 of the Standard Specifications:

“(c) Ground Tire Rubber (GTR) Modified Asphalt Binder. A quantity of 10.0 to 14.0 percent GTR (Note 1) shall be blended by dry unit weight with a PG 64-28 to make a GTR 70-28 or a PG 58-28 to make a GTR 64-28. The base PG 64-28 and PG 58-28 asphalt binders shall meet the requirements of Article 1032.05(a). Compatible polymers may be added during production. The GTR modified asphalt binder shall meet the requirements of the following table.

Test	Asphalt Grade GTR 70-28	Asphalt Grade GTR 64-28
Flash Point (C.O.C.), AASHTO T 48, °F (°C), min.	450 (232)	450 (232)
Rotational Viscosity, AASHTO T 316 @ 275 °F (135 °C), Poises, Pa·s, max.	30 (3)	30 (3)
Softening Point, AASHTO T 53, °F (°C), min.	135 (57)	130 (54)
Elastic Recovery, ASTM D 6084, Procedure A (sieve waived) @ 77 °F, (25 °C), aged, ss, 100 mm elongation, 5 cm/min., cut immediately, %, min.	65	65

Note 1. GTR shall be produced from processing automobile and/or light truck tires by the ambient grinding method. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall contain no free metal particles or other materials. A mineral powder (such as talc) meeting the requirements of AASHTO M 17 may be added, up to a maximum of four percent by weight of GTR to reduce sticking and caking of the GTR particles. When tested in accordance with Illinois modified AASHTO T 27, a 50 g sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 16 (1.18 mm)	100
No. 30 (600 µm)	95 ± 5
No. 50 (300 µm)	> 20

Add the following to the end of Note 1. of Article 1030.03 of the Standard Specifications:

“A dedicated storage tank for the Ground Tire Rubber (GTR) modified asphalt binder shall be provided. This tank must be capable of providing continuous mechanical mixing throughout by continuous agitation and recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of the asphalt binder at 300° F to 350° F (149° C to 177° C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of 0.40 percent.”

Revise 1030.02(c) of the Standard Specifications to read:

“(c) RAP Materials (Note 5)1031”

Add the following note to 1030.02 of the Standard Specifications:

Note 5. When using reclaimed asphalt pavement and/or reclaimed asphalt shingles, the maximum asphalt binder replacement percentage shall be according to the most recent special provision for recycled materials.

FRICITION AGGREGATE (D-1)

Effective: January 1, 2011 Revised: April 29, 2016

Revise Article 1004.03(a) of the Standard Specifications to read:

“1004.03 Coarse Aggregate for Hot-Mix Asphalt (HMA). The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate for HMA shall be according to the following table.

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA Low ESAL	Stabilized Subbase or Shoulders	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{1/} Crushed Concrete
HMA High ESAL Low ESAL	Binder IL-19.0 or IL-19.0L SMA Binder	<u>Allowed Alone or in Combination</u> ^{5/ 6/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete ^{3/}
HMA High ESAL Low ESAL	C Surface and Leveling Binder IL-9.5 or IL-9.5L SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination</u> ^{5/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/} Crushed Concrete ^{3/}

Use	Mixture	Aggregates Allowed	
HMA High ESAL	D Surface and Leveling Binder IL-9.5 SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination</u> ^{5/} :	
		Crushed Gravel Carbonate Crushed Stone (other than Limestone) ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/} Crushed Concrete ^{3/}	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		25% Limestone	Dolomite
HMA High ESAL	E Surface IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> ^{5/ 6/} :	
		Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Dolomite ^{2/}	Any Mixture E aggregate
75% Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone		
75% Crushed Gravel ^{2/} or Crushed Concrete ^{3/}	Crushed Sandstone, Crystalline Crushed Stone, Crushed Slag (ACBF), or Crushed Steel Slag		

Use	Mixture	Aggregates Allowed	
HMA High ESAL	F Surface IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> ^{5/ 6/} :	
		Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Crushed Gravel ^{2/} , Crushed Concrete ^{3/} , or Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone

- 1/ Crushed steel slag allowed in shoulder surface only.
- 2/ Carbonate crushed stone (limestone) and/or crushed gravel shall not be used in SMA Ndesign 80. In SMA Ndesign 50, carbonate crushed stone shall not be blended with any of the other aggregates allowed alone in Ndesign 50 SMA binder or Ndesign 50 SMA surface.
- 3/ Crushed concrete will not be permitted in SMA mixes.
- 4/ Crushed steel slag shall not be used as leveling binder.
- 5/ When combinations of aggregates are used, the blend percent measurements shall be by volume."
- 6/ Combining different types of aggregate will not be permitted in SMA Ndesign 80."

RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES (D-1)

Effective: November 1, 2012

Revise: April 2, 2016

Revise Section 1031 of the Standard Specifications to read:

“SECTION 1031. RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES

1031.01 Description. Reclaimed asphalt pavement and reclaimed asphalt shingles shall be according to the following.

- (a) Reclaimed Asphalt Pavement (RAP). RAP is the material resulting from cold milling or crushing an existing hot-mix asphalt (HMA) pavement. RAP will be considered processed FRAP after completion of both crushing and screening to size. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction.

(b) Reclaimed Asphalt Shingles (RAS). Reclaimed asphalt shingles (RAS). RAS is from the processing and grinding of pre-consumer or post-consumer shingles. RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable material, as defined in Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Shingle (RAS) Sources", by weight of RAS. All RAS used shall come from a Bureau of Materials and Physical Research approved processing facility where it shall be ground and processed to 100 percent passing the 3/8 in. (9.5 mm) sieve and 90 percent passing the #4 (4.75 mm) sieve. RAS shall meet the testing requirements specified herein. In addition, RAS shall meet the following Type 1 or Type 2 requirements.

(1) Type 1. Type 1 RAS shall be processed, pre-consumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.

(2) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential, or four unit or less dwellings not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

1031.02 Stockpiles. RAP and RAS stockpiles shall be according to the following.

(a) RAP Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. Additional processed RAP (FRAP) shall be stockpiled in a separate working pile, as designated in the QC Plan, and only added to the sealed stockpile when test results for the working pile are complete and are found to meet tolerances specified herein for the original sealed FRAP stockpile. Stockpiles shall be sufficiently separated to prevent intermingling at the base. All stockpiles (including unprocessed RAP and FRAP) shall be identified by signs indicating the type as listed below (i.e. "Non- Quality, FRAP -#4 or Type 2 RAS", etc...).

(1) Fractionated RAP (FRAP). FRAP shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in FRAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. All FRAP shall be processed prior to testing and sized into fractions with the separation occurring on or between the #4 (4.75 mm) and 1/2 in. (12.5 mm) sieves. Agglomerations shall be minimized such that 100 percent of the RAP in the coarse fraction shall pass the maximum sieve size specified for the mix the FRAP will be used in.

(2) Restricted FRAP (B quality) stockpiles shall consist of RAP from Class I, Superpave (High ESAL), or HMA (High ESAL). If approved by the Engineer, the aggregate from a maximum 3.0 in. (75 mm) single combined pass of surface/binder milling will be classified as B quality. All millings from this application will be processed into FRAP as described previously.

(3) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate RAP shall be processed (FRAP) prior to testing. Conglomerate RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.

(4) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from HMA shoulders, bituminous stabilized subbases or Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder mixture. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an inconsistent gradation and/or asphalt binder content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.

(5) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

RAP or FRAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, joint sealants, plant cleanout etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

(b) RAS Stockpiles. Type 1 and Type 2 RAS shall be stockpiled separately and shall be sufficiently separated to prevent intermingling at the base. Each stockpile shall be signed indicating what type of RAS is present.

However, a RAS source may submit a written request to the Department for approval to blend mechanically a specified ratio of Type 1 RAS with Type 2 RAS. The source will not be permitted to change the ratio of the blend without the Department prior written approval. The Engineer's written approval will be required, to mechanically blend RAS with any fine aggregate produced under the AGCS, up to an equal weight of RAS, to improve workability. The fine aggregate shall be "B Quality" or better from an approved Aggregate Gradation Control System source. The fine aggregate shall be one that is approved for use in the HMA mixture and accounted for in the mix design and during HMA production.

Records identifying the shingle processing facility supplying the RAS, RAS type, and lot number shall be maintained by project contract number and kept for a minimum of three years.

1031.03 Testing. FRAP and RAS testing shall be according to the following.

(a) FRAP Testing. When used in HMA, the FRAP shall be sampled and tested either during processing or after stockpiling. It shall also be sampled during HMA production.

(1) During Stockpiling. For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).

(2) Incoming Material. For testing as incoming material, washed extraction samples shall be run at a minimum frequency of one sample per 2000 tons (1800 metric tons) or once per week, whichever comes first.

(3) After Stockpiling. For testing after stockpiling, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP/FRAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

Before extraction, each field sample of FRAP, shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedure. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

(b) RAS Testing. RAS shall be sampled and tested during stockpiling according to Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Shingle (RAS) Sources". The Contractor shall also sample as incoming material at the HMA plant.

(1) During Stockpiling. Washed extraction and testing for unacceptable materials shall be run at the minimum frequency of one sample per 200 tons (180 metric tons) for the first 1000 tons (900 metric tons) and one sample per 1000 tons (900 metric tons) thereafter. A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). Once a ≤ 1000 ton (900 metric ton), five-sample/test stockpile has been established it shall be sealed. Additional incoming RAS shall be in a separate working pile as designated in the Quality Control plan and only added to the sealed stockpile when the test results of the working pile are complete and are found to meet the tolerances specified herein for the original sealed RAS stockpile.

(2) Incoming Material. For testing as incoming material at the HMA plant, washed extraction shall be run at the minimum frequency of one sample per 250 tons (227 metric tons). A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). The incoming material test results shall meet the tolerances specified herein.

The Contractor shall obtain and make available all test results from start of the initial stockpile sampled and tested at the shingle processing facility in accordance with the facility's QC Plan.

Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedures. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

1031.04 Evaluation of Tests. Evaluation of test results shall be according to the following.

(a) Evaluation of FRAP Test Results. All test results shall be compiled to include asphalt binder content, gradation and, when applicable (for slag), G_{mm}. A five test average of results from the original pile will be used in the mix designs. Individual extraction test results run thereafter, shall be compared to the average used for the mix design, and will be accepted if within the tolerances listed below.

Parameter	FRAP
No. 4 (4.75 mm)	± 6 %
No. 8 (2.36 mm)	± 5 %
No. 30 (600 μm)	± 5 %
No. 200 (75 μm)	± 2.0 %
Asphalt Binder	± 0.3 %
G _{mm}	± 0.03 ^{1/}

1/For stockpile with slag or steel slag present as determined in the current Manual of Test Procedures Appendix B 21, "Determination of Reclaimed Asphalt Pavement Aggregate Bulk Specific Gravity".

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the FRAP stockpile shall not be used in Hot-Mix Asphalt unless the FRAP representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

The Contractor shall maintain a representative moving average of five tests to be used for Hot-Mix Asphalt production.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the ITP, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)" or Illinois Modified AASHTO T-164-11, Test Method A.

(b) Evaluation of RAS Test Results. All of the test results, with the exception of percent unacceptable materials, shall be compiled and averaged for asphalt binder content and gradation. A five test average of results from the original pile will be used in the mix designs. Individual test results run thereafter, when compared to the average used for the mix design, will be accepted if within the tolerances listed below.

Parameter	RAS
No. 8 (2.36 mm)	± 5 %
No. 16 (1.18 mm)	± 5 %
No. 30 (600 µm)	± 4 %
No. 200 (75 µm)	± 2.5 %
Asphalt Binder Content	± 2.0 %

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the RAS shall not be used in Hot-Mix Asphalt unless the RAS representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

(c) Quality Assurance by the Engineer. The Engineer may witness the sampling and splitting conduct assurance tests on split samples taken by the Contractor for quality control testing a minimum of once a month.

The overall testing frequency will be performed over the entire range of Contractor samples for asphalt binder content and gradation. The Engineer may select any or all split samples for assurance testing. The test results will be made available to the Contractor as soon as they become available.

The Engineer will notify the Contractor of observed deficiencies.

Differences between the Contractor's and the Engineer's split sample test results will be considered acceptable if within the following limits.

Test Parameter	Acceptable Limits of Precision	
	FRAP	RAS
% Passing: ^{1/}		
1/2 in.	5.0%	
No. 4	5.0%	
No. 8	3.0%	4.0%
No. 30	2.0%	3.0%
No. 200	2.2%	2.5%
Asphalt Binder Content	0.3%	1.0%
G _{mm}	0.030	

1/Based on washed extraction.

In the event comparisons are outside the above acceptable limits of precision, the Engineer will immediately investigate.

(d) Acceptance by the Engineer. Acceptable of the material will be based on the validation of the Contractor's quality control by the assurance process.

1031.05 Quality Designation of Aggregate in RAP and FRAP.

(a) RAP. The aggregate quality of the RAP for homogeneous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.

- (1) RAP from Class I, Superpave/HMA (High ESAL), or (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.
- (2) RAP from Superpave/HMA (Low ESAL) IL-19.0L binder mixture is designated as Class D quality coarse aggregate.
- (3) RAP from Class I, Superpave/HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.
- (4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.

(b) FRAP. If the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer.

If the quality is not known, the quality shall be determined as follows. Fractionated RAP stockpiles containing plus #4 (4.75 mm) sieve coarse aggregate shall have a maximum tonnage of 5,000 tons (4,500 metric tons). The Contractor shall obtain a representative sample witnessed by the Engineer. The sample shall be a minimum of 50 lb (25 kg). The sample shall be extracted according to Illinois Modified AASHTO T 164 by a consultant laboratory prequalified by the Department for the specified testing. The consultant laboratory shall submit the test results along with the recovered aggregate to the District Office. The cost for this testing shall be paid by the Contractor. The District will forward the sample to the Bureau of Materials and Physical Research Aggregate Lab for MicroDeval Testing, according to ITP 327. A maximum loss of 15.0 percent will be applied for all HMA applications. The fine aggregate portion of the fractionated RAP shall not be used in any HMA mixtures that require a minimum of "B" quality aggregate or better, until the coarse aggregate fraction has been determined to be acceptable thru a MicroDeval Testing.

1031.06 Use of FRAP and/or RAS in HMA. The use of FRAP and/or RAS shall be the Contractor's option when constructing HMA in all contracts.

(a) FRAP. The use of FRAP in HMA shall be as follows.

(1) Coarse Aggregate Size (after extraction). The coarse aggregate in all FRAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.

(2) Steel Slag Stockpiles. FRAP stockpiles containing steel slag or other expansive material, as determined by the Department, shall be homogeneous and will be approved for use in HMA (High ESAL and Low ESAL) mixtures regardless of lift or mix type.

(3) Use in HMA Surface Mixtures (High and Low ESAL). FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall have coarse aggregate that is Class B quality or better. FRAP shall be considered equivalent to limestone for frictional considerations unless produced/screened to minus 3/8 inch.

(4) Use in HMA Binder Mixtures (High and Low ESAL), HMA Base Course, and HMA Base Course Widening. FRAP stockpiles for use in HMA binder mixtures (High and Low ESAL), HMA base course, and HMA base course widening shall be FRAP in which the coarse aggregate is Class C quality or better.

(5) Use in Shoulders and Subbase. FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be FRAP, Restricted FRAP, conglomerate, or conglomerate DQ.

(b) RAS. RAS meeting Type 1 or Type 2 requirements will be permitted in all HMA applications as specified herein.

(c) FRAP and/or RAS Usage Limits. Type 1 or Type 2 RAS may be used alone or in conjunction with FRAP in HMA mixtures up to a maximum of 5.0 percent by weight of the total mix.

When FRAP is used alone or FRAP is used in conjunction with RAS, the percent of virgin asphalt binder replacement (ABR) shall not exceed the amounts indicated in the table below for a given N Design.

Max Asphalt Binder Replacement for FRAP with RAS Combination

HMA Mixtures ^{1/2/4/}	Maximum % ABR		
	Binder/Leveling Binder	Surface	Polymer Modified ^{3/}
30L	50	40	30
50	40	35	30
70	40	30	30
90	40	30	30
4.75 mm N-50			40
SMA N-80			30

1/For Low ESAL HMA shoulder and stabilized subbase, the percent asphalt binder replacement shall not exceed 50 % of the total asphalt binder in the mixture.

2/When the binder replacement exceeds 15 % for all mixes, except for SMA and IL-4.75, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 % binder replacement using a virgin asphalt binder grade of PG64-22 will be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 %, the required virgin asphalt binder grade shall be PG64-28.

3/When the ABR for SMA or IL-4.75 is 15 % or less, the required virgin asphalt binder shall be SBS PG76-22 and the elastic recovery shall be a minimum of 80. When the ABR for SMA or IL-4.75 exceeds 15%, the virgin asphalt binder grade shall be SBS PG70-28 and the elastic recovery shall be a minimum of 80.

4/When FRAP or RAS is used alone, the maximum percent asphalt binder replacement designated on the table shall be reduced by 10 %.

1031.07 HMA Mix Designs. At the Contractor's option, HMA mixtures may be constructed utilizing RAP/FRAP and/or RAS material meeting the detailed requirements specified herein.

(a) FRAP and/or RAS. FRAP and /or RAS mix designs shall be submitted for verification. If additional FRAP or RAS stockpiles are tested and found to be within tolerance, as defined under "Evaluation of Tests" herein, and meet all requirements herein, the additional FRAP or RAS stockpiles may be used in the original design at the percent previously verified.

(b) RAS. Type 1 and Type 2 RAS are not interchangeable in a mix design. A RAS stone bulk specific gravity (Gsb) of 2.300 shall be used for mix design purposes.

1031.08 HMA Production. HMA production utilizing FRAP and/or RAS shall be as follows.

To remove or reduce agglomerated material, a scalping screen, gator, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAS and FRAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

If during mix production, corrective actions fail to maintain FRAP, RAS or QC/QA test results within control tolerances or the requirements listed herein the Contractor shall cease production of the mixture containing FRAP or RAS and conduct an investigation that may require a new mix design.

(a) RAS. RAS shall be incorporated into the HMA mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. The portion of RAS shall be controlled accurately to within ± 0.5 percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that the mixture production is halted when RAS flow is interrupted.

(b) HMA Plant Requirements. HMA plants utilizing FRAP and/or RAS shall be capable of automatically recording and printing the following information.

(1) Dryer Drum Plants.

- a. Date, month, year, and time to the nearest minute for each print.
- b. HMA mix number assigned by the Department.
- c. Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
- d. Accumulated dry weight of RAS and FRAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
- e. Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.
- f. Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.
- g. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.
- h. Aggregate RAS and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS and FRAP are printed in wet condition.)
- i. When producing mixtures with FRAP and/or RAS, a positive dust control system shall be utilized.
- j. Accumulated mixture tonnage.
- k. Dust Removed (accumulated to the nearest 0.1 ton (0.1 metric ton))

(2) Batch Plants.

- a. Date, month, year, and time to the nearest minute for each print.
- b. HMA mix number assigned by the Department.
- c. Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).

- d. Mineral filler weight to the nearest pound (kilogram).
- f. RAS and FRAP weight to the nearest pound (kilogram).
- g. Virgin asphalt binder weight to the nearest pound (kilogram).
- h. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

1031.09 RAP in Aggregate Surface Course and Aggregate Wedge Shoulders, Type B. The use of RAP or FRAP in aggregate surface course and aggregate shoulders shall be as follows.

(a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except “Non-Quality” and “FRAP”. The testing requirements of Article 1031.03 shall not apply. RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, “Reclaimed Asphalt Pavement (RAP) for Aggregate Applications”.

(b) Gradation. The RAP material shall meet the gradation requirements for CA 6 according to Article 1004.01(c), except the requirements for the minus No. 200 (75 µm) sieve shall not apply. The sample for the RAP material shall be air dried to constant weight prior to being tested for gradation.”

HMA MIXTURE DESIGN REQUIREMENTS (D-1)

Effective: January 1, 2013

Revised: April 1, 2016

1) Design Composition and Volumetric Requirements

Revise the table in Article 406.06(d) of the Standard Specifications to read:

"MINIMUM COMPACTED LIFT THICKNESS	
Mixture Composition	Thickness, in. (mm)
IL-4.75	3/4 (19)
SMA-9.5, IL-9.5, IL-9.5L	1 1/2 (38)
SMA-12.5	2 (50)
IL-19.0, IL-19.0L	2 1/4 (57)"

Revise the table in Article 1004.03(c) of the Standard Specifications to read:

“Use	Size/Application	Gradation No.
Class A-1, 2, & 3	3/8 in. (10 mm) Seal	CA 16
Class A-1	1/2 in. (13 mm) Seal	CA 15
Class A-2 & 3	Cover	CA 14
HMA High ESAL	IL-19.0 IL-9.5	CA 11 ^{1/} CA 16, CA 13 ^{3/}
HMA Low ESAL	IL-19.0L IL-9.5L Stabilized Subbase or Shoulders	CA 11 ^{1/} CA 16
SMA ^{2/}	1/2 in. (12.5mm) Binder & Surface IL 9.5 Surface	CA13 ^{3/} , CA14 or CA16 CA16, CA 13 ^{3/}

1/ CA 16 or CA 13 may be blended with the gradations listed.

2/ The coarse aggregates used shall be capable of being combined with stone sand, slag sand, or steel slag sand meeting the FA/FM 20 gradation and mineral filler to meet the approved mix design and the mix requirements noted herein.

3/ CA 13 shall be 100 percent passing the 1/2 in. (12.5mm) sieve.

Revise Article 1004.03(e) of the Supplemental Specifications to read:

“(e) Absorption. For SMA the coarse aggregate shall also have water absorption ≤ 2.0 percent.”

Revise the last paragraph of Article 1102.01 (a) (5) of the Standard Specifications to read:

“IL-4.75 and Stone Matrix Asphalt (SMA) mixtures which contain aggregate having absorptions greater than or equal to 2.0 percent, or which contain steel slag sand, shall have minimum surge bin storage plus haul time of 1.5 hours.”

Revise the nomenclature table in Article 1030.01 of the Standard Specifications to read:

“High ESAL	IL-19.0 binder; IL-9.5 surface; IL-4.75; SMA-12.5, SMA-9.5
Low ESAL	IL-19.0L binder; IL-9.5L surface; Stabilized Subbase (HMA) ^{1/} ; HMA Shoulders ^{2/}

1/ Uses 19.0L binder mix.

2/ Uses 19.0L for lower lifts and 9.5L for surface lift.”

Revise Article 1030.02 of the Standard Specifications and Supplemental Specifications to read:

“**1030.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.03
(b) Fine Aggregate	1003.03
(c) RAP Material	1031
(d) Mineral Filler	1011
(e) Hydrated Lime	1012.01
(f) Slaked Quicklime (Note 1)	
(g) Performance Graded Asphalt Binder (Note 2)	1032
(h) Fibers (Note 3)	
(i) Warm Mix Asphalt (WMA) Technologies (Note 4)	

Note 1. Slaked quicklime shall be according to ASTM C 5.

Note 2. The asphalt binder shall be an SBS PG 76-28 when the SMA is used on a full-depth asphalt pavement and SBS PG 76-22 when used as an overlay, except where modified herein. The asphalt binder shall be an Elvaloy or SBS PG 76-22 for IL-4.75, except where modified herein. The elastic recovery shall be a minimum of 80.

Note 3. A stabilizing additive such as cellulose or mineral fiber shall be added to the SMA mixture according to Illinois Modified AASHTO M 325. The stabilizing additive shall meet the Fiber Quality Requirements listed in Illinois Modified AASHTO M 325. Prior to approval and use of fibers, the Contractor shall submit a notarized certification by the producer of these materials stating they meet these requirements. Reclaimed Asphalt Shingles (RAS) may be used in Stone Matrix Asphalt (SMA) mixtures designed with an SBA polymer modifier as a fiber additive if the mix design with RAS included meets AASHTO T305 requirements. The RAS shall be from a certified source that produces either Type I or Type 2. Material shall meet requirements noted herein and the actual dosage rate will be determined by the Engineer.

Note 4. Warm mix additives or foaming processes shall be selected from the current Bureau of Materials and Physical Research Approved List, “Warm Mix Asphalt Technologies”.

Revise Article 1030.04(a)(1) of the Standard Specifications and the Supplemental Specifications to read:

“(1) High ESAL Mixtures. The Job Mix Formula (JMF) shall fall within the following limits.

High ESAL, MIXTURE COMPOSITION (% PASSING) ^{1/}										
Sieve Size	IL-19.0 mm		SMA ^{4/} IL-12.5 mm		SMA ^{4/} IL-9.5 mm		IL-9.5 mm		IL-4.75 mm	
	min	max	min	max	min	max	min	max	min	max
1 1/2 in. (37.5 mm)										
1 in. (25 mm)		100								
3/4 in. (19 mm)	90	100		100						
1/2 in. (12.5 mm)	75	89	80	100		100		100		100
3/8 in. (9.5 mm)				65	90	100	90	100		100
#4 (4.75 mm)	40	60	20	30	36	50	34	69	90	100
#8 (2.36 mm)	20	42	16	24 ^{5/}	16	32 ^{5/}	34 ^{6/}	52 ^{2/}	70	90
#16 (1.18 mm)	15	30					10	32	50	65
#30 (600 μm)			12	16	12	18				
#50 (300 μm)	6	15					4	15	15	30
#100 (150 μm)	4	9					3	10	10	18
#200 (75 μm)	3	6	7.0	9.0 ^{3/}	7.5	9.5 ^{3/}	4	6	7	9 ^{3/}
Ratio Dust/Asphalt Binder		1.0		1.5		1.5		1.0		1.0

- 1/ Based on percent of total aggregate weight.
- 2/ The mixture composition shall not exceed 44 percent passing the #8 (2.36 mm) sieve for surface courses with Ndesign = 90.
- 3/ Additional minus No. 200 (0.075 mm) material required by the mix design shall be mineral filler, unless otherwise approved by the Engineer.
- 4/ The maximum percent passing the #635 (20 μm) sieve shall be ≤ 3 percent.
- 5/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted above the percentage stated on the table.
- 6/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted below 34 percent.

Revise Article 1030.04(b)(1) of the Standard Specifications to read:

“(1) High ESAL Mixtures. The target value for the air voids of the HMA shall be 4.0 percent and for IL-4.75 it shall be 3.5 percent at the design number of gyrations. The VMA and VFA of the HMA design shall be based on the nominal maximum size of the aggregate in the mix, and shall conform to the following requirements.

VOLUMETRIC REQUIREMENTS High ESAL				
Ndesign	Voids in the Mineral Aggregate (VMA), % minimum			Voids Filled with Asphalt Binder (VFA), %
	IL-19.0	IL-9.5	IL-4.75 ^{1/}	
50	13.5	15.0	18.5	65 – 78 ^{2/}
70				65 - 75
90				

1/ Maximum Draindown for IL-4.75 shall be 0.3 percent

2/ VFA for IL-4.75 shall be 72-85 percent”

Replace Article 1030.04(b)(3) of the Standard Specifications with the following:

“(3) SMA Mixtures.

Volumetric Requirements SMA ^{1/}			
Ndesign	Design Air Voids Target %	Voids in the Mineral Aggregate (VMA), % min.	Voids Filled with Asphalt (VFA), %
80 ^{4/}	3.5	17.0 ^{2/}	75 - 83
		16.0 ^{3/}	

1/ Maximum draindown shall be 0.3 percent. The draindown shall be determined at the JMF asphalt binder content at the mixing temperature plus 30 °F.

2/ Applies when specific gravity of coarse aggregate is ≥ 2.760.

3/ Applies when specific gravity of coarse aggregate is < 2.760.

4/ Blending of different types of aggregate will not be permitted. For surface course, the coarse aggregate can be crushed steel slag, crystalline crushed stone or crushed sandstone. For binder course, coarse aggregate shall be crushed stone (dolomite), crushed gravel, crystalline crushed stone, or crushed sandstone.

Add to the end of Article 1030.05 (d) (2) a. of the Standard Specifications:

“During production, the Contractor shall test SMA mixtures for draindown according to AASHTO T305 at a frequency of 1 per day of production.”

Delete last sentence of the second paragraph of Article 1102.01(a) (4) b. 2.

Add to the end of Article 1102.01 (a) (4) b. 2.:

“As an option, collected dust (baghouse) may be used in lieu of manufactured mineral filler according to the following:

(a.) Sufficient collected dust (baghouse) is available for production of the SMA mix for the entire project.

(b.) A mix design was prepared based on collected dust (baghouse).

2) Design Verification and Production

Revise Article 1030.04 (d) of the Standard Specifications to read:

“(d) Verification Testing. High ESAL, IL-4.75, and SMA mix designs submitted for verification will be tested to ensure that the resulting mix designs will pass the required criteria for the Hamburg Wheel Test (IL mod AASHTO T-324) and the Tensile Strength Test (IL mod AASHTO T-283). The Department will perform a verification test on gyratory specimens compacted by the Contractor. If the mix fails the Department’s verification test, the Contractor shall make the necessary changes to the mix and resubmit compacted specimens to the Department for verification. If the mix fails again, the mix design will be rejected.

All new and renewal mix designs will be required to be tested, prior to submittal for Department verification and shall meet the following requirements:

- (1)Hamburg Wheel Test criteria. The maximum allowable rut depth shall be 0.5 in. (12.5 mm). The minimum number of wheel passes at the 0.5 in. (12.5 mm) rut depth criteria shall be based on the high temperature binder grade of the mix as specified in the mix requirements table of the plans.

Illinois Modified AASHTO T 324 Requirements ^{1/}

Asphalt Binder Grade	# Repetitions	Max Rut Depth (mm)
PG 70 -XX (or higher)	20,000	12.5
PG 64 -XX (or lower)	10,000	12.5

- 1/ When produced at temperatures of 275 ± 5 °F (135 ± 3 °C) or less, loose Warm Mix Asphalt shall be oven aged at 270 ± 5 °F (132 ± 3 °C) for two hours prior to gyratory compaction of Hamburg Wheel specimens.

Note: For SMA Designs (N-80) the maximum rut depth is 6.0 mm at 20,000 repetitions.

For IL 4.75mm Designs (N-50) the maximum rut depth is 9.0mm at 15,000 repetitions.

- (2) Tensile Strength Criteria. The minimum allowable conditioned tensile strength shall be 60 psi (415 kPa) for non-polymer modified performance graded (PG) asphalt binder and 80 psi (550 kPa) for polymer modified PG asphalt binder. The maximum allowable unconditioned tensile strength shall be 200 psi (1380 kPa).”

Production Testing. Revise first paragraph of Article 1030.06(a) of the Standard Specifications to read:

- “(a) High ESAL, IL-4.75, WMA, and SMA Mixtures. For each contract, a 300 ton (275 metric tons) test strip, except for SMA mixtures it will be 400 ton (363 metric ton), will be required at the beginning of HMA production for each mixture with a quantity of 3000 tons (2750 metric tons) or more according to the Manual of Test Procedures for Materials “Hot Mix Asphalt Test Strip Procedures”.

Add the following after the sixth paragraph in Article 1030.06 (a) of the Standard Specifications:

“The Hamburg Wheel test shall also be conducted on all HMA mixtures from a sample taken within the first 500 tons (450 metric tons) on the first day of production or during start up with a split reserved for the Department. The mix sample shall be tested according to the Illinois Modified AASHTO T 324 and shall meet the requirements specified herein. Mix production shall not exceed 1500 tons (1350 metric tons) or one day’s production, whichever comes first, until the testing is completed and the mixture is found to be in conformance. The requirement to cease mix production may be waived if the plant produced mixture demonstrates conformance prior to start of mix production for a contract.

If the mixture fails to meet the Hamburg Wheel criteria, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria”

Method of Measurement:

Add the following after the fourth paragraph of Article 406.13 (b):

“The plan quantities of SMA mixtures shall be adjusted using the actual approved binder and surface Mix Design’s G_{mb} .”

Basis of Payment.

Replace the fourth paragraph of Article 406.14 of the Standard Specifications with the following:

“Stone matrix asphalt will be paid for at the contract unit price per ton (metric ton) for POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, STONE MATRIX ASPHALT, of the mixture composition and Ndesign specified; and POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, STONE MATRIX ASPHALT, of the mixture composition and Ndesign specified.”

HOT MIX ASPHALT QUALITY CONTROL FOR PERFORMANCE (CBM)

Effective: January 1, 2012

Revised: January 2, 2017

Description. This special provision describes the procedures for production, placement and payment of hot-mix asphalt (HMA) under the quality control for performance (QCP) program. This special provision shall apply to the HMA mixtures specified in the plans. This work shall be according to the Standard Specifications except as modified herein.

Delete Articles:	406.06(b)(1), 2 nd Paragraph	(Temperature Requirements)
	406.06 (e), 3 rd Paragraph	(Paver Speed Requirements)
	406.07(b)	(Rolling)
	406.07(c)	(Density)
	1030.05(a)(4, 5, 9,)	(QC/QA Documents)
	1030.05(d)(2)a.	(Plant Tests)
	1030.05(d)(2)b.	(Dust-to-Asphalt and Moisture Content)
	1030.05(d)(2)d.	(Small Tonnage)
	1030.05(d)(2)f.	(HMA Sampling)
	1030.05(d)(3)	(Required Field Tests)
	1030.05(d)(4)	(Control Limits)
	1030.05(d)(5)	(Control Charts)
	1030.05(d)(7)	(Corrective Action for Field Tests (Density))
	1030.05(e)	(Quality Assurance by the Engineer)
	1030.05(f)	(Acceptance by the Engineer)
	1030.06(a), 2 nd paragraph	(Before start-up...)

Definitions.

- (a) Quality Control (QC). All production and construction activities by the Contractor required to achieve the required level of quality.
- (b) Quality Assurance (QA). All monitoring and testing activities by the Engineer required to assess product quality, level of payment, and acceptability of the product.
- (c) Pay Parameters. Pay parameters shall be field voids in the mineral aggregate (Field VMA), voids, and density. Field VMA will be calculated using the combined aggregates bulk specific gravity (G_{sb}) from the mix design.
- (d) Mixture Lot. A mixture lot shall begin once an acceptable test strip has been completed and the adjusted job mix formula has been determined. If the test strip is waived, a mixture lot shall begin with the start of production. A mixture lot shall consist of four sublots unless it is the last or only lot, in which case it may consist of as few as one subplot.
- (e) Mixture Sublot. A mixture subplot for Field VMA, voids, and dust/AC shall be a maximum of 1000 tons (910 metric tons).
 - (1) If the remaining quantity is greater than 200 tons (180 metric tons) but less than 1000 tons (910 metric tons), the last mixture subplot will be that quantity.
 - (2) If the remaining quantity is 200 tons (180 metric tons) or less, the quantity shall be combined with the previous mixture subplot.
- (f) Density Interval. Density intervals shall be every 0.2 miles (320 m) for lift thicknesses of 3 in. (75 mm) or less and 0.1 miles (160 m) for lift thicknesses greater than 3 in. (75 mm). If a density interval is less than 200 ft (60 m), it will be combined with the previous density interval.

- (g) Density Sublot. A density sublot shall be the average of five consecutive density intervals.
- (1) If less than three density intervals remain outside a density sublot, they shall be included in the previous density sublot.
- (2) If three or more density intervals remain, they shall be considered a density sublot.
- (h) Density Test. A density test shall consist of a core taken at a random location within each density interval.

When establishing the target density, the HMA maximum theoretical gravity (G_{mm}) shall be based on the running average of four Department test results. Initial G_{mm} shall be based on the average of the first four test results. If less than four G_{mm} results are available, an average of all available Department G_{mm} test results shall be used.

If the Contractor opts to use intelligent compaction, the Contractor may receive 100 percent for the density pay factor in Equation 1 of the Department’s Manual of Test Procedure for Materials “QCP Pay Calculation” document for each applicable HMA mixture. The Contractor may only select this option if the HMA Mixture Requirements table on the plans specifies values in the “Roller Type / Number of Passes / Compaction Temperature Range” cell. Intelligent compaction shall be performed according to the Department’s Manual of Test Procedure for Materials “Procedure for Intelligent Compaction”.

Quality Control (QC) by the Contractor. The Contractor’s QC plan shall include the schedule of testing for both pay parameters and non-pay parameters required to control the product such as asphalt binder content and mixture gradation. The minimum test frequency shall be according to the following table.

Minimum Quality Control Sampling and Testing Requirements

Quality Characteristic		Minimum Test Frequency
Mixture Gradation		1 per sublot
Asphalt Binder Content		
Dust/AC Ratio		
Field VMA		
Voids	G_{mb}	
	G_{mm}	

The Contractor’s splits in conjunction with other quality control tests shall be used to control production.

The Contractor shall submit split jobsite mix sample test results to the Engineer within 48 hours of the time of sampling. All QC testing shall be performed in a qualified laboratory by personnel who have successfully completed the Department’s HMA Level I training.

Quality Assurance (QA) by the Engineer. Quality Assurance by the Engineer will be as follows.

- (a) Voids, Field VMA and Dust/AC Ratio. The Engineer will determine the random tonnage and the Contractor shall be responsible for obtaining the sample according to the Department's Manual of Test Procedures for Materials "PFP Hot-Mix Asphalt Random Jobsite Sampling Procedure".
- (b) Density: After final rolling, the Engineer will identify the random core locations within each density testing interval according to the Department's Manual of Test Procedures for Materials "PFP and QCP Random Density Procedure".

The Contractor shall cut the 4 in. (100 mm) diameter cores within the same day and prior to opening to traffic unless otherwise approved by the Engineer. All core holes shall be filled immediately upon completion of coring. All water shall be removed from the core holes prior to filling. All core holes shall be filled with a rapid hardening mortar or concrete which shall be mixed in a separate container prior to placement in the hole. Any depressions in the surface of the filled core holes greater than 1/4 in. (6 mm) at the time of final inspection will require removal of the fill material to the depth of the lift thickness and replacement.

The Engineer will witness and secure all mixture and density samples. The Contractor shall transport the secured sample to a location designated by the Engineer.

The Engineer will test one or all of the randomly selected split samples from each lot for voids, Field VMA and dust/AC ratio. The Engineer will test a minimum of one sample per project. The Engineer will test all of the pavement cores for density unless intelligent compaction is used. All QA testing will be performed in a qualified laboratory by personnel who have successfully completed the Department's HMA Level I training. QA test results will be available to the Contractor within ten working days from receipt of secured cores and split mixture samples.

The Engineer will maintain a complete record of all Department test results and copies will be provided to the Contractor with each set of subplot results. The records will contain, at a minimum, the originals of all Department test results and raw data, random numbers used and resulting calculations for sampling locations, and quality level analysis calculations.

If the QA results do not meet the 100% subplot pay factor limits or do not compare to QC results within the precision limits listed below, the Engineer will test all split mix samples for the lot.

Test Parameter	Limits of Precision
G_{mb}	0.030
G_{mm}	0.026
Field VMA	1.0 %

Acceptance by the Engineer. All of the Department's tests shall be within the acceptable limits listed below:

Parameter		Acceptable Limits
Field VMA		-1.0 – +3.0% ^{1/}
Voids		2.0 – 6.0%
Density	IL-9.5, IL-19.0, IL-4.75, IL-9.5FG ^{3/}	90.0 – 98.0%
	SMA	92.0 – 98.0%
Dust / AC Ratio		0.4 – 1.6 ^{2/}

- 1/ Based on minimum required VMA from mix design
- 2/ Does not apply to SMA.
- 3/ Acceptable density limits for IL-9.5FG placed less than 1.25 in. shall be 89.0% - 98.0%

In addition, no visible pavement distresses shall be present such as, but not limited to, segregation, excessive coarse aggregate fracturing or flushing.

Basis of Payment. Payment will be based on the calculation of the composite pay factor using QA test results for each mixture according to the Department's Manual of Test Procedure for Materials "QCP Pay Calculation" document.

If the intelligent compaction option is chosen, the Contractor may receive 100 percent for the density pay factor in Equation 1 of the Department's Manual of Test Procedure for Materials "QCP Pay Calculation" document for each applicable HMA mixture. If the specified roller type, passes, temperature and speed requirements are not met, the density pay adjustments will apply.

Dust/AC Ratio. A monetary deduction will be made using the pay adjustment table below for dust/AC ratios that deviate from the 0.6 to 1.2 range. If the tested mixture subplot is outside of this range, the Department will test the remaining sublots for dust/AC pay adjustment.

Dust/AC Pay Adjustment Table^{1/}

Range	Deduct / subplot
$0.6 \leq X \leq 1.2$	\$0
$0.5 \leq X < 0.6$ or $1.2 < X \leq 1.4$	\$1000
$0.4 \leq X < 0.5$ or $1.4 < X \leq 1.6$	\$3000
$X < 0.4$ or $X > 1.6$	Shall be removed and replaced

- 1/ Does not apply to SMA.

ADJUSTMENTS AND RECONSTRUCTIONS

Effective: March 15, 2011

Revise the first paragraph of Article 602.04 to read:

“602.04 Concrete. Cast-in-place concrete for structures shall be constructed of Class SI concrete according to the applicable portions of Section 503. Cast-in-place concrete for pavement patching around adjustments and reconstructions shall be constructed of Class PP-1 concrete, unless otherwise noted in the plans, according to the applicable portions of Section 1020.”

Revise the third, fourth and fifth sentences of the second paragraph of Article 602.11(c) to read:

“Castings shall be set to the finished pavement elevation so that no subsequent adjustment will be necessary, and the space around the casting shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e) (3)b.”

Revise Article 603.05 to read:

“603.05 Replacement of Existing Flexible Pavement. After the castings have been adjusted, the surrounding space shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e) (3)b.”

Revise Article 603.06 to read:

“603.06 Replacement of Existing Rigid Pavement. After the castings have been adjusted, the pavement and HMA that was removed, shall be replaced with Class PP-1 concrete, unless otherwise noted in the plans, not less than 9 in. (225 mm) thick. The pavement may be opened to traffic according to Article 701.17(e)(3)b.

The surface of the Class PP concrete shall be constructed flush with the adjacent surface.” Revise the first sentence of Article 603.07 to read:

“603.07 Protection Under Traffic. After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.”

AGGREGATE SUBGRADE IMPROVEMENT (D-1)

Effective: February 22, 2012

Revised: April 1, 2016

Add the following Section to the Standard Specifications:

“SECTION 303. AGGREGATE SUBGRADE IMPROVEMENT

303.01 Description. This work shall consist of constructing an aggregate subgrade improvement.

303.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.07
(b) Reclaimed Asphalt Pavement (RAP) (Notes 1, 2 and 3)	1031

Note 1. Crushed RAP, from either full depth or single lift removal, may be mechanically blended with aggregate gradation CS 01 but shall not exceed 40 percent by weight of the total product. The top size of the Coarse RAP shall be less than 4 in. (100 mm) and well graded.

Note 2. RAP having 100 percent passing the 1 1/2 in (37.5 mm) sieve and being well graded, may be used as capping aggregate in the top 3 in. (75 mm) when aggregate gradation CS 01 is used in lower lifts. When RAP is blended with any of the coarse aggregates, the blending shall be done with mechanically calibrated feeders. The final product shall not contain more than 40 percent by weight of RAP.

Note 3. The RAP used for aggregate subgrade improvement shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, “Reclaimed Asphalt Pavement (RAP) for Aggregate Applications”.

303.03 Equipment. The vibratory machine shall be according to Article 1101.01, or as approved by the Engineer. The calibration for the mechanical feeders shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered.

303.04 Soil Preparation. The stability of the soil shall be according to the Department’s Subgrade Stability Manual for the aggregate thickness specified.

303.05 Placing Aggregate. The maximum nominal lift thickness of aggregate gradation CS 01 shall be 24 in. (600 mm).

303.06 Capping Aggregate. The top surface of the aggregate subgrade shall consist of a minimum 3 in. (75 mm) of aggregate gradations CA 06 or CA 10. When Reclaimed Asphalt Pavement (RAP) is used, it shall be crushed and screened where 100 percent is passing the 1 1/2 in. (37.5 mm) sieve and being well graded. RAP that has been fractionated to size will not be permitted for use in capping. Capping aggregate will not be required when the aggregate subgrade improvement is used as a cubic yard pay item for undercut applications. When RAP is blended with any of the coarse aggregates, the blending shall be done with mechanically calibrated feeders.

303.07 Compaction. All aggregate lifts shall be compacted to the satisfaction of the Engineer. If the moisture content of the material is such that compaction cannot be obtained, sufficient water shall be added so that satisfactory compaction can be obtained.

303.08 Finishing and Maintenance of Aggregate Subgrade Improvement. The aggregate subgrade improvement shall be finished to the lines, grades, and cross sections shown on the plans, or as directed by the Engineer. The aggregate subgrade improvement shall be maintained in a smooth and compacted condition.

303.09 Method of Measurement. This work will be measured for payment according to Article 311.08.

303.10 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for AGGREGATE SUBGRADE IMPROVEMENT or at the contract unit price per square yard (square meter) for AGGREGATE SUBGRADE IMPROVEMENT, of the thickness specified.

Add the following to Section 1004 of the Standard Specifications:

“1004.07 Coarse Aggregate for Aggregate Subgrade Improvement. The aggregate shall be according to Article 1004.01 and the following.

- (a) Description. The coarse aggregate shall be crushed gravel, crushed stone, or crushed concrete. The top 12 inches of the aggregate subgrade improvement shall be 3 inches of capping material and 9 inches of crushed gravel, crushed stone or crushed concrete. In applications where greater than 36 inches of subgrade material is required, rounded gravel, meeting the CS01 gradation, may be used beginning at a depth of 12 inches below the bottom of pavement.
- (b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials. Non-mechanically blended RAP may be allowed up to a maximum of 5.0 percent.

(c) Gradation.

- (1) The coarse aggregate gradation for total subgrade thicknesses of 12 in. (300 mm) or greater shall be CS 01.

COARSE AGGREGATE SUBGRADE GRADATIONS					
Grad No.	Sieve Size and Percent Passing				
	8"	6"	4"	2"	#4
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20

COARSE AGGREGATE SUBGRADE GRADATIONS (Metric)					
Grad No.	Sieve Size and Percent Passing				
	200 mm	150 mm	100 mm	50 mm	4.75 mm
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20

The 3 in. (75 mm) capping aggregate shall be gradation CA 6 or CA 10.

COARSE AGGREGATE FOR BACKFILL, TRENCH BACKFILL AND BEDDING (D-1)

Effective: November 1, 2011

Revised: November 1, 2013

This work shall be according to Section 1004.05 of the Standard Specifications except for the following:

Reclaimed Asphalt Pavement (RAP) may be blended with gravel, crushed gravel, crushed stone crushed concrete, crushed slag, chats, crushed sand stone or wet bottom boiler slag. The RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications". The RAP shall be uniformly graded and shall pass the 1.0 in. (25 mm) screen. When RAP is blended with any of the coarse aggregate listed above, the blending shall be done mechanically with calibrated feeders. The feeders shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered. The final blended product shall not contain more than 40 percent by weight RAP.

The coarse aggregate listed above shall meet CA 6 and CA 10 gradations prior to being blended with the processed and uniformly graded RAP. Gradation deleterious count shall not exceed 10% of total RAP and 5% of other by total weight.

ENGINEER'S FIELD OFFICE TYPE A (SPECIAL)

Effective: December 1, 2011

Revised: May 1, 2013

Revise the first paragraph of Article 670.02 to read:

670.02 Engineer's Field Office Type A (Special). Type A (Special) field offices shall have a ceiling height of not less than 7 feet and a floor space of not less than 3000 square feet with a minimum of two separate offices. The office shall also have a separate storage room capable of being locked for the storage of the nuclear measuring devices. The office shall be provided with sufficient heat, natural and artificial light, and air conditioning. Doors and windows shall be equipped with locks approved by the Engineer.

Revise the first sentence of the second paragraph of Article 670.02 to read:

An electronic security system that will respond to any breach of exterior doors and windows with an on-site alarm shall be provided.

Revise the last sentence of the third paragraph of Article 670.02 to read:

Adequate all-weather parking space shall be available to accommodate a minimum of twelve vehicles.

Revise the fifth paragraph of Article 670.02 to read:

Sanitary facilities shall include hot and cold potable running water, lavatory and toilet as an integral part of the office where available. Solid waste disposal consisting of seven waste baskets and an outside trash container of sufficient size to accommodate a weekly provided pick-up service. A weekly cleaning service for the office shall be provided.

Revise subparagraph (a) of Article 670.02 to read:

(a) Twelve desks with minimum working surface 42 inch x 30 inch each and twelve non-folding chairs with upholstered seats and backs.

Revise the first sentence of subparagraph (c) of Article 670.02 to read:

(c) Two four-post drafting tables with minimum top size of 37-½ inch x 48 inch.

Revise subparagraph (d) of Article 670.02 to read:

(d) Eight free standing four-drawer legal size file cabinets with lock and an underwriters' laboratories insulated file device 350 degrees one hour rating.

Revise subparagraph (e) of Article 670.02 to read:

- (e) Twenty folding chairs and two conference tables with minimum top size of 44 inch x 96 inch.

Revise subparagraph (h) of Article 670.02 to read:

- (h) Three electric desk type tape printing calculator and two pocket scientific notation calculators with a 1000 hour battery life or with a portable recharger.

Revise subparagraph (i)(2) of Article 670.02 to read:

- (i)(2) Telephones lines. Five separate telephone lines including one line for the fax machine, and two lines for the exclusive use of the Engineer. All telephone lines shall include long distance service and all labor and materials necessary to install the phone lines at the locations directed by the Engineer. The TELCOM company shall configure ROLL/HUNT features as specified by the engineer.

Revise subparagraph (j) of Article 670.02 to read:

- (j) Two plain paper network multi-function printer/copier/scanner machines capable of reproducing prints up to 11 inch x 17 inch within automatic feed tray capable of sorting 30 sheets of paper. Letter size and 11 inch x 17 inch paper shall be provided. The contractor shall provide the multi-function machines with IT support for setup and maintenance.

Revise subparagraph (k) of Article 670.02 to read:

- (k) One plain paper fax machine including maintenance and supplies.

Revise subparagraph (l) of Article 670.02 to read:

- (l) Six four-line telephones, with touch tone, where available, and two digital answering machines, for exclusive use by the Engineer.

Revise subparagraph (m) of Article 670.02 to read:

- (m) One electric water cooler dispenser including water service.

Add the following subparagraphs to Article 670.02:

- (s) One 4 foot x 6 foot chalkboard or dry erase board.
- (t) One 4 foot x 6 foot framed cork board.

Add the following to Article 670.07 Basis of Payment.

The building or buildings, fully equipped, will be paid for at the contract unit price per calendar month or fraction thereof for ENGINEER'S FIELD OFFICE, TYPE A (SPECIAL).

HEAT OF HYDRATION CONTROL FOR CONCRETE STRUCTURES (D-1)

Effective: November 1, 2013

Article 1020.15 shall not apply.

PUBLIC CONVENIENCE AND SAFETY (DISTRICT 1)

Effective: May 1, 2012

Revised: July 15, 2012

Add the following to the end of the fourth paragraph of Article 107.09:

“If the holiday is on a Saturday or Sunday, and is legally observed on a Friday or Monday, the length of Holiday Period for Monday or Friday shall apply.”

Add the following sentence after the Holiday Period table in the fourth paragraph of Article 107.09:

“The Length of Holiday Period for Thanksgiving shall be from 5:00 AM the Wednesday prior to 11:59 PM the Sunday After”

Delete the fifth paragraph of Article 107.09 of the Standard Specifications:

“On weekends, excluding holidays, roadways with Average Daily Traffic of 25,000 or greater, all lanes shall be open to traffic from 3:00 PM Friday to midnight Sunday except where structure construction or major rehabilitation makes it impractical.”

TEMPORARY PAVEMENT

Effective: March 1, 2003

Revised: April 10, 2008

Description. This work shall consist of constructing a temporary pavement at the locations shown on the plans or as directed by the engineer.

The contractor shall use either Portland cement concrete according to Sections 353 and 354 of the Standard Specifications or HMA according to Sections 355, 356, 406 of the Standard Specifications, and other applicable HMA special provisions as contained herein. The HMA mixtures to be used shall be specified in the plans. The thickness of the Temporary Pavement shall be as described in the plans. The contractor shall have the option of constructing either material type if both Portland cement concrete and HMA are shown in the plans.

Articles 355.08 and 406.11 of the Standard Specifications shall not apply.

The removal of the Temporary Pavement, if required, shall conform to Section 440 of the Standard Specification.

Method of Measurement. Temporary pavement will be measured in place and the area computed in square yards (square meters).

Basis of Payment. This work will be paid for at the contract unit price per square yard (square meter) for TEMPORARY PAVEMENT and TEMPORARY PAVEMENT (INTERSTATE).

Removal of temporary pavement will be paid for at the contract unit price per square yard (square meter) for TEMPORARY PAVEMENT REMOVAL.

RECLAIMED ASPHALT PAVEMENT FOR NON-POROUS EMBANKMENT AND BACKFILL

Effective: April 1, 2001

Revised: January 1, 2007

Add the following sentence to Article 1004.05 (a) of the Standard Specifications:

"Reclaimed Asphalt Pavement (RAP) may be used as aggregate in Non-porous Granular Embankment and Backfill. The RAP material shall be reclaimed asphalt pavement material resulting from the cold milling or crushing of an existing hot-mix bituminous concrete pavement structure, including shoulders. RAP containing contaminants such as earth, brick, concrete, sheet asphalt, sand, or other materials identified by the Department will be unacceptable until the contaminants are thoroughly removed.

Add the following sentence to Article 1004.05 (c)(2) of the Standard Specifications:

"One hundred percent of the RAP when used shall pass the 3 inch (75 mm) sieve. The RAP shall be well graded from coarse to fine. RAP that is gap-graded or single-sized will not be accepted."

STORM SEWER ADJACENT TO OR CROSSING WATER MAIN

Effective: February 1, 1996

Revised: January 1, 2007

This work consists of constructing storm sewer adjacent to or crossing a water main, at the locations shown on the plans. The material and installation requirements shall be according to the latest edition of the "Standard Specifications for Water and Sewer Main Construction in Illinois", and the applicable portions of Section 550 of the Standard Specifications; which may include concrete collars and encasing pipe with seals if required.

Pipe materials shall meet the requirements of Sections 40 and 41-2.01 of the "Standard Specifications for Water and Sewer Main Construction in Illinois", except PVC pipe will not be allowed. Ductile-Iron pipe shall meet the minimum requirements for Thickness Class 50.

Encasing of standard type storm sewer, according to the details for "Water and Sewer Separation Requirements (Vertical Separation)" in the "STANDARD DRAWINGS" Division of the "Standard Specifications for Water and Sewer Main Construction in Illinois", may be used for storm sewers crossing water mains.

Basis of Payment: This work will be paid according to Article 550.10 of the Standard Specifications, except the pay item shall be STORM SEWER (WATER MAIN REQUIREMENTS), of the diameter specified.

RAILROAD BRIDGE STEEL BEARINGS

Materials, fabrication, inspection, testing, and erection shall conform to Standard Specification Section 521 BEARINGS except as modified herein.

Description: This work shall consist of furnishing and installing steel bearings.

Materials: Shall be according to American Railway Engineering and Maintenance- of-Way Association, (AREMA) 2010, Part 11, Bearing Construction.

Construction: Bearings shall be constructed according to AREMA, 2010, Part 11.

Anchor Bolt Installation: The contractor shall install anchor bolts per Standard Section 521.

Method of Measurement: When paid for as a separate item, steel bearings will be measured for payment as each. Each will be defined as one complete bearing assembly.

Basis of Payment: Steel bearing work will be paid for at the contract unit price for each STEEL BEARING ASSEMBLY. Anchor bolts will be paid for at the contract unit price for ANCHOR BOLTS, per each of the diameter specified.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES

Description: This work shall be according to Article 669 of the Standard Specifications and the following: Qualifications. The term environmental firm shall mean an environmental firm with at least five(5) documented leaking underground storage tank (LUST) cleanups or that is pre-qualified in hazardous waste by the Department. Documentation includes but not limited to verifying remediation and special waste operations for sites contaminated with gasoline, diesel, or waste oil in accordance with all Federal, State, or local regulatory requirements and shall be provided to the Engineer for approval. The environmental firm selected shall not be a former or current consultant or have any ties with any of the properties contained within and/or adjacent to this construction project.

The generator number for Lake County, Illinois is 0978995044.

General: This Special Provision will likely require the Contractor to subcontract for the execution of certain activities.

All contaminated materials shall be managed as either “uncontaminated soil” or non-special waste. This work shall include monitoring and potential sampling, analytical testing, and management of a material contaminated by regulated substances. The Environmental Firm shall continuously monitor all soil excavation for worker protection and soil contamination.

Phase I Preliminary Engineering information is available through the District’s Environmental Studies Unit. Soil samples or analysis without the approval of the Engineer will be at no additional cost to the Department. The lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit whichever is less.

The Contractor shall manage any excavated soils and sediment within the following areas:

- Station 28+00 to Station 30+00 (IL 132) 0 to 100 feet RT (Commercial Building, PESA Site 1259A-18, 3747 West Grand Avenue). This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Anthracene, Benzo(a)Pyrene, Benzo (b)Fluoranthene, Carbazole, Dibenzo(a,h)Anthracene, Indeno(1,2,3-cd)Pyrene, and Manganese.
- Station 30+00 to Station 32+00 (IL 132) 0 to 100 feet RT (Commercial Building, PESA Site 1259A-20, 3701 West Grand Avenue). This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Anthracene, Benzo(a)Pyrene, Benzo(b)Fluoranthene, Carbazole, Dibenzo(a,h)Anthracene, Indeno(1,2,3-cd)Pyrene, and Manganese.
- Station 22+50 to Station 25+00 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene, Arsenic, and Manganese.
- Station 10+50 to Station 20+00 (IL 132) 0 to 100 feet LT (Residential Building, PESA Site 1259A-10, various addresses). This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 30+00 to Station 32+00 (IL 132) 0 to 100 feet LT (Don Mac Lagan’s Automotive, PESA Site 1259A-19, 3710 West Grand Avenue). This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene and Manganese.
- Station 10+50 to Station 15+00 (IL 132) 0 to 70 feet RT (Residential Building/Vacant Lot, PESA Site 1259A-10, Various Addresses). This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene, Dibenzo(a,h) Anthracene, and Manganese.

- Station 16+50 to Station 19+00 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Arsenic.
- Station 25+40 to Station 28+50 (IL 132) 0 to 100 feet LT (Commercial Building, PESA Site 1259A-16, 860 North Waveland Avenue). This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Manganese.
- Station 12+00 to Station 16+50 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Manganese.
- Station 19+00 to Station 22+50 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Arsenic.
- Station 28+50 to Station 30+00 (IL 132) 0 to 100 feet LT (Hollywood Inn and Suites, PESA Site 1259A-17, 3732-3740 West Grand Avenue). This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene.
- Station 0+00 to Station 2+50 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene and Manganese.
- Station 6+70 to Station 8+70 (Shoofly Tracks) 0 to 50 feet RT/LT (Union Pacific Railroad, PESA Site 1259A-3, 500-1100 North blocks of Skokie Highway). This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Benzo(a)Pyrene and Manganese.
- Station 22+50 to Station 25+40 (IL 132) 0 to 100 feet LT (Vacant Land, PESA Site 1259A-14, 3800 West block of Grand Avenue). This material meets the criteria of Article 669.09(b)(1) and shall be managed in accordance to Article 669.09.

CONCRETE BARRIER MEDIAN

606.01 Description. This work shall consist of the construction of concrete barrier median at the stations shown on the drawings. The depth of the Concrete Barrier Median is to be 9 ½ inches. Construction shall be in accordance with Section 606.09 of the Standard Specifications. The work shall be done in accordance with Section 606 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions.

606.02 Basis of Payment. The work will be paid for at the unit cost per square foot for CONCRETE BARRIER MEDIAN.

TRAFFIC SIGNAL GENERAL REQUIREMENTS

Effective: May 22, 2002
800.01TS

Revised: March 25, 2016

These Traffic Signal Special Provisions and the "District One Standard Traffic Signal Design Details" supplement the requirements of the State of Illinois "Standard Specifications for Road and Bridge Construction." The intent of these Special Provisions is to prescribe the materials and construction methods commonly used for traffic signal installations.

All material furnished shall be new unless otherwise noted herein.

Traffic signal construction and maintenance work shall be performed by personnel holding current July 20, 2016 MSA Traffic Signal Technician Level II certification. A copy of the certification shall be immediately available upon request of the Engineer.

The work to be done under this contract consists of furnishing, installing and maintaining all traffic signal work and items as specified in the Plans and as specified herein in a manner acceptable and approved by the Engineer.

Definitions of Terms

Add the following to Section 101 of the Standard Specifications:

101.56 Vendor. Company that sells a particular type of product directly to the contractor or the Equipment Supplier.

101.57 Equipment supplier. Company that supplies, represents and provides technical support for IDOT District One approved traffic signal controllers and other related equipment. The Equipment Supplier shall be located within IDOT District One and shall:

- Be full service with on-site facilities to assemble, test and trouble-shoot traffic signal controllers and cabinet assemblies.
- Maintain an inventory of IDOT District One approved controllers and cabinets.
- Be staffed with permanent sales and technical personnel able to provide traffic signal controller and cabinet expertise and support.
- Technical staff shall hold current IMSA Traffic Signal Technician Level III certification and shall attend traffic signal turn-ons and inspections with a minimum 14 calendar day notice.

Submittals

Revise Article 801.05 of the Standard Specifications to read:

All material approval requests shall be submitted electronically through the District's SharePoint System unless directed otherwise by the Engineer. Electronic material submittals shall follow the District's Traffic Operations Construction Submittals guidelines. General requirements include:

1. All material approval requests shall be made prior to or no later than the date of the preconstruction meeting. A list of major traffic signal items can be found in Article 801.05. Material or equipment which is similar or identical shall be the product of the same manufacturer, unless necessary for system continuity. Traffic signal materials and equipment shall bear the U.L. label whenever such labeling is available.
2. Product data and shop drawings shall be assembled by pay item. Only the top sheet of each pay item submittal will be stamped by the Department with the review status, except shop drawings for mast arm pole assemblies and the like will be stamped with the review status on each sheet.
3. Original manufacturer published product data and shop drawing sheets with legible dimensions and details shall be submitted for review.
4. When hard copy submittals are necessary, four complete copies of the manufacturer's descriptive literatures and technical data for the traffic signal materials shall be submitted. For hard copy or electronic submittals, the descriptive literature and technical data shall be adequate for determining whether the materials meet the requirements of the plans and specifications. If the literature contains more than one item, the Contractor shall indicate which item or items will be furnished.
5. When hard copy submittals are necessary for structural elements, four complete copies of the shop drawings for the mast arm assemblies and poles, and the combination mast arm assemblies and poles showing, in detail, the fabrication thereof and the certified mill analyses of the materials used in the fabrication, anchor rods, and reinforcing materials shall be submitted.
6. Partial or incomplete submittals will be returned without review.
7. Certain non-standard mast arm poles and special structural elements will require additional review from IDOT's Central Office. Examples include ornamental/decorative, non-standard length mast arm pole assemblies and monotube structures. The Contractor shall account for the additional review time in his schedule.
8. The contract number or permit number, project location/limits and corresponding pay code number must be on each sheet of correspondence, catalog cuts and mast arm poles and assemblies drawings.
9. Where certifications and/or warranties are specified, the information submitted for approval shall include certifications and warranties. Certifications involving inspections, and/or tests of material shall be complete with all test data, dates, and times.

10. After the Engineer reviews the submittals for conformance with the design concept of the project, the Engineer will stamp the drawings indicating their status as 'Approved', 'Approved-As-Noted', 'Disapproved', or 'Incomplete'. Since the Engineer's review is for conformance with the design concept only, it is the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, layout drawings, or other documents by the Department's approval thereof. The Contractor must still be in full compliance with contract and specification requirements.
11. The Contractor shall secure approved materials in a timely manner to assure construction schedules are not delayed.
12. All submitted items reviewed and marked 'APPROVED AS NOTED', 'DISAPPROVED', or 'INCOMPLETE' are to be resubmitted in their entirety, unless otherwise indicated within the submittal comments, with a disposition of previous comments to verify contract compliance at no additional cost to the contract.
13. Exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the Contractor's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing to the Engineer. In general, substitutions will not be acceptable. Requests for substitutions must demonstrate that the proposed substitution is superior to the material or equipment required by the Contract Documents. No exceptions, deviations or substitutions will be permitted without the approval of the Engineer.
14. Contractor shall not order major equipment such as mast arm assemblies prior to Engineer approval of the Contractor marked proposed traffic signal equipment locations to assure proper placement of contract required traffic signal displays, push buttons and other facilities. Field adjustments may require changes in proposed mast arm length and other coordination.

Marking Proposed Locations

Revise "Marking Proposed Locations for Highway Lighting System" of Article 801.09 to read "Marking Proposed Locations for Highway Lighting System and Traffic Signals."

Add the following to Article 801.09 of the Standard Specifications:

It shall be the contractor's responsibility to verify all dimensions and conditions existing in the field prior to ordering materials and beginning construction. This shall include locating the mast arm foundations and verifying the mast arms lengths.

Inspection of Electrical Systems

Add the following to Article 801.10 of the Standard Specifications:

(c) All cabinets including temporary traffic signal cabinets shall be assembled by an approved equipment supplier in District One. The Department reserves the right to request any controller and cabinet to be tested at the equipment supplier's facility prior to field installation, at no extra cost to this contract.

Maintenance and Responsibility

Revise Article 801.11 of the Standard Specifications to read:

- a. Existing traffic signal installations and/or any electrical facilities at all or various locations may be altered or reconstructed totally or partially as part of the work on this Contract. The Contractor is hereby advised that all traffic control equipment, presently installed at these locations, may be the property of the State of Illinois, Department of Transportation, Division of Highways, County, Private Developer, Municipality or Transit Agency in which they are located. Once the Contractor has begun any work on any portion of the project, all traffic signals within the limits of this contract or those which have the item "Maintenance of Existing Traffic Signal Installation," "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation," shall become the full responsibility of the Contractor. The Contractor shall supply the Engineer, Area Traffic Signal Maintenance and Operations Engineer, IDOT ComCenter and the Department's Electrical Maintenance Contractor with two 24-hour emergency contact names and telephone numbers.
- b. Automatic Traffic Enforcement equipment such as red lighting running and railroad crossing camera systems are owned and operated by others and the Contractor shall not be responsible for maintaining this equipment.
- c. Regional transit, County and other agencies may also have equipment connected to existing traffic signal or peripheral equipment such as PTZ cameras, switches, transit signal priority (TSP and BRT) servers and other devices that shall be included with traffic signal maintenance at no additional cost to the contract.
- d. When the project has a pay item for "Maintenance of Existing Traffic Signal Installation," "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation," the Contractor must notify both the Area Traffic Signal Maintenance and Operations Engineer at (847) 705-4424 and the Department's Electrical Maintenance Contractor, of their intent to begin any physical construction work on the Contract or any portion thereof. This notification must be made a minimum of seven (7) working days prior to the start of construction to allow sufficient time for inspection of the existing traffic signal installation(s) and transfer of maintenance to the Contractor. The Department will attempt to full-fill the Contractor's inspection date request(s), however workload and other conditions may prevent the Department from accommodating specific dates or times. The Contractor shall not be entitled to any other compensation if the requested inspection date(s) cannot be scheduled by the Department. If work is started prior to an inspection, maintenance of the traffic signal installation(s) will be transferred to the Contractor without an inspection. The Contractor will become responsible for repairing or replacing all equipment that is not operating properly or is damaged at no cost to the owner of the traffic signal. Final repairs or replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection otherwise the traffic signal installation will not be accepted.
- e. The Contractor is advised that the existing and/or temporary traffic signal installation must remain in operation during all construction stages, except for the most essential down time. Any shutdown of the traffic signal installation, which exceeds fifteen (15) minutes, must have prior approval of the Engineer. Approval to shut down the traffic signal installation will only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Shutdowns shall not be allowed during inclement weather or holiday periods.

- f. The Contractor shall be fully responsible for the safe and efficient operation of the traffic signals and other equipment noted herein. Any inquiry, complaint or request by the Department, the Department's Electrical Maintenance Contractor or the public, shall be investigated and repairs begun within one hour. Failure to provide this service will result in liquidated damages of \$1000 per day per occurrence. In addition, the Department reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$1000 per month per occurrence. Unpaid bills will be deducted from the cost of the Contract. The Department may inspect any signaling device on the Department's highway system at any time without notification.
- g. Any proposed activity in the vicinity of a highway-rail grade crossing must adhere to the guidelines set forth in the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) regarding work in temporary traffic control zones in the vicinity of highway-rail grade crossings which states that lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the railroad tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.
- h. The Contractor shall be responsible to clear snow, ice, dirt, debris or other condition that obstructs visibility of any traffic signal display or access to traffic signal equipment.
- i. The Contractor shall maintain the traffic signal in normal operation during short or long term loss of utility or battery back-up power at critical locations designated by the Engineer. Critical locations may include traffic signals interconnected to railroad warning devices, expressway ramps, intersection with an SRA route, critical corridors or other locations identified by the Engineer. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries. Temporary power to critical locations shall not be for separately but shall be included in the contract.

Damage to Traffic Signal System

Add the following to Article 801.12(b) of the Standard Specifications to read:

Any traffic signal control equipment damaged or not operating properly from any cause shall be replaced with new equipment meeting current District One traffic signal specifications and provided by the Contractor at no additional cost to the Contract and/or owner of the traffic signal system, all as approved by the Engineer. Final replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection otherwise the traffic signal installation will not be accepted. Cable splices are only allowed at the bases of post and mast arms.

Temporary replacement of damaged or knockdown of a mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals will not be permitted.

Automatic Traffic Enforcement equipment, such as Red Light Enforcement cameras, detectors, and peripheral equipment, damaged or not operating properly from any cause, shall be the responsibility of the municipality or the Automatic Traffic Enforcement company per Permit agreement.

Traffic Signal Inspection (TURN-ON)

Revise Article 801.15(b) of the Standard Specifications to read:

It is the intent to have all electric work completed and equipment field tested by the Equipment Supplier prior to the Department's "turn-on" field inspection. If in the event the Engineer determines work is not complete and the inspection will require more than two (2) hours to complete, the inspection shall be canceled and the Contractor will be required to reschedule at another date. The maintenance of the traffic signals will not be accepted until all punch list work is corrected and re-inspected.

When the road is open to traffic, except as otherwise provided in Section 850 of the Standard Specifications, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request must be made to the Area Traffic Signal Maintenance and Operations Engineer at (847) 705-4424 a minimum of seven (7) working days prior to the time of the requested inspection. The Department will attempt to fulfill the Contractor's turn-on and inspection date request(s), however workload and other conditions may prevent the Department from accommodating specific dates or times. The Contractor shall not be entitled to any other compensation if the requested turn-on and inspection date(s) cannot be scheduled by the Department. The Department will not grant a field inspection until written or electronic notification is provided from the Contractor that the equipment has been field tested and the intersection is operating according to Contract requirements. The Contractor must invite local fire department personnel to the turn-on when Emergency Vehicle Preemption (EVP) is included in the project. When the contract includes the item RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM, OPTIMIZE TRAFFIC SIGNAL SYSTEM, or TEMPORARY TRAFFIC SIGNAL TIMINGS, the Contractor must notify the SCAT Consultant of the turn-on/detour implementation schedule, as well as stage changes and phase changes during construction.

The Contractor must have all traffic signal work completed and the electrical service installation connected by the utility company prior to requesting an inspection and turn-on of the traffic signal installation. The Contractor shall be responsible to provide a police officer to assist with traffic control at the time of testing.

The Contractor shall provide a representative from the control equipment vendor's office who is knowledgeable of the cabinet design and controller functions to attend the traffic signal inspection for both permanent and temporary traffic signal turn-ons.

Upon demonstration that the signals are operating and all work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Engineer will then allow the signals to be placed in continuous operation. The Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

The District requires the following Final Project Documentation from the Contractor at traffic signal turn-ons in electronic format in addition to hard copies where noted. A CD/DVD shall be submitted with separate folders corresponding to each numbered title below. The CD/DVD shall be labelled with date, project location, company and contract or permit number. Record Drawings, Inventory and Material Approvals shall be submitted prior to traffic signal turn-on for review by the Department as described here-in.

Final Project Documentation:

1. Record Drawings. Signal plans of record with field revisions marked in red ink. One hard copy set of 11"x17" record drawings shall also be provided.
2. Inventory. Inventory of new and existing traffic signal equipment including cabinet types and devices within cabinets in an Excel spread sheet format. One hard copy shall also be provided.
3. Pictures. Digital pictures of a minimum 12M pixels of each intersection approach showing all traffic signal displays and equipment. Pictures shall include controller cabinet equipment in enough detail to clearly identify manufacture and model of major equipment.
4. Field Testing. Written notification from the Contractor and the equipment vendor of satisfactory field testing with corresponding material performance measurements, such as for detector loops and fiber optic systems (see Article 801.13). One hard copy of all contract required performance measurement testing shall also be provided.
5. Materials Approval. The material approval letter. A hard copy shall also be provided.
6. Manuals. Operation and service manuals of the signal controller and associated control equipment. One hard copy shall also be provided.
7. Cabinet Wiring Diagram and Cable Logs. Five (5) hard copies 11" x 17" of the cabinet wiring diagrams shall be provided along with electronic pdf and dgn files of the cabinet wiring diagram. Five hard copies of the cable logs and electronic excel files shall be provided with cable #, number of conductors and spares, connected device/signal head and intersection location.
8. Controller Programming Settings. The traffic signal controller's timings; backup timings; coordination splits, offsets, and cycles; TBC Time of Day, Week and Year Programs; Traffic Responsive Program, Detector Phase Assignment, Type and Detector Switching; and any other functions programmable from the keyboard. The controller manufacturer shall also supply a printed form, not to exceed 11" x 17" for recording that data noted above. The form shall include a location, date, manufacturer's name, controller model and software version. The form shall be approved by the Engineer and a minimum of three (3) copies must be furnished at each turn-on. The manufacturer must provide all programming information used within the controller at the time of turn-on.
9. Warrantees and Guarantees. All manufacturer and contractor warrantees and guarantees required by Article 801.14.
10. GPS coordinate of traffic signal equipment as describe in the Record Drawings section herein.

Acceptance of the traffic signal equipment by the Department shall be based upon inspection results at the traffic signal "turn on", completeness of the required documentation and successful operation during a minimum 72 hour "burn-in" period following activation of the traffic signal. If approved, traffic signal acceptance shall be verbal at the "turn on" inspection followed by written correspondence from the Engineer. The Contractor shall be responsible for all traffic signal equipment and associated maintenance thereof until Departmental acceptance is granted.

All equipment and/or parts to keep the traffic signal installation operating shall be furnished by the Contractor. No spare traffic signal equipment is available from the Department.

All punch list work shall be completed within two (2) weeks after the final inspection. The Contractor shall notify the Electrical Maintenance Contractor to inspect all punch list work. Failure to meet these time constraints shall result in liquidated damage charges of \$500 per month per incident.

All cost of work and materials required to comply with the above requirements shall be included in the pay item bid prices, under which the subject materials and signal equipment are paid, and no additional compensation will be allowed. Materials and signal equipment not complying with the above requirements shall be subject to removal and disposal at the Contractor's expense.

Record Drawings

The requirements listed for Electrical Installation shall apply for Traffic Signal Installations in Article 801.16. Revise the 2nd paragraph of Article 801.16 of the Standard Specifications to read:

"When the work is complete, and seven days before the request for a final inspection, the reduced-size set of contract drawings, stamped "RECORD DRAWINGS", shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor's supervising Engineer or electrician. The record drawings shall be submitted in PDF format on CDROM as well as hardcopy for review and approval. If the contract consists of multiple intersections, each intersection shall be saved as an individual PDF file with TS# and location name in its file name.

In addition to the record drawings, copies of the final catalog cuts which have been Approved or Approved as Noted shall be submitted in PDF format along with the record drawings. The PDF files shall clearly indicate the pay item either by filename or PDF Table of Contents referencing the respective pay item number for multi-item PDF files. Specific part or model numbers of items which have been selected shall be clearly visible."

As part of the record drawings, the Contractor shall inventory all traffic signal equipment, new or existing, on the project and record information in an Excel spreadsheet. The inventory shall include equipment type, model numbers, software manufacturer and version and quantities.

Add the following to Article 801.16 of the Standard Specifications:

"In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following traffic signal components being installed, modified or being affected in other ways by this contract:

- All Mast Arm Poles and Posts
- Traffic Signal Wood Poles
- Rail Road Bungalow
- UPS
- Handholes
- Conduit roadway crossings
- Controller Cabinets
- Communication Cabinets
- Electric Service Disconnect locations
- CCTV Camera installations
- Fiber Optic Splice Locations
- Conduit Crossings

Datum to be used shall be North American 1983.

Data shall be provided electronically and in print form. The electronic format shall be compatible with MS Excel. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

- File shall be named: TSXXX-YY-MM-DD (i.e. TS22157_15-01-01)
- Each intersection shall have its own file
- Row 1 should have the location name (i.e. IL 31 @ Klausen)
- Row 2 is blank
- Row 3 is the headers for the columns
- Row 4 starts the data
- Column A (Date) – should be in the following format: MM/DD/YYYY
- Column B (Item) – as shown in the table below
- Column C (Description) – as shown in the table below
- Column D and E (GPS Data) – should be in decimal form, per the IDOT special provisions

Examples:

Date	Item	Description	Latitude	Longitude
01/01/2015	MP (Mast Arm Pole)	NEQ, NB, Dual, Combination Pole	41.580493	-87.793378
01/01/2015	HH (Handhole)	Heavy Duty, Fiber, Intersection, Double	41.558532	-87.792571
01/01/2015	ES (Electrical Service)	Ground mount, Pole mount	41.765532	-87.543571
01/01/2015	CC (Controller Cabinet)		41.602248	-87.794053
01/01/2015	RSC (Rigid Steel Crossing)	IL 31 east side crossing south leg to center HH at Klausen	41.611111	-87.790222
01/01/2015	PTZ (PTZ)	NEQ extension pole	41.593434	-87.769876
01/01/2015	POST (Post)		41.651848	-87.762053
01/01/2015	MCC (Master Controller Cabinet)		41.584593	-87.793378
01/01/2015	COMC (Communication Cabinet)		41.584600	-87.793432
01/01/2015	BBS (Battery Backup System)		41.558532	-87.792571
01/01/2015	CNCR (Conduit Crossing)	4-inch IL 31 n/o of Klausen	41.588888	-87.794440

Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 1 foot. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified.

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have a minimum 1 foot accuracy after post processing.

GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years.”

Delete the last sentence of the 3rd paragraph of Article 801.16.

Locating Underground Facilities

Revise Section 803 to the Standard Specifications to read:

IDOT traffic signal facilities are not part of any of the one-call locating service such as J.U.L.I.E or Digger. If this Contract requires the services of an Electrical Contractor, the Contractor shall be responsible at his/her own expense for locating existing IDOT electrical facilities prior to performing any work. If this Contract does not require the services of an Electrical Contractor, the Contractor may request one free locate for existing IDOT electrical facilities from the District One Electrical Maintenance Contractor prior to the start of any work. Additional requests may be at the expense of the Contractor. The location of underground traffic facilities does not relieve the Contractor of their responsibility to repair any facilities damaged during construction at their expense.

The exact location of all utilities shall be field verified by the Contractor before the installation of any components of the traffic signal system. For locations of utilities, locally owned equipment, and leased enforcement camera system facilities, the local Counties or Municipalities may need to be contacted: in the City of Chicago contact Digger at (312) 744-7000 and for all other locations contact J.U.L.I.E. at 1-800-892-0123 or 811.

Restoration of Work Area

Add the following article to Section 801 of the Standard Specifications:

801.17 Restoration of work area. Restoration of the traffic signal work area shall be included in the related pay items such as foundation, conduit, handhole, underground raceways, etc. All roadway surfaces such as shoulders, medians, sidewalks, pavement, etc. shall be replaced in kind. All damage to mowed lawns shall be replaced with an approved sod, and all damage to unmowed fields shall be seeded. All brick pavers disturbed in the work area shall be restored to their original configuration as directed by the Engineer. All damaged brick pavers shall be replaced with a comparable material approved by the Engineer. Restoration of the work area shall be included in the contract without any extra compensation allowed to the Contractor.

Bagging Signal Heads

Light tan colored traffic and pedestrian signal reusable covers shall be used to cover dark/un-energized signal sections and visors. Covers shall be made of outdoor fabric with urethane coating for repelling water, have elastic fully sewn around the cover ends for a tight fit over the visor, and have a minimum of two straps with buckles to secure the cover to the backplate. A center mesh strip allows viewing without removal for signal status testing purposes. Covers shall include a message indicating the signal is not in service.

GROUNDING OF TRAFFIC SIGNAL SYSTEMS

Effective: May 22, 2002
806.01TS

Revised: July 1, 2015

Revise Section 806 of the Standard Specifications to read:

General.

All traffic signal systems, equipment and appurtenances shall be properly grounded in strict conformance with the NEC. This work shall be in accordance with IDOT's District One Traffic Signal Design Details.

The grounding electrode system shall include a ground rod installed with each traffic signal controller concrete foundation and all mast arm and post concrete foundations. An additional ground rod will be required at locations where measured resistance exceeds 25 ohms. Ground rods are included in the applicable concrete foundation or service installation pay item and will not be paid for separately.

Testing shall be according to Article 801.13 (a) (4) and (5).

- (a) The grounded conductor (neutral conductor) shall be white color coded. This conductor shall be bonded to the equipment grounding conductor only at the Electric Service Installation. All power cables shall include one neutral conductor of the same size.
- (b) The equipment grounding conductor shall be green color coded. The following is in addition to Article 801.04 of the Standard Specifications.
 1. Equipment grounding conductors shall be bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment grounding conductor.
 2. Equipment grounding conductors shall be bonded, using a UL Listed grounding connector, to all traffic signal mast arm poles, traffic signal posts, pedestrian posts, pull boxes, handhole frames and covers, conduits, and other metallic enclosures throughout the traffic signal wiring system, except where noted herein. Bonding shall be made with a splice and pigtail connection, using a sized compression type copper sleeve, sealant tape, and heat-shrinkable cap. A UL listed electrical joint compound shall be applied to all conductors' terminations, connector threads and contact points. Conduit grounding bushings shall be installed at all conduit terminations including spare or empty conduits.
 3. All metallic and non-metallic raceways shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 volts and/or fiber optic cable will not be required to include an equipment grounding conductor.

4. Individual conductor splices in handholes shall be soldered and sealed with heat shrink.

When necessary to maintain effective equipment grounding, a full cable heat shrink shall be provided over individual conductor heat shrinks.

(c) The grounding electrode conductor shall be similar to the equipment grounding conductor in color coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, UL listed pressure connectors, and UL listed clamps.

COILABLE NON-METALLIC CONDUIT

Effective: May 22, 2002
810.01TS

Revised: July 1, 2015

Description.

This work shall consist of furnishing and installing empty coilable non-metallic conduit (CNC).

General.

The CNC installation shall be in accordance with Sections 810 and 811 of the Standard Specifications except for the following:

Add the following to Article 810.03 of the Standard Specifications:

CNC meeting the requirements of NEC Article 353 shall be used for detector loop raceways to the handholes.

Add the following to Article 811.03 of the Standard Specifications:

On temporary traffic signal installations with detector loops, CNC meeting the requirements of NEC Article 353 shall be used for detector loop raceways from the saw-cut to 10 feet (3m) up the wood pole, unless otherwise shown on the plans

Basis of Payment.

All installations of CNC for loop detection shall be included in the contract and not paid for separately.

UNDERGROUND RACEWAYS

Effective: May 22, 2002
810.02TS

Revised: July 1, 2015

Revise Article 810.04 of the Standard Specifications to read:

“Installation. All underground conduits shall have a minimum depth of 30-inches (700 mm) below the finished grade.”

Add the following to Article 810.04 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Steel Conduit unless otherwise indicated on the plans.”

Add the following to Article 810.04 of the Standard Specifications:

“All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap.

The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.”

HANDHOLES

Effective: January 01, 2002
814.01TS

Revised: July 1, 2015

Description.

Add the following to Section 814 of the Standard Specifications:

All conduits shall enter the handhole at a depth of 30 inches (762 mm) except for the conduits for detector loops when the handhole is less than 5 feet (1.52 m) from the detector loop. All conduit ends should be sealed with a waterproof sealant to prevent the entrance of contaminants into the handhole.

Steel cable hooks shall be coated with hot-dipped galvanization in accordance with AASHTO Specification M111. Hooks shall be a minimum of 1/2 inch (13 mm) diameter with two 90 degree bends and extend into the handhole at least 6 inches (152 mm). Hooks shall be placed a minimum of 12 inches (305 mm) below the lid or lower if additional space is required.

Precast round handholes shall not be used unless called out on the plans.

The cover of the handhole frame shall be labeled “Traffic Signals” with legible raised letters.

Revise the third paragraph of Article 814.03 of the Standard Specifications to read:

“Handholes shall be constructed as shown on the plans and shall be cast-in-place, or precast concrete units. Heavy duty handholes shall be either cast-in-place or precast concrete units.”

Add the following to Article 814.03 of the Standard Specifications:

“(c) Precast Concrete. Precast concrete handholes shall be fabricated according to Article 1042.17. Where a handhole is contiguous to a sidewalk, preformed joint filler of 1/2 inch (13 mm) thickness shall be placed between the handhole and the sidewalk.”

Cast-In-Place Handholes.

All cast-in-place handholes shall be concrete, with inside dimensions of 21-1/2 inches (546 mm) minimum. Frames and lid openings shall match this dimension.

For grounding purposes the handhole frame shall have provisions for a 7/16 inch (11 mm) diameter stainless steel bolt cast into the frame. The covers shall have a stainless steel threaded stint extended from the eye hook assembly for the purpose of attaching the grounding conductor to the handhole cover.

The minimum wall thickness for heavy duty hand holes shall be 12 inches (305mm).

Precast Round Handholes.

All precast handholes shall be concrete, with inside dimensions of 30 inches (762mm) diameter. Frames and covers shall have a minimum opening of 26 inches (660mm) and no larger than the inside diameter of the handhole.

For grounding purposes the handhole frame shall have provisions for a 7/16 inch (11 mm) diameter stainless steel bolt cast into the frame. For the purpose of attaching the grounding conductor to the handhole cover, the covers shall either have a 7/16 inch (11 mm) diameter stainless steel bolt cast into the cover or a stainless steel threaded stint extended from an eye hook assembly. A hole may be drilled for the bolt if one cannot be cast into the frame or cover. The head of the bolt shall be flush or lower than the top surface of the cover.

The minimum wall thickness for precast heavy duty hand holes shall be 6 inches (152 mm). Precast round handholes shall be only produced by an approved precast vendor.

Materials.

Add the following to Section 1042 of the Standard Specifications:

“1042.17 Precast Concrete Handholes. Precast concrete handholes shall be according to Articles 1042.03(a)(c)(d)(e).”

GROUNDING CABLE

Effective: May 22, 2002
817.01TS

Revised: July 1, 2015

The cable shall meet the requirements of Section 817 of the "Standard Specifications," except for the following:

Add the following to Article 817.02 (b) of the Standard Specifications:

Unless otherwise noted on the Plans, traffic signal grounding conductor shall be one conductor, #6 gauge copper, with a green color coded XLP jacket.

The traffic signal grounding conductor shall be bonded, using a UL Listed grounding connector to all proposed and existing traffic signal mast arm poles and traffic/pedestrian signal posts, including push button posts. The grounding conductor shall be bonded to all proposed and existing pull boxes, handhole frames and covers and other metallic enclosures throughout the traffic signal wiring system and noted herein and detailed on the plans. The grounding conductor shall be bonded to conduit terminations using rated grounding bushings. Bonding to existing handhole frames and covers shall be paid for separately.

Add the following to Article 817.05 of the Standard Specifications:

Basis of Payment.

Grounding cable shall be measured in place for payment in foot (meter). Payment shall be at the contract unit price for ELECTRIC CABLE IN CONDUIT, EQUIPMENT GROUNDING CONDUCTOR, NO. 6 1C, which price includes all associated labor and material including grounding clamps, splicing, exothermic welds, grounding connectors, conduit grounding bushings, and other hardware.

MAINTENANCE OF EXISTING TRAFFIC SIGNAL AND FLASHING BEACON INSTALLATION

Effective: May 22, 2002
850.01TS

Revised: July 1, 2015

General.

1. Full maintenance responsibility shall start as soon as the Contractor begins any physical work on the Contract or any portion thereof. If Contract work is started prior to a traffic signal inspection, maintenance of the traffic signal installation(s) will be transferred to the Contractor without an inspection.
2. The Contractor shall have electricians with IMSA Level II certification on staff to provide signal maintenance. A copy of the certification shall be immediately available upon request of the Engineer.

3. This item shall include maintenance of all traffic signal equipment and other connected and related equipment such as flashing beacons, emergency vehicle pre-emption equipment, master controllers, uninterruptable power supply (UPS and batteries), PTZ cameras, vehicle detection, handholes, lighted signs, telephone service installations, communication cables, conduits to adjacent intersections, and other traffic signal equipment.
4. Regional transit, County and other agencies may also have equipment connected to existing traffic signal or peripheral equipment such as PTZ cameras, switches, transit signal priority (TSP and BRT) servers, radios and other devices that shall be included with traffic signal maintenance at no additional cost to the contract.
5. Maintenance shall not include Automatic Traffic Enforcement equipment, such as Red Light Enforcement cameras, detectors, or peripheral equipment. This equipment is operated and maintained by the local municipality and should be de-activated while on contractor maintenance.
6. The energy charges for the operation of the traffic signal installation shall be paid for by the Contractor.

Maintenance.

1. The Contractor shall check all controllers every two (2) weeks, which will include visually inspecting all timing intervals, relays, detectors, and pre-emption equipment to ensure that they are functioning properly. The Contractor shall check signal system communications and phone lines to assure proper operation. This item includes, as routine maintenance, all portions of emergency vehicle pre-emption equipment. The Contractor shall maintain in stock at all times a sufficient amount of materials and equipment to provide effective temporary and permanent repairs. Prior to the traffic signal maintenance transfer, the contractor shall supply a detailed maintenance schedule that includes dates, locations, names of electricians providing the required checks and inspections along with any other information requested by the Engineer.
2. The Contractor is advised that the existing and/or span wire traffic signal installation must remain in operation during all construction stages, except for the most essential down time. Any shutdown of the traffic signal installation, which exceeds fifteen (15) minutes, must have prior approval of the Engineer. Approval to shut down the traffic signal installation will only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Shutdowns shall not be allowed during inclement weather or holiday periods.

3. The Contractor shall provide immediate corrective action when any part or parts of the system fail to function properly. Two far side heads facing each approach shall be considered the minimum acceptable signal operation pending permanent repairs. When repairs at a signalized intersection require that the controller be disconnected or otherwise removed from normal operation, and power is available, the Contractor shall place the traffic signal installation on flashing operation. The signals shall flash RED for all directions unless a different indication has been specified by the Engineer. The Contractor shall be required to place stop signs (R1-1-36) at each approach of the intersection as a temporary means of regulating traffic. When the signals operate in flash, the Contractor shall furnish and equip all their vehicles assigned to the maintenance of traffic signal installations with a sufficient number of stop signs as specified herein. The Contractor shall maintain a sufficient number of spare stop signs in stock at all times to replace stop signs which may be damaged or stolen.
4. The Contractor shall provide the Engineer with 2 (two) 24 hour telephone numbers for the maintenance of the traffic signal installation and for emergency calls by the Engineer.
5. Traffic signal equipment which is lost or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of the Standard Specifications and these special provisions.
6. The Contractor shall respond to all emergency calls from the Department or others within one (1) hour after notification and provide immediate corrective action. When equipment has been damaged or becomes faulty beyond repair, the Contractor shall replace it with new and identical equipment. The cost of furnishing and installing the replaced equipment shall be borne by the Contractor at no additional charge to the contract. The Contractor may institute action to recover damages from a responsible third party. If at any time the Contractor fails to perform all work as specified herein to keep the traffic signal installation in proper operating condition or if the Engineer cannot contact the Contractor's designated personnel, the Engineer shall have the State's Electrical Maintenance Contractor perform the maintenance work. The Contractor shall be responsible for all of the State's Electrical Maintenance Contractor's costs and liquidated damages of \$1000 per day per occurrence. The State's Electrical Maintenance Contractor shall bill the Contractor for the total cost of the work. The Contractor shall pay this bill within thirty (30) days of the date of receipt of the invoice or the cost of such work will be deducted from the amount due the Contractor. The Contractor shall allow the Electrical Maintenance Contractor to make reviews of the Existing Traffic Signal Installation that has been transferred to the Contractor for Maintenance.
7. Any proposed activity in the vicinity of a highway-rail grade crossing must adhere to the guidelines set forth in the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) regarding work in temporary traffic control zones in the vicinity of highway-rail grade crossings which states that lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the railroad tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

8. Equipment included in this item that is damaged or not operating properly from any cause shall be replaced with new equipment meeting current District One traffic signal specifications and provided by the Contractor at no additional cost to the Contract and/or owner of the traffic signal system, all as approved by the Engineer. Final replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection otherwise the traffic signal installation will not be accepted. Cable splices outside the controller cabinet shall not be allowed.
9. Automatic Traffic Enforcement equipment, such as Red Light Enforcement cameras, detectors, and peripheral equipment, damaged or not operating properly from any cause, shall be the responsibility of the municipality or the Automatic Traffic Enforcement Company per Permit agreement.
10. The Contractor shall be responsible to clear snow, ice, dirt, debris or other condition that obstructs visibility of any traffic signal display or access to traffic signal equipment.
11. The Contractor shall maintain the traffic signal in normal operation during short or long term loss of utility or battery back-up power at critical locations designated by the Engineer. Critical locations may include traffic signals interconnected to railroad warning devices, expressway ramps, intersection with an SRA route, critical corridors or other locations identified by the Engineer. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries. Temporary power to critical locations shall not be paid for separately but shall be included in the contract.
12. Temporary replacement of damaged or knockdown of a mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals will not be permitted.

Basis of Payment.

This work will be paid for at the contract unit price per each for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION. Each intersection will be paid for separately. Maintenance of a standalone and or not connected flashing beacon shall be paid for at the contract unit price for MAINTENANCE OF EXISTING FLASHING BEACON INSTALLATION. Each flashing beacon will be paid for separately.

FULL-ACTUATED CONTROLLER AND CABINET

Effective: January 1, 2002
857.02TS

Revised: July 1, 2015

Description.

This work shall consist of furnishing and installing a traffic actuated solid state digital controller in the controller cabinet of the type specified, meeting the requirements of Section 857 of the Standard Specifications, as modified herein, including malfunction management unit, load switches and flasher relays, with all necessary connections for proper operation.

If the intersection is part of an existing system and/or when specified in the plans, this work shall consist of furnishing and installing a(n) " _____ " brand traffic actuated solid state controller.

Materials.

Add the following to Article 857.02 of the Standard Specifications:

For installation as a stand-alone traffic signal, connected to a closed loop system or integrated into an advance traffic management system (ATMS), controllers shall be Econolite ASC/3S-1000 or Eagle/Siemens M52 unless specified otherwise on the plans or elsewhere on these specifications. Only controllers supplied by one of the District One approved closed loop equipment suppliers will be allowed. Unless specified otherwise on the plans or these specifications, the controller shall be of the most recent model and software version supplied by the equipment supplier at the time of the traffic signal TURN-ON. A removable controller data key shall also be provided. Individual load switches shall be provided for each vehicle, pedestrian, and right turn over lap phase. The controller shall prevent phases from being skipped during program changes and after all preemption events and shall inhibit simultaneous display of circular yellow and yellow arrow indications.

For integration into an ATMS such as Centrats, Tactics, or TransSuite, the controller shall have the latest version of NTCIP software installed. For operation prior to integration into an ATMS, the controller shall maintain existing close loop management communications.

Add the following to Article 1074.03 of the Standard Specifications:

- (a) (6) Cabinets shall be designed for NEMA TS2 Type 1 operation. All cabinets shall be pre-wired for a minimum of eight (8) phases of vehicular, four (4) phases of pedestrian and four (4) phases of overlap operation.
- (b) (1) Revise "conflict monitor" to read "Malfunction Management Unit"
- (b) (5) Cabinets – Provide 1/8" (3.2 mm) thick unpainted aluminum alloy 5052-H32.
The surface shall be smooth, free of marks and scratches. All external hardware shall be stainless steel.
- (b) (6) Controller Harness – Provide a TS2 Type 2 "A" wired harness in addition to the
TS2 Type 1 harness.
- (b) (7) Surge Protection – Shall be a 120VAC Single phase Modular filter Plug-in type, supplied from an approved vendor.
- (b) (8) BIU – shall be secured by mechanical means.
- (b) (9) Transfer Relays – Solid state or mechanical flash relays are acceptable.
- (b) (10) Switch Guards – All switches shall be guarded.
- (b) (11) Heating – One (1) 200 watt, thermostatically-controlled, electric heater.
- (b) (12) Lighting – One (1) LED Panel shall be placed inside the cabinet top panel and one (1) LED Panel shall be placed on each side of the pull-out drawer/shelf assembly located beneath the controller support shelf. The LED Panels shall be controlled by a door switch. The LED Panels shall be provided from an approved vendor.

- (b) (13) The cabinet shall be equipped with a pull-out drawer/shelf assembly. A 1 ½ inch (38mm) deep drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of accommodating one (1) complete set of cabinet prints and manuals. This drawer shall support 50 lbs. (23 kg) in weight when fully extended. The drawer shall open and close smoothly. Drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 18 inches (610mm) wide.
- (b) (14) Plan & Wiring Diagrams – 12” x 15” (305mm x 406mm) moisture sealed container attached to door.
- (b) (15) Detector Racks – Fully wired and labeled for four (4) channels of emergency vehicle pre-emption and sixteen channels (16) of vehicular operation.
- (b) (16) Field Wiring Labels – All field wiring shall be labeled.
- (b) (17) Field Wiring Termination – Approved channel lugs required.
- (b) (18) Power Panel – Provide a nonconductive shield.
- (b) (19) Circuit Breaker – The circuit breaker shall be sized for the proposed load but shall not be rated less than 30 amps.
- (b) (20) Police Door – Provide wiring and termination for plug in manual phase advance switch.

Basis of Payment.

This work will be paid for at the contract unit price each for FULL-ACTUATED CONTROLLER AND TYPE IV CABINET; FULL-ACTUATED CONTROLLER AND TYPE V CABINET; FULL-ACTUATED CONTROLLER AND TYPE SUPER P CABINET; FULL-ACTUATED CONTROLLER AND TYPE SUPER R CABINET; FULL-ACTUATED CONTROLLER AND TYPE IV CABINET, SPECIAL; FULL-ACTUATED CONTROLLER AND TYPE V CABINET, SPECIAL; FULL-ACTUATED CONTROLLER AND TYPE SUPER P CABINET (SPECIAL); FULL-ACTUATED CONTROLLER AND TYPE SUPER R CABINET (SPECIAL).

UNINTERRUPTABLE POWER SUPPLY, SPECIAL

Effective: January 1, 2013
862.01TS

Revised: May 19, 2016

This work shall be in accordance with section 862 of the Standard Specification except as modified herein:

Add the following to Article 862.01 of the Standard Specifications:

The UPS shall have the power capacity to provide normal operation of a signalized intersection that utilizes all LED type signal head optics, for a minimum of 6 (six) hours.

Add the following to Article 862.02 of the Standard Specifications:

Materials shall be according to Article 1074.04 as modified in UNINTERRUPTABLE POWER SUPPLY, SPECIAL.

Add the following to Article 862.03 of the Standard Specifications:

The UPS shall additionally include, but not be limited to, a battery cabinet, where applicable. For Super-P (Type IV) and Super-R (Type V) cabinets, the battery cabinet is integrated to the traffic signal cabinet, and shall be included in the cost for the traffic signal cabinet of the size and type indicated on the plans.

The UPS shall provide reliable emergency power to the traffic signals in the event of a power failure or interruption.

Revise Article 862.04 of the Standard Specifications to read:

Installation

When a UPS is installed at an existing traffic signal cabinet, the UPS cabinet shall partially rest on the lip of the existing controller cabinet foundation and be secured to the existing controller cabinet by means of at least four (4) stainless steel bolts. The UPS cabinet shall be completely enclosed with the bottom and back constructed of the same material as the cabinet.

When a UPS is installed at a new signal cabinet and foundation, it shall be mounted as shown on the plans.

At locations where UPS is installed and an Emergency Vehicle Priority System is in use, any existing incandescent confirmation beacons shall be replaced with LED lamps in accordance with the District One Emergency Vehicle Priority System specification at no additional cost to the contract. A concrete apron shall be provided and be in accordance with Articles 424 and 202 of the Standard Specifications. The concrete apron shall also, follow the District 1 Standard Traffic Signal Design Detail, Type D for Ground Mounted Controller Cabinet and UPS Battery Cabinet.

This item shall include any required modifications to an existing traffic signal controller as a result of the addition of the UPS including the addition of alarms.

Materials

Revise Article 1074.04(a)(1) of the Standard Specifications to read:

The UPS shall be line interactive or double conversion and provide voltage regulation and power conditioning when utilizing utility power. The UPS shall be sized appropriately for the intersection(s) normal traffic signal operating load. The UPS must be able to maintain the intersection's normal operating load plus 20 percent (20%) of the intersection's normal operating load. When installed at a railroad-interconnected intersection the UPS must maintain the railroad pre-emption load, plus 20 percent (20%) of the railroad preemption-operating load. The total connected traffic signal load shall not exceed the published ratings for the UPS.

The UPS shall provide a minimum of 6 (six) hours of normal operation run-time for signalized intersections with LED type signal head optics at 77 °F (25 °C) (minimum 1000 W active output capacity, with 86 percent minimum inverter efficiency).

Revise the first paragraph of Article 1074.04(a)(3) of the Standard Specifications to read:

The UPS shall have a minimum of four (4) sets of normally open (NO) and normally closed (NC) single-pole double-throw (SPDT) relay contact closures, available on a panel mounted terminal block or locking circular connectors, rated at a minimum 120 V/1 A, and labeled so as to identify each contact according to the plans.

Revise Article 1074.04(a)(10) of the Standard Specifications to read:

The UPS shall be compatible with the District's approved traffic controller assemblies utilizing NEMA TS 1 or NEMA TS 2 controllers and cabinet components for full time operation.

Revise Article 1074.04(a)(17) of the Standard Specifications to read:

When the intersection is in battery backup mode, the UPS shall bypass all internal cabinet lights, ventilation fans, cabinet heaters, service receptacles, luminaires, any lighted street name signs, any automated enforcement equipment and any other devices directed by the Engineer.

Revise Article 1074.04(b)(2)b of the Standard Specifications to read:

Batteries, inverter/charger and power transfer relay shall be housed in a separate NEMA Type 3R cabinet. The cabinet shall be Aluminum alloy, 5052-H32, 0.125-inch thick and have a natural mill finish.

Revise Article 1074.04(b)(2)c of the Standard Specifications to read:

No more than three batteries shall be mounted on individual shelves for a cabinet housing six batteries and no more than four batteries per shelf for a cabinet housing eight batteries.

Revise Article 1074.04(b)(2)e of the Standard Specifications to read:

The battery cabinet housing shall have the following nominal outside dimensions: a width of 25 in. (785 mm), a depth of 16 in. (440 mm), and a height of 41 to 48 in. (1.1 to 1.3 m). Clearance between shelves shall be a minimum of 10 in. (250 mm).

End of paragraph 1074.04(b)(2)e

The door shall be equipped with a two position doorstop, one a 90o and one at 120o.

Revise Article 1074.04(b)(2)g of the Standard Specifications to read:

The door shall open to the entire cabinet have a neoprene gasket, an Aluminum continuous piano hinge with stainless steel pin, and a three point locking system. The cabinet shall be provided with a main door lock which shall operate with a traffic industry conventional No. 2 key. Provisions for padlocking the door shall be provided.

Add the following to Article 1074.04(b)(2) of the Standard Specifications:

- j. The battery cabinet shall have provisions for an external generator connection.

Add the following to Article 1074.04(c) of the Standard Specifications:

(8) The UPS shall include a tip or kill switch installed in the battery cabinet, which shall completely disconnect power from the UPS when the switch is manually activated.

(9) The UPS shall include standard RS-232 and internal Ethernet interface.

(10) The UPS shall incorporate a flanged electric generator inlet for charging the batteries and operating the UPS. The generator connector shall be male type, twist-lock, rated as 15A, 125VAC with a NEMA L5-15P configuration and weatherproof lift cover plate. Access to the generator inlet shall be from a secured weatherproof lift cover plate or behind a locked battery cabinet police panel.

(11) The bypass switch shall include an internal power transfer relay that allows removal of the battery back-up unit, while the traffic signal is connected to utility power, without impacting normal traffic signal operation.

Revise Article 1074.04(d)(3) of the Standard Specifications to read:

All batteries supplied in the UPS shall be either gel cell or AGM type, deep cycle, completely sealed, prismatic lead calcium based, silver alloy, valve regulated lead acid (VRLA) requiring no maintenance. All batteries in a UPS installation shall be the same type; mixing of gel cell and AGM types within a UPS installation is not permitted.

Revise Article 1074.04(d)(4) of the Standard Specifications to read:

Batteries shall be certified by the manufacturer to operate over a temperature range of -13 to 160 °F (-25 to + 71 °C) for gel cell batteries and -40 to 140 °F (-40 to + 60 °C) for AGM type batteries.

Add the following to Article 1074.04(d) of the Standard Specifications:

(9) The UPS shall consist of an even number of batteries that are capable of maintaining normal operation of the signalized intersection for a minimum of 6 (six) hours. Calculations shall be provided showing the number of batteries of the type supplied that are needed to satisfy this requirement. A minimum of four batteries shall be provided.

(10) Battery Heater mats shall be provided, when gel cell type batteries are supplied.

Add the following to the Article 1074.04 of the Standard Specifications:

(e) Warranty. The warranty for an uninterruptable power supply (UPS) and batteries (full replacement) shall cover a minimum of 5 years from date the equipment is placed in operation.

(f) Installation. Bypass switch shall completely disconnect the traffic signal cabinet from the utility provider.

(g) The UPS shall be set-up to run the traffic signal continuously, without going to a red flashing condition, when switched to battery power unless otherwise directed by the Engineer. The Contractor shall confirm set-up with the Engineer. The continuous operation mode when switched to battery may require modification to unit connections and these modifications are included in the unit price for this item.

Revise Article 862.05 of the Standard Specifications to read:

Basis of Payment

This work will be paid for at the contract unit price per each for UNINTERRUPTABLE POWER SUPPLY, SPECIAL or UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL. Replacement of Emergency Vehicle Priority System confirmation beacons and any required modifications to the traffic signal controller shall be included in the cost of the UNINTERRUPTABLE POWER SUPPLY, SPECIAL or UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL item. The concrete apron and earth excavation required shall be included in the cost of the UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL item.

ELECTRIC CABLE

Effective: May 22, 2002
873.01TS

Revised: July 1, 2015

Delete "or stranded, and No. 12 or" from the last sentence of Article 1076.04 (a) of the Standard Specifications.

Add the following to the Article 1076.04(d) of the Standard Specifications:

Service cable may be single or multiple conductor cable.

EMERGENCY VEHICLE PRIORITY SYSTEM LINE SENSOR CABLE, NO. 20 3/C

Effective: January 1, 2013
873.03TS

Revised: July 1, 2015

This work shall consist of furnishing and installing lead-in cable for light detectors installed at existing and/or proposed traffic signal installations as part of an emergency vehicle priority system. The work includes installation of the lead-in cables in existing and/or new conduit. The electric cable shall be shielded and have (3) stranded conductors, colored blue, orange, and yellow with a stranded tinned copper drain wire. The cable shall meet the requirements of the vendor of the Emergency Vehicle Priority System Equipment.

Basis of Payment.

This work will be paid for at the contract unit price per foot for EMERGENCY VEHICLE PRIORITY SYSTEM LINE SENSOR CABLE, NO. 20 3/C, which price shall be payment in full for furnishing, installing and making all electrical connections necessary for proper operations.

TRAFFIC SIGNAL POST

Effective: May 22, 2002
875.01TS

Revised: July 01, 2015

Add the following to Article 1077.01 (c) of the Standard Specifications: Washers for post bases shall be the same size or larger than the nut.

Revise the first sentence of Article 1077.01 (d) of the Standard Specifications to read:

All posts and bases shall be steel and hot dipped galvanized according to AASHTO M 111. If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions.

MAST ARM ASSEMBLY AND POLE

Effective: May 22, 2002
877.01TS

Revised: July 01, 2015

Revise the second sentence of Article 1077.03 (a)(3) of the Standard Specifications to read: Traffic signal mast arms shall be one piece construction, unless otherwise approved by the Engineer.

Add the following to Article 1077.03 (a)(3) of the Standard Specifications:

If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions.

CONCRETE FOUNDATIONS

Effective: May 22, 2002
878.01TS

Revised: July 01, 2015

Add the following to Article 878.03 of the Standard Specifications:

All anchor bolts shall be according to Article 1006.09, with all anchor bolts hot dipped galvanized a minimum of 12 in. (300 mm) at the threaded end.

Foundations used for Combination Mast Arm Poles shall provide an extra 2-1/2 inch (65 mm) raceway.

No foundation is to be poured until the Resident Engineer gives his/her approval as to the depth of the foundation.

Add the following to the first paragraph of Article 878.05 of the Standard Specifications:

The price shall include a concrete apron in front of the cabinet and UPS as shown in the plans or as directed by the engineer.

LIGHT EMITTING DIODE (LED) SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD

Effective: May 22, 2002
880.01TS

Revised: July 1, 2015

Materials.

Add the following to Section 1078 of the Standard Specifications:

1. LED modules proposed for use and not previously approved by IDOT District One will require independent testing for compliance to current VTCSH-ITE standards for the product and be Intertek ETL Verified. This would include modules from new vendors and new models from IDOT District One approved vendors.
2. The proposed independent testing facility shall be approved by IDOT District One. Independent testing must include a minimum of two (2) randomly selected modules of each type of module (i.e. ball, arrow, pedestrian, etc.) used in the District and include as a minimum Luminous Intensity and Chromaticity tests. However, complete module performance verification testing may be required by the Engineer to assure the accuracy of the vendor's published data and previous test results. An IDOT representative will select sample modules from the local warehouse and mark the modules for testing. Independent test results shall meet current ITE standards and vendor's published data. Any module failures shall require retesting of the module type. All costs associated with the selection of sample modules, testing, reporting, and retesting, if applicable, shall be the responsibility of the LED module vendor and not be a cost to this contract.

3. All signal heads shall provide 12" (300 mm) displays with glossy yellow or black polycarbonate housings. All head housings shall be the same color (yellow or black) at the intersection. For new signalized intersections and existing signalized intersections where all signals heads are being replaced, the proposed head housings shall be black. Where only selected heads are being replaced, the proposed head housing color (yellow or black) shall match existing head housings. Connecting hardware and mounting brackets shall be polycarbonate (black). A corrosion resistant anti-seize lubricant shall be applied to all metallic mounting bracket joints, and shall be visible to the inspector at the signal turn-on. Post top mounting collars are required on all posts, and shall be constructed of the same material as the brackets.
4. The LED signal modules shall be replaced or repaired if an LED signal module fails to function as intended due to workmanship or material defects within the first 7 years from the date of traffic signal TURN-ON. LED signal modules which exhibit luminous intensities less than the minimum values specified in Table 1 of the ITE Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement (June 27, 2005) [VTSCH], or applicable successor ITE specifications, or show signs of entrance of moisture or contaminants within the first 7 years of the date of traffic signal TURN-ON shall be replaced or repaired. The vendor's written warranty for the LED signal modules shall be dated, signed by a vendor's representative and included in the product submittal to the State.

(a) Physical and Mechanical Requirements

1. Modules can be manufactured under this specification for the following faces:
 - a. 12 inch (300 mm) circular, multi-section
 - b. 12 inch (300 mm) arrow, multi-section
2. The maximum weight of a module shall be 4 lbs. (1.8 kg).
3. Each module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.), and shall be weather proof after installation and connection.
5. The lens of the module shall be tinted with a wavelength-matched color to reduce sun phantom effect and enhance on/off contrast. The tinting shall be uniform across the lens face. Polymeric lens shall provide a surface coating or chemical surface treatment applied to provide abrasion resistance. The lens of the module shall be integral to the unit, convex with a smooth outer surface and made of plastic. The lens shall have a textured surface to reduce glare.
6. The use of tinting or other materials to enhance ON/OFF contrasts shall not affect chromaticity and shall be uniform across the face of the lens.

7. Each module shall have a symbol of the type of module (i.e. circle, arrow, etc.) in the color of the module. The symbol shall be 1 inch (25.4 mm) in diameter. Additionally, the color shall be written out in 1/2 inch (12.7mm) letters next to the symbol.

(b) Photometric Requirements

4. The LEDs utilized in the modules shall be AlInGaP technology for red and InGaN for green and amber indications, and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.

(c) Electrical

1. Maximum power consumption for LED modules is per Table 2.
2. Operating voltage of the modules shall be 120 VAC. All parameters shall be measured at this voltage.
3. The modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).
4. When a current of 20 mA AC (or less) is applied to the unit, the voltage read across the two leads shall be 15 VAC or less.
5. The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or set on a non-dimming operation.
6. LED arrows shall be wired such that a catastrophic loss or the failure of one or more LED will not result in the loss of the entire

module. (d) Retrofit Traffic Signal Module

1. The following specification requirements apply to the Retrofit module only. All general specifications apply unless specifically superseded in this section.
2. Retrofit modules can be manufactured under this specification for the following faces:
 - a. 12 inch (300 mm) circular, multi-section
 - b. 12 inch (300 mm) arrow, multi-section
3. Each Retrofit module shall be designed to be installed in the doorframe of a standard traffic signal housing. The Retrofit module shall be sealed in the doorframe with a one-piece EPDM (ethylene propylene rubber) gasket.

4. The maximum weight of a Retrofit module shall be 4 lbs. (1.8 kg).
 5. Each Retrofit module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.), and shall be weather proof after installation and connection.
 6. Electrical conductors for modules, including Retrofit modules, shall be 39.4 inches (1m) in length, with quick disconnect terminals attached.
 7. The lens of the Retrofit module shall be integral to the unit, shall be convex with a smooth outer surface and made of plastic or of glass.
- (e) The following specification requirements apply to the 12 inch (300 mm) arrow module only.
All general specifications apply unless specifically superseded in this section.
1. The arrow module shall meet specifications stated in Section 9.01 of the Equipment and Material Standards of the Institute of Transportation Engineers (November 1998) [ITE Standards], Chapter 2 (Vehicle Traffic Control Signal Heads) or applicable successor ITE specifications for arrow indications.
 2. The LEDs arrow indication shall be a solid display with a minimum of three (3) outlining rows of LEDs and at least one (1) fill row of LEDs.
- (f) The following specification requirement applies to the 12 inch (300 mm) programmed visibility (PV) module only. All general specifications apply unless specifically superseded in this section.
1. The LED module shall be a module designed and constructed to be installed in a programmed visibility (PV) signal housing without modification to the housing.

Basis of Payment.

Add the following to the first paragraph of Article 880.04 of the Standard Specifications:

The price shall include furnishing the equipment described above, all mounting hardware and installing them in satisfactory operating condition.

Revise the second paragraph of Article 880.04 of the Standard Specifications to read:

If the work consists of retrofitting an existing polycarbonate traffic signal head with light emitting diodes (LEDs), it will be paid for as a SIGNAL HEAD, LED, RETROFIT, of the type specified, and of the particular kind of material, when specified. Price shall be payment in full for removal of the existing module, furnishing the equipment described above including LED modules, all mounting hardware, and installing them in satisfactory operating condition. The type specified will indicate the number of signal faces, the number of signal sections in each signal face and the method of mounting.

FLASHING BEACON INSTALLATION, RELOCATION AND REMOVAL

Effective: January 1, 2007
880.02TS

Revised: July 1, 2015

This work shall consist of furnishing and installing a new flashing beacon installation, solar powered flashing beacon installation, relocation of existing flashing beacon, and/or the removal of the existing flashing beacon installation as shown on the plans and as described herein. The energy charges for the operation of the flashing beacon installation shall be paid for by the Department unless otherwise directed by the Engineer.

The installation, relocation and removal of flashing beacon installation shall be according to the applicable portions of Sections 800 and 1000 of the Standard Specifications for Road and Bridge Construction and District 1 Flashing Beacon Installation Details except as revised herein. LED signal heads shall be as modified in 880.01TS LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD Special Provision.

- (a) Flashing Beacon Installation. This item shall consist of installing a post mounted 12 inch (300 mm) L.E.D. single section red or yellow flashing beacon on a new or existing post as shown on the plans or as directed by the Engineer. This item shall include furnishing and installing a flasher controller in an aluminum cabinet, or integrated within the signal head, 12 inch (300 mm) L.E.D. red or yellow signal section with a dimmer if required by the Engineer, and all other hardware necessary to complete the installation.
- (b) Solar Powered Flashing Beacon Installation. This item shall consist of installation of a solar powered flashing beacon, post mounted as shown on the plans or as directed by the Engineer. This item shall consist of furnishing and installing a 12 inch (300 mm) single red or yellow flashing module on a new or existing post as shown on the plans or as directed by the Engineer. This item shall included furnishing and installing a flasher controller that is integrated within the signal head, with discrete solar panels, LED module, battery, electronics, compact housing and be capable of operating 24 hours, 7 days a week. The flasher unit shall be installed on standard wood or metal posts. The flash pattern shall be MUTCD compliant and have alternate flash patterns available. The battery shall have a life span of a minimum of 5 years and be field replaceable. The battery and electronics may be located inside the solar panel housing or signal head. The sections of the flasher unit shall be secured with tamper resistant stainless steel hardware and unless otherwise noted, the housing shall be black in color.
- (c) Relocate Existing Flashing Beacon. Relocation of an existing flashing beacon installation, as shown on the plans or as directed by the Engineer, shall meet the above requirements. This work shall include the complete relocation of the existing flashing beacon installation, the backfilling of the holes created by the removal of the poles, restoration of the surface to match the adjoining area.

- (d) Remove Existing Flashing Beacon Installation Complete. Removal of an existing flashing beacon installation shall be as shown on the plans or as directed by the Engineer and shall be according to applicable portions of Section 895 of the Standard Specifications. This work shall include a complete removal of an existing flashing beacon installation, backfilling of the holes created by the removal of the poles and restoration of the surface to match the adjoining area. The flashing beacon installation will be removed only after the permanent signal installation is accepted for maintenance, or as directed by the Engineer.

Basis of Payment.

This work shall be paid for at the contract unit price each for FLASHING BEACON INSTALLATION; SOLAR POWERED FLASHING BEACON INSTALLATION; RELOCATE EXISTING FLASHING BEACON or REMOVE EXISTING FLASHING BEACON INSTALLATION COMPLETE. The price shall be payment in full for all labor and material necessary to complete the work described above.

LIGHT EMITTING DIODE (LED) PEDESTRIAN SIGNAL HEAD

Effective: May 22, 2002
881.01TS

Revised: July 1, 2015

Add the following to the third paragraph of Article 881.03 of the Standard Specifications:

No mixing of different types of pedestrian traffic signals or displays will be permitted.

Add the following to Article 881.03 of the Standard Specifications:

(a) Pedestrian Countdown Signal Heads.

- (1) Pedestrian Countdown Signal Heads shall not be installed at signalized intersections where traffic signals and railroad warning devices are interconnected.
- (2) Pedestrian Countdown Signal Heads shall be 16 inch (406mm) x 18 inch (457mm), for single units with glossy yellow or black polycarbonate housings. All pedestrian head housings shall be the same color (yellow or black) at the intersection. For new signalized intersections and existing signalized intersections where all pedestrian heads are being replaced, the proposed head housings shall be black. Where only selected heads are being replaced, the proposed head housing color (yellow or black) shall match existing head housings. Connecting hardware and mounting brackets shall be polycarbonate (black). A corrosion resistant anti-seize lubricant shall be applied to all metallic mounting bracket joints, and shall be visible to the inspector at the signal turn- on.
- (3) Each pedestrian signal LED module shall be fully MUTCD compliant and shall consist of double overlay message combining full LED symbols of an Upraised Hand and a Walking Person. "Egg Crate" type sun shields are not permitted. Numerals shall measure 9 inches (229mm) in height and easily identified from a distance of 120 feet (36.6m).

Materials.

Add the following to Article 1078.02 of the Standard Specifications: General.

1. The module shall operate in one mode: Clearance Cycle Countdown Mode Only. The countdown module shall display actual controller programmed clearance cycle and shall start counting when the flashing clearance signal turns on and shall countdown to "0" and turn off when the steady Upraised Hand (symbolizing Don't Walk) signal turns on. Module shall not have user accessible switches or controls for modification of cycle.
2. At power on, the module shall enter a single automatic learning cycle. During the automatic learning cycle, the countdown display shall remain dark.
3. The module shall re-program itself if it detects any increase or decrease of Pedestrian Timing. The counting unit will go blank once a change is detected and then take one complete pedestrian cycle (with no counter during this cycle) to adjust its buffer timer.
4. If the controller preempts during the Walking Person (symbolizing Walk), the countdown will follow the controller's directions and will adjust from Walking Person to flashing Upraised Hand. It will start to count down during the flashing Upraised Hand.
5. If the controller preempts during the flashing Upraised Hand, the countdown will continue to count down without interruption.
6. The next cycle, following the preemption event, shall use the correct, initially programmed values.
7. If the controller output displays Upraised Hand steady condition and the unit has not arrived to zero or if both the Upraised Hand and Walking Person are dark for some reason, the unit suspends any timing and the digits will go dark.
8. The digits will go dark for one pedestrian cycle after loss of power of more than 1.5 seconds.
9. The countdown numerals shall be two (2) "7 segment" digits forming the time display utilizing two rows of LEDs.
10. The LED module shall meet the requirements of the Institute of Transportation Engineers (ITE) LED purchase specification, "Pedestrian Traffic Control Signal Indications – Part 2: LED Pedestrian Traffic Signal Modules," or applicable successor ITE specifications, except as modified herein.
11. The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or set on a non-dimming operation.
12. In the event of a power outage, light output from the LED modules shall cease instantaneously.

13. The LEDs utilized in the modules shall be AllnGaP technology for Portland Orange (Countdown Numerals and Upraised Hand) and GaN technology for Lunar White (Walking Person) indications.

14. The individual LEDs shall be wired such that a catastrophic loss or the failure of one or more LED will not result in the loss of the entire module.

Basis of Payment.

Add the following to the first paragraph of Article 881.04 of the Standard Specifications:

The price shall include furnishing the equipment described above, all mounting hardware and installing them in satisfactory operating condition.

Add the following to Article 881.04 of the Standard Specifications:

If the work consists of retrofitting an existing polycarbonate pedestrian signal head and pedestrian countdown signal head with light emitting diodes (LEDs), it will be paid for as a PEDESTRIAN SIGNAL HEAD, LED, RETROFIT, of the type specified, and of the particular kind of material, when specified. Price shall be payment in full for furnishing the equipment described above including LED modules, all mounting hardware, and installing them in satisfactory operating condition.

TRAFFIC SIGNAL BACKPLATE

Effective: May 22, 2002
882.01TS

Revised: July 1, 2015

Delete 1st sentence of Article 1078.03 of the Standard Specifications and add "All backplates shall be louvered, formed ABS plastic".

Add the following to the third paragraph of Article 1078.03 of the Standard Specifications.

The retroreflective backplate shall not contain louvers.

Delete second sentence of the fourth paragraph of Article 1078.03 the Standard Specifications.

Add the following to the fourth paragraph of Article 1078.03 of the Standard Specifications:

When retro reflective sheeting is specified, it shall be Type ZZ sheeting according to Article 1091.03 and applied in preferred orientation for the maximum angularity according to the vendor's recommendations. The retroreflective sheeting shall be installed under a controlled environment at the vendor/equipment supplier before shipment to the contractor. The formed plastic backplate shall be prepared and cleaned, following recommendations of the retroreflective sheeting manufacturer.

DETECTOR LOOP

Effective: May 22, 2002
886.01TS

Revised: January 5, 2016

Procedure.

A minimum of seven (7) working days prior to the Contractor cutting loops, the Contractor shall mark the proposed loop locations and contact the Area Traffic Signal Maintenance and Operations Engineer (847) 705-4424 to inspect and approve the layout. When preformed detector loops are installed, the Contractor shall have them inspected and approved prior to the pouring of the Portland cement concrete surface, using the same notification process as above.

Installation.

Revise Article 886.04 of the Standard Specifications to read:

Loop detectors shall be installed according to the requirements of the "District One Standard Traffic Signal Design Details." Saw-cuts (homeruns on preformed detector loops) from the loop to the edge of pavement shall be made perpendicular to the edge of pavement when possible in order to minimize the length of the saw-cut (homerun on preformed detector loops) unless directed otherwise by the Engineer or as shown on the plan.

The detector loop cable insulation shall be labeled with the cable specifications.

Each loop detector lead-in wire shall be labeled in the handhole using a water proof tag, from an approved vendor, secured to each wire with nylon ties.

Resistance to ground shall be a minimum of 100 mega-ohms under any conditions of weather or moisture. Inductance shall be more than 50 and less than 700 microhenries. Quality readings shall be more than 5.

- (a) Type I. All loops installed in new asphalt pavement shall be installed in the binder course and not in the surface course. The edge of pavement, curb and handhole shall be cut with a 1/4 inch (6.3 mm) deep x 4 inches (100 mm) saw cut to mark location of each loop cable.
- (b) Loop sealant shall be two-component thixotropic chemically cured polyurethane from an approved vendor. The sealant shall be installed 1/8 inch (3 mm) below the pavement surface. If installed above the surface the excess shall be removed immediately.
- (c) Preformed. This work shall consist of furnishing and installing a rubberized or cross linked polyethylene heat resistant preformed traffic signal loop in accordance with the Standard Specifications, except for the following:
- (d) Preformed detector loops shall be installed in new pavement constructed of Portland cement concrete using mounting chairs or tied to re-bar or the preformed detector loops may be placed in the sub-base. Loop lead-ins shall be extended to a temporary protective enclosure near the proposed handhole location. The protective enclosure shall provide sufficient protection from other construction activities and may be buried for additional protection.

- (e) Handholes shall be placed next to the shoulder or back of curb when preformed detector loops enter the handhole. CNC, included in this pay item, shall be used to protect the preformed lead-ins from back of curb to the handhole.

- (f) Preformed detector loops shall be factory assembled with ends capped and sealed against moisture and other contaminants. The loop configurations and homerun lengths shall be assembled for the specific application. The loop and homerun shall be constructed using 11/16 inch (17.2 mm) outside diameter (minimum), 3/8 inch (9.5 mm) inside diameter (minimum) Class A oil resistant synthetic cord reinforced hydraulic hose with 250 psi (1,720 kPa) internal pressure rating or a similarly sized XLPE cable jacket. Hose for the loop and homerun assembly shall be one continuous piece. No joints or splices shall be allowed in the hose except where necessary to connect homeruns to the loops. This will provide maximum wire protection and loop system strength. Hose tee connections shall be heavy duty high temperature synthetic rubber. The tee shall be of proper size to attach directly to the hose, minimizing glue joints. The tee shall have the same flexible properties as the hose to insure that the whole assembly can conform to pavement movement and shifting without cracking or breaking. For XLPE jacketed preformed loops, all splice connections shall be soldered, sealed, and tested before being sealed in a high impact glass impregnated plastic splice enclosure. The wire used shall be #16 THWN stranded copper. The number of turns in the loop shall be application specific. Homerun wire pairs shall be twisted a minimum of four turns per foot. No wire splices will be allowed in the preformed loop assembly. The loop and homeruns shall be filled and sealed with a flexible sealant to insure complete moisture blockage and further protect the wire. The preformed loops shall be constructed to allow a minimum of 6.5 feet of extra cable in the handhole.

Method of Measurement.

Add the following to Article 886.05 of the Standard Specifications:

Preformed detector loops will be measured along the detector loop embedded in the pavement, rather than the actual length of the wire. Detector loop measurements shall include the saw cut and the length of the detector loop wire to the edge of pavement. The detector loop wire, including all necessary connections for proper operations, from the edge of pavement to the handhole, shall be included in the price of the detector loop. CNC, trench and backfill, and drilling of pavement or handholes shall be included in detector loop quantities.

Basis of Payment.

This work shall be paid for at the contract unit price per foot (meter) for DETECTOR LOOP, TYPE I or PREFORMED DETECTOR LOOP as specified in the plans, which price shall be payment in full for furnishing and installing the detector loop and all related connections for proper operation.

RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT

Effective: January 1, 2002
887.02TS

Revised: July 1, 2015

This item shall consist of relocating the existing emergency vehicle priority system, detector unit (single channel or dual channel) from its existing location to a new traffic signal post or mast arm assembly and pole, and connecting it to an emergency vehicle priority system, phasing unit. If the existing Emergency Vehicle Priority System, Detector Unit Assembly includes a Confirmation Beacon, the Confirmation Beacon shall also be relocated and connected to the Emergency Vehicle Priority System, Detector Unit and shall be included at no cost in this item.

The emergency vehicle system is not to be inoperative for more than 8 hours and the Contractor must notify the Municipality or Fire Protection District 72 hours prior to the disconnection of the equipment.

Basis of Payment.

This item will be paid for at the contract unit price each for RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT.

RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, PHASING UNIT

Effective: January 1, 2002
887.03TS

Revised: July 1, 2015

This item shall consist of relocating the existing emergency vehicle priority system phasing unit from an existing traffic signal controller cabinet to a new traffic signal controller cabinet, as indicated in the plans or as directed by the Engineer.

The work shall include disconnecting the emergency vehicle priority system phasing unit(s) and reconnecting it into the new traffic signal controller cabinet.

The emergency vehicle system is not to be inoperative for more than 8 hours and the Contractor must notify the Municipality or Fire Protection District 72 hours prior to the disconnection of the equipment. The Contractor must demonstrate to the satisfaction of the Engineer that the emergency vehicle system operates properly.

Basis of Payment.

This item will be paid for on a basis of one (1) each per intersection for RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, PHASING UNIT.

PEDESTRIAN PUSH-BUTTON

Effective: May 22, 2002
888.01TS

Revised: July 1, 2015

Description.

Revise Article 888.01 of the Standard Specifications to read:

This work shall consist of furnishing and installing a latching (single call) or non-latching (dual call) pedestrian push-button and a regulatory pedestrian instruction sign according to MUTCD, sign series R10-3e 9" x 15" sign with arrow(s) for a count-down pedestrian signal. The pedestrian station sign size without count-down pedestrian signals shall accommodate a MUTCD sign series R10-3b or R10-3d 9" x 12" sign with arrow(s).

Installation.

Add the following to Article 888.03 of the Standard Specifications:

A mounting bracket and/or extension shall be used to assure proper orientation when two pedestrian push buttons are required for one post. The price of the bracket and/or extension shall be included in the cost of the pedestrian push button. The contractor is not allowed to install a push-button assembly with the sign below the push-button in order to meet mounting requirements.

Materials.

Revise Article 1074.02(a) of the Standard Specifications to read:

The pedestrian push-button housing shall be constructed of aluminum alloy according to ASTM B 308 6061-T6 and powder coated yellow, unless otherwise noted on the plans. The housing shall be furnished with suitable mounting hardware.

Revise Article 1074.02(e) of the Standard Specifications to read:

Stations shall be designed to be mounted to a post, mast arm pole or wood pole. The station shall be aluminum and shall accept a 3 inch (75mm) round push-button assembly and a regulatory pedestrian instruction sign according to MUTCD, sign series R10-3e 9" x 15" sign with arrow(s) for a count-down pedestrian signal. The pedestrian station size without count-down pedestrian signals shall accommodate a MUTCD sign series R10-3b or R10-3d 9" x 12" sign with arrow(s).

Add the following to Article 1074.02 of the Standard Specifications:

- (f) Location. Pedestrian push-buttons and stations shall be mounted to a post, mast arm pole or wood pole as shown on the plans and shall be fully ADA accessible from a paved or concrete surface. See the District's Detail sheets for orientation and mounting details.

Basis of Payment

Revise Article 888.04 of the Standard Specifications to read:

This work will be paid for at the contract unit price per each for PEDESTRIAN PUSH-BUTTON or PEDESTRIAN PUSH-BUTTON, NON-LATCHING.

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Effective: May 22, 2002
890.01TS

Revised: July 1, 2015

Revise Section 890 of the Standard Specifications to read:

Description.

This work shall consist of furnishing, installing, maintaining, and removing a temporary traffic signal installation as shown on the plans, including but not limited to temporary signal heads, emergency vehicle priority systems, interconnect, vehicle detectors, uninterruptable power supply, and signing. Temporary traffic signal controllers and cabinets interconnected to railroad traffic control devices shall be new. When temporary traffic signals will be operating within a county or local agency Traffic Management System, the equipment must be NTCIP compliant and compatible with the current operating requirements of the Traffic Management System.

General.

Only an approved controller equipment supplier will be allowed to assemble temporary traffic signal and railroad traffic signal cabinet. Traffic signal inspection and TURN-ON shall be according to 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS special provision.

Construction Requirements.

(a) Controllers.

1. Only controllers supplied by one of the District approved closed loop equipment supplier will be approved for use at temporary signal locations. All controllers used for temporary traffic signals shall be fully actuated NEMA microprocessor based with RS232 data entry ports compatible with existing monitoring software approved by IDOT District 1, installed in NEMA TS2 cabinets with 8 phase back panels, capable of supplying 255 seconds of cycle length and individual phase length settings up to 99 seconds. On projects with one lane open and two way traffic flow, such as bridge deck repairs, the temporary signal controller shall be capable of providing an adjustable all red clearance setting of up to 30 seconds in length. All controllers used for temporary traffic signals shall meet or exceed the requirements of Section 857 of the Standard Specifications with regards to internal time base coordination and preemption. All railroad interconnected temporary controllers and cabinets shall be new and shall satisfy the requirements of Article 857.02 of the Standard Specifications and as modified herein.

2. Only control equipment, including controller cabinet and peripheral equipment, supplied by one of the District approved closed loop equipment suppliers will be approved for use at temporary traffic signal locations. All control equipment for the temporary traffic signal(s) shall be furnished by the Contractor unless otherwise stated in the plans. On projects with multiple temporary traffic signal installations, all controllers shall be the same manufacturer brand and model number with the latest version software installed at the time of the signal TURN- ON.
 - (b) Cabinets. All temporary traffic signal cabinets shall have a closed bottom made of aluminum alloy. The bottom shall be sealed along the entire perimeter of the cabinet base to ensure a water, dust and insect-proof seal. The bottom shall provide a minimum of two (2) 4 inch (100 mm) diameter holes to run the electric cables through. The 4 inch (100 mm) diameter holes shall have a bushing installed to protect the electric cables and shall be sealed after the electric cables are installed.
 - (c) Grounding. Grounding shall be provided for the temporary traffic signal cabinet meeting or exceeding the applicable portions of the National Electrical Code, Section 806 of the Standard Specifications and shall meet the requirements of the 806.01TS GROUNDING OF TRAFFIC SIGNAL SYSTEMS special provision.
 - (d) Traffic Signal Heads. All traffic signal sections shall be 12 inches (300 mm). Pedestrian signal sections shall be 16 inch (406mm) x 18 inch (457mm). Traffic signal sections shall be LED with expandable view, unless otherwise approved by the Engineer. Pedestrian signal heads shall be Light Emitting Diode (LED) Pedestrian Countdown Signal Heads except when a temporary traffic signal is installed at an intersection interconnected with a railroad grade crossing. When a temporary traffic signal is installed at an intersection interconnected with a railroad grade crossing, Light Emitting Diode (LED) Pedestrian Signal Heads shall be furnished. The temporary traffic signal heads shall be placed as indicated on the temporary traffic signal plan or as directed by the Engineer. If no traffic staging is in place or will not be staged on the day of the turn on, the temporary traffic signal shall have the signal head displays, signal head placements and controller phasing match the existing traffic signal or shall be as directed by the engineer. The Contractor shall furnish enough extra cable length to relocate heads to any position on the span wire or at locations illustrated on the plans for construction staging. The temporary traffic signal shall remain in operation during all signal head relocations. Each temporary traffic signal head shall have its own cable from the controller cabinet to the signal head.

(e) Interconnect.

1. Temporary traffic signal interconnect shall be provided using fiber optic cable or wireless interconnect technology as specified in the plans. The Contractor may request, in writing, to substitute the fiber optic temporary interconnect indicated in the contract documents with a wireless interconnect. The Contractor must provide assurances that the radio device will operate properly at all times and during all construction staging. If approved for use by the Engineer, the Contractor shall submit marked-up traffic signal plans indicating locations of radios and antennas and installation details. If wireless interconnect is used, and in the opinion of the engineer, it is not viable, or if it fails during testing or operations, the Contractor shall be responsible for installing all necessary poles, fiber optic cable, and other infrastructure for providing temporary fiber optic interconnect at no cost to the contract.
2. The existing system interconnect and phone lines are to be maintained as part of the Temporary Traffic Signal Installation specified for on the plan. The interconnect, including any required fiber splices and terminations, shall be installed into the temporary controller cabinet as per the notes or details on the plans. All labor and equipment required to install and maintain the existing interconnect as part of the Temporary Traffic Signal Installation shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION. When shown in the plans, temporary traffic signal interconnect equipment shall be furnished and installed. The temporary traffic signal interconnect shall maintain interconnect communications throughout the entire signal system for the duration of the project. Any temporary signal within an existing closed loop traffic signal system shall be interconnected to that system using similar brand control equipment at no additional cost to the contract.
3. Temporary wireless interconnect. The radio interconnect system shall be compatible with Eagle or Econolite controller closed loop systems. This work shall include all temporary wireless interconnect components, at the adjacent existing traffic signal(s) to provide a completely operational closed loop system. This work shall include all materials, labor and testing to provide the completely operational closed loop system as shown on the plans. The radio interconnect system shall include the following components:
 - a. Rack or Shelf Mounted RS-232 Frequency Hopping Spread Spectrum (FHSS) Radio
 - b. Software for Radio Configuration (Configure Frequency and Hopping Patterns)
 - c. Antennas (Omni Directional or Yagi Directional)
 - d. Antenna Cables, LMR400, Low Loss. Max. 100-ft from controller cabinet to antenna
 - e. Brackets, Mounting Hardware, and Accessories Required for Installation
 - f. RS232 Data Cable for Connection from the radio to the local or master controller
 - g. All other components required for a fully functional radio interconnect system

All controller cabinet modifications and other modifications to existing equipment that are required for the installation of the radio interconnect system components shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION.

The radio interconnect system may operate at 900Mhz (902-928) or 2.4 Ghz depending on the results of a site survey. The telemetry shall have an acceptable rate of transmission errors, time outs, etc. comparable to that of a hardwire system.

The proposed or existing master controller and telemetry module shall be configured for use with the radio interconnect at a minimum rate of 9600 baud.

The radio interconnect system shall include all other components required for a complete and fully functional telemetry system and shall be installed in accordance to the vendors recommendations.

- (f) Emergency Vehicle Pre-Emption. All emergency vehicle preemption equipment (light detectors, light detector amplifiers, confirmation beacons, etc.) as shown on the temporary traffic signal plans shall be provided by the Contractor. It shall be the Contractor's responsibility to contact the municipality or fire district to verify the brand of emergency vehicle preemption equipment to be installed prior to the contract bidding. The equipment must be completely compatible with all components of the equipment currently in use by the Agency. All light operated systems shall operate at a uniform rate of 14.035 hz \pm 0.002, or as otherwise required by the Engineer, and provide compatible operation with other light systems currently being operated in the District. All labor and material required to install and maintain the Emergency Vehicle Preemption installation shall be included in the item Temporary Traffic Signal Installation.
- (g) Vehicle Detection. All temporary traffic signal installations shall have vehicular detection installed at all approaches of the intersection and as directed by the Engineer. Pedestrian push buttons shall be provided for all pedestrian signal heads/phases as directed by the Engineer. Microwave vehicle sensors or video vehicle detection system shall be approved by IDOT prior to Contractor furnishing and installing. The Contractor shall install, wire, and adjust the alignment of the microwave vehicle sensor or video vehicle detection system in accordance to the manufacturer's recommendations and requirements. The Contractor shall be responsible for adjusting the alignment of the microwave vehicle sensor or video vehicle detection system for all construction staging changes and for maintaining proper alignment throughout the project. An equipment supplier shall be present and assist the contractor in setting up and maintaining the microwave vehicle sensor or video vehicle detection system. An in-cabinet video monitor shall be provided with all video vehicle detection systems and shall be included in the item Temporary Traffic Signal Installation.

- (h) Uninterruptable Power Supply. All temporary traffic signal installations shall have Uninterruptable Power Supply (UPS). The UPS cabinet shall be mounted to the temporary traffic signal cabinet and shall be according to the applicable portions of Section 862 of the Standard Specifications and as modified in 862.01TS UNINTERRUPTABLE POWER SUPPLY, SPECIAL Special Provision.
- (i) Signs. All existing street name and intersection regulatory signs shall be removed from existing poles and relocated to the temporary signal span wire. If new mast arm assembly and pole(s) and posts are specified for the permanent signals, the signs shall be relocated to the new equipment at no extra cost. Any intersection regulatory signs that are required for the temporary traffic signal shall be provided as shown on the plans or as directed by the Engineer. Relocation, removing, bagging and installing the regulatory signs for the various construction stages shall be provided as shown on the plans or as directed by the Engineer. If Illuminated Street Name Signs exist they shall be taken down and stored by the contractor and reflecting street name signs shall be installed on the temporary traffic signal installation.
- (j) Energy Charges. The electrical utility energy charges for the operation of the temporary traffic signal installation shall be paid for by others if the installation replaces an existing signal. Otherwise charges shall be paid for under 109.05 of the Standard Specifications.
- (k) Maintenance. Maintenance shall meet the requirements of the Standard Specifications and 850.01TS MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION Special Provisions. Maintenance of temporary signals and of the existing signals shall be included in the cost of the TEMPORARY TRAFFIC SIGNAL INSTALLATION pay item. When temporary traffic signals are to be installed at locations where existing signals are presently operating, the Contractor shall be fully responsible for the maintenance of the existing signal installation as soon as he begins any physical work on the Contract or any portion thereof. In addition, a minimum of seven (7) days prior to assuming maintenance of the existing traffic signal installation(s) under this Contract, the Contractor shall request that the Resident Engineer contact the Bureau of Traffic Operations (847) 705-4424 for an inspection of the installation(s).
- (l) Temporary Traffic Signals for Bridge Projects. Temporary Traffic Signals for bridge projects shall follow the State Standards, Standard Specifications, Special Provisions and any plans for Bridge Temporary Traffic Signals included in the plans. The installation shall meet the Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION specification. In addition all electric cable shall be aurally suspended, at a minimum height of 18 feet (5.5m) on temporary wood poles (Class 5 or better) of 45 feet (13.7 m) minimum height. The signal heads shall be span wire mounted or bracket mounted to the wood pole or as directed by the Engineer. The Controller cabinet shall be mounted to the wood pole as shown in the plans, or as directed by the Engineer. Microwave vehicle sensors or video vehicle detection system may be used in place of detector loops as approved by the Engineer.

(m) Temporary Portable Traffic Signal for Bridge Projects.

1. Unless otherwise directed by the Engineer, temporary portable traffic signals shall be restricted to use on roadways of less than 8000 ADT that have limited access to electric utility service, shall not be installed on projects where the estimated need exceeds ten (10) weeks, and shall not be in operation during the period of November through March. The Contractor shall replace the temporary portable traffic signals with temporary span wire traffic signals noted herein at no cost to the contract if the bridge project or Engineer requires temporary traffic signals to remain in operation into any part of period of November through March. If, in the opinion of the Engineer, the reliability and safety of the temporary portable traffic signal is not similar to that of a temporary span wire traffic signal installation, the Contractor shall replace the temporary portable traffic signals with temporary span wire traffic signals at no cost to the contract.
2. The controller and LED signal displays shall meet the applicable Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION special provision.
3. Work shall be according to Article 701.18(b) of the Standard Specifications except as noted herein.
4. General.
 - a. The temporary portable bridge traffic signals shall be trailer-mounted units. The trailer-mounted units shall be set up securely and level. Each unit shall be self-contained and consist of two signal heads. The left signal head shall be mounted on a mast arm capable of extending over the travel lane. Each unit shall contain a solar cell system to facilitate battery charging. There shall be a minimum of 12 days backup reserve battery supply and the units shall be capable of operating with a 120 V power supply from a generator or electrical service.
 - b. All signal heads located over the travel lane shall be mounted at a minimum height of 17 feet (5m) from the bottom of the signal back plate to the top of the road surface. All far right signal heads located outside the travel lane shall be mounted at a minimum height of 8 feet (2.5m) from the bottom of the signal back plate to the top of the adjacent travel lane surface.
 - c. The long all red intervals for the traffic signal controller shall be adjustable up to 250 seconds in one-second increments.
 - d. As an alternative to detector loops, temporary portable bridge traffic signals may be equipped with microwave sensors or other approved methods of vehicle detection and traffic actuation.

- e. All portable traffic signal units shall be interconnected using hardwire communication cable. Radio communication equipment may be used only with the approval of the Engineer. If radio communication is used, a site analysis shall be completed to ensure that there is no interference present that would affect the traffic signal operation. The radio equipment shall meet all applicable FCC requirements.
- f. The temporary portable bridge traffic signal system shall meet the physical display and operational requirements of conventional traffic signals as specified in Part IV and other applicable portions of the currently adopted version of the Manual on Uniform Traffic Control Devices (MUTCD) and the Illinois MUTCD. The signal system shall be designed to continuously operate over an ambient temperature range between -30 °F (-34 °C) and 120 °F (48 °C). When not being utilized to inform and direct traffic, portable signals shall be treated as nonoperating equipment according to Article 701.11.
- g. Basis of Payment. This work will be paid for according to Article 701.20(c).

Basis of Payment.

This work shall be paid for at the contract unit price each for TEMPORARY TRAFFIC SIGNAL INSTALLATION, TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION, or TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION, the price of which shall include all costs for the modifications required for traffic staging, changes in signal phasing as required in the Contract plans, microwave vehicle sensors, video vehicle detection system, any maintenance or adjustment to the microwave vehicle sensors/video vehicle detection system, the temporary wireless interconnect system, temporary fiber optic interconnect system, all material required, the installation and complete removal of the temporary traffic signal, and any changes required by the Engineer. Each intersection will be paid for separately.

TEMPORARY TRAFFIC SIGNAL TIMING

Effective: May 22, 2002
890.02TS

Revised: July 1, 2015

Description.

This work shall consist of developing and maintaining appropriate traffic signal timings for the specified intersection for the duration of the temporary signalized condition, as well as impact to existing traffic signal timings caused by detours or other temporary conditions.

All timings and adjustments necessary for this work shall be performed by an approved Consultant who has previous experience in optimizing Closed Loop Traffic signal Systems for District One of the Illinois Department of Transportation. The Contractor shall contact the Traffic Signal Engineer at (847) 705-4424 for a listing of approved Consultants.

The following tasks are associated with TEMPORARY TRAFFIC SIGNAL TIMING.

- (a) Consultant shall attend temporary traffic signal inspection (turn-on) and/or detour meeting and conduct on-site implementation of the traffic signal timings.
- (b) Consultant shall be responsible for making fine-tuning adjustments to the timings in the field to alleviate observed adverse operating conditions and to enhance operations.
- (c) Consultant shall provide monthly observation of traffic signal operations in the field.
- (d) Consultant shall provide on-site consultation and adjust timings as necessary for construction stage changes, temporary traffic signal phase changes, and any other conditions affecting timing and phasing, including lane closures, detours, and other construction activities.
- (e) Consultant shall make timing adjustments and prepare comment responses as directed by the Area Traffic Signal Operations Engineer.
- (f) Return original timing plan once construction is complete.

Basis of Payment.

The work shall be paid for at the contract unit price each for TEMPORARY TRAFFIC SIGNAL TIMING, which price shall be payment in full for performing all work described herein per intersection. When the temporary traffic signal installation is turned on and/or detour implemented, 50 percent of the bid price will be paid. The remaining 50 percent of the bid price will be paid following the removal of the temporary traffic signal installation and/or detour.

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

Effective: May 22, 2002
895.02TS

Revised: July 1, 2015

Add the following to Article 895.05 of the Standard Specifications:

The traffic signal equipment which is to be removed and is to become the property of the Contractor shall be disposed of outside the right-of-way at the Contractor's expense.

All equipment to be returned to the State shall be delivered by the Contractor to the State's Traffic Signal Maintenance Contractor's main facility. The Contractor shall contact the State's Electrical Maintenance Contractor to schedule an appointment to deliver the equipment. No equipment will be accepted without a prior appointment. All equipment shall be delivered within 30 days of removing it from the traffic signal installation. The Contractor shall provide one hard copy and one electronic file of a list of equipment that is to remain the property of the State, including model and serial numbers, where applicable. The Contractor shall also provide a copy of the Contract plan or special provision showing the quantities and type of equipment. Controllers and peripheral equipment from the same location shall be boxed together (equipment from different locations may not be mixed) and all boxes and controller cabinets shall be clearly marked or labeled with the location from which they were removed. If equipment is not returned according to these requirements, it will be rejected by the State's Electrical Maintenance Contractor. The Contractor shall be responsible for the condition of the traffic signal equipment from the time Contractor takes maintenance of the signal installation until the acceptance of a receipt drawn by the State's Electrical Maintenance Contractor indicating the items have been returned in good condition.

The Contractor shall safely store and arrange for pick up or delivery of all equipment to be returned to agencies other than the State. The Contractor shall package the equipment and provide all necessary documentation as stated above.

Traffic signal equipment which is lost or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of these Specifications at no cost to the contract.

GENERAL ELECTRICAL REQUIREMENTS

Effective: January 1, 2012

Add the following to Article 801 of the Standard Specifications:

“Maintenance transfer and Preconstruction Inspection:

General. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance transfer and preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance transfer and preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date. The maintenance transfer and preconstruction inspection shall:

Establish the procedures for formal transfer of maintenance responsibility required for the construction period.

Establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the State. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least 304.8 mm (one (1) foot) to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance transfer and preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and this does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of his work, as specified elsewhere herein. Note that the contractor shall be entitled to only one request for location marking of existing systems and that multiple requests may only be honored at the contractor's expense. No locates will be made after maintenance is transferred, unless it is at the contractor's expense.

Condition of Existing Systems. The Contractor shall conduct an inventory of all existing electrical system equipment within the project limits, which may be affected by the work, making note of any parts which are found broken or missing, defective or malfunctioning. Megger and load readings shall be taken for all existing circuits which will remain in place or be modified. If a circuit is to be taken out in its entirety, then readings do not have to be taken. The inventory and test data shall be reviewed with and approved by the Engineer and a record of the inventory shall be submitted to the Engineer for the record. Without such a record, all systems transferred to the Contractor for maintenance during construction shall be returned at the end of construction in complete, fully operating condition."

Add the following to the 1st paragraph of Article 801.05(a) of the Standard Specifications:

"Items from multiple disciplines shall not be combined on a single submittal and transmittal. Items for lighting, signals, surveillance and CCTV must be in separate submittals since they may be reviewed by various personnel in various locations."

Revise the second sentence of the 5th paragraph of Article 801.05(a) of the Standard Specifications to read:

"The Engineer will stamp the submittals indicating their status as 'Approved', 'Approved as Noted', 'Disapproved', or 'Information Only'.

Revise the 6th paragraph of Article 801.05(a) of the Standard Specifications to read:

Resubmittals. All submitted items reviewed and marked 'Approved as Noted', or 'Disapproved' are to be resubmitted in their entirety with a disposition of previous comments to verify contract compliance at no additional cost to the state unless otherwise indicated within the submittal comments."

Revise Article 801.11(a) of the Standard Specifications to read:

“Lighting Operation and Maintenance Responsibility. The scope of work shall include the assumption of responsibility for the continuing operation and maintenance the of existing, proposed, temporary, sign and navigation lighting, or other lighting systems and all appurtenances affected by the work as specified elsewhere herein. Maintenance of lighting systems is specified elsewhere and will be paid for separately

Energy and Demand Charges. The payment of basic energy and demand charges by the electric utility for existing lighting which remains in service will continue as a responsibility of the Owner, unless otherwise indicated. Unless otherwise indicated or required by the Engineer duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously at the Owner's expense and lighting systems shall not be kept in operation during long daytime periods at the Owner's expense. Upon written authorization from the Engineer to place a proposed new lighting system in service, whether the system has passed final acceptance or not, (such as to allow temporary lighting to be removed), the Owner will accept responsibility for energy and demand charges for such lighting, effective the date of authorization. All other energy and demand payments to the utility shall be the responsibility of the Contractor until final acceptance.”

Add the following to Section 801 of the Standard Specifications:

“Lighting Cable Identification. Each wire installed shall be identified with its complete circuit number at each termination, splice, junction box or other location where the wire is accessible.”

“Lighting Cable Fuse Installation. Standard fuse holders shall be used on non-frangible (non-breakaway) light pole installations and quick-disconnect fuse holders shall be used on frangible (breakaway) light pole installations. Wires shall be carefully stripped only as far as needed for connection to the device. Over-stripping shall be avoided. An oxide inhibiting lubricant shall be applied to the wire for minimum connection resistance before the terminals are crimped-on. Crimping shall be performed in accordance with the fuse holder manufacturer's recommendations. The exposed metal connecting portion of the assembly shall be taped with two half-lapped wraps of electrical tape and then covered by the specified insulating boot. The fuse holder shall be installed such that the fuse side is connected to the pole wire (load side) and the receptacle side of the holder is connected to the line side.”

Revise the 2nd paragraph of Article 801.16 of the Standard Specifications to read:

“When the work is complete, and seven days before the request for a final inspection, the full-size set of contract drawings. Stamped “RECORD DRAWINGS”, shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor’s supervising Engineer or electrician. The record drawings shall be submitted in PDF format on CDROM as well as hardcopy for review and approval. In addition to the record drawings, copies of the final catalog cuts which have been Approved or Approved as Noted shall be submitted in PDF format along with the record drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible.”

Add the following to Article 801.16 of the Standard Specifications:

“In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following electrical components being installed, modified or being affected in other ways by this contract:

- Last light pole on each circuit
- Handholes
- Conduit roadway crossings
- Controllers
- Control Buildings
- Structures with electrical connections, i.e. DMS, lighted signs.
- Electric Service locations
- CCTV Camera installations
- Fiber Optic Splice Locations

Datum to be used shall be North American 1983.

Data shall be provided electronically and in print form. The electronic format shall be compatible with MS Excel. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

1. Description of item
2. Designation or approximate station if the item is undesignated
3. Latitude
4. Longitude

Examples:

Equipment Description	Equipment Designation	Latitude	Longitude
CCTV Camera pole	ST42	41.580493	-87.793378
FO mainline splice handhole	HHL-ST31	41.558532	-87.792571
Handhole	HH at STA 234+35	41.765532	-87.543571
Electric Service	Elec Srv	41.602248	-87.794053
Conduit crossing	SB IL83 to EB I290 ramp SIDE A	41.584593	-87.793378
Conduit crossing	SB IL83 to EB I290 ramp SIDE B	41.584600	-87.793432
Light Pole	DA03	41.558532	-87.792571
Lighting Controller	X	41.651848	-87.762053
Sign Structure	FGD	41.580493	-87.793378
Video Collection Point	VCP-IK	41.558532	-87.789771
Fiber splice connection	Toll Plaza34	41.606928	-87.794053

Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 100 feet. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified.

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have a minimum 5 meter accuracy after post processing.

GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years.”

UNDERGROUND RACEWAYS

Effective: March 1, 2015

Revise Article 810.04 of the Standard Specifications to read:

“Installation. All underground conduits shall have a minimum depth of 30-inches (700 mm) below the finished grade.”

Add the following to Article 810.04 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Steel Conduit unless otherwise indicated on the plans.”

Add the following to Article 810.04 of the Standard Specifications:

“All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap.

The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.”

EXPOSED RACEWAYS

Effective: January 1, 2012

Revise the first paragraph of Article 811.03(a) of the Standard Specifications to read:

“General. Rigid metal conduit installation shall be according to Article 810.05(a).

Conduits terminating in junction and pull boxes shall be terminated with insulated and gasketed watertight threaded NEMA 4X conduit hubs. The hubs shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C. When PVC coated conduit is utilized, the aforementioned hubs shall also be PVC coated.”

Add the following to Article 811.03(b) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

Add the following to Article 1088.01(a) of the Standard Specifications:

All iron and steel products, which are to be incorporated into the work, including conduit and all conduit fittings, shall be domestically manufactured or produced and fabricated as specified in Article 106.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

- “a. PVC Coated Steel Conduit. The PVC coated rigid metal conduit shall be UL Listed (UL 6). The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations shall be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating shall be UL listed.
- b. The PVC coating shall have the following characteristics:

Hardness:	85+ Shore A Durometer
Dielectric Strength:	400V/mil @ 60 Hz

Aging:	1,000 Hours Atlas Weatherometer
Temperature	The PVC compound shall conform at 0° F. to Federal Specifications PL-406b, Method 2051, Amendment of 25 September 1952 (ASTM D 746)
Elongation:	200%

- c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.
- d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).
- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.
- f. Conduit bodies shall have a tongue-in-groove gasket for maximum sealing capability. The design shall incorporate a positive placement feature to assure proper installation. Certified test results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be submitted for review when requested by the Engineer.

- g. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

Two parallel cuts 13 mm (1/2 inch) apart and 40 mm (1 1/2 inches) in length shall be made with a sharp knife along the longitudinal axis. A third cut shall be made perpendicular to and crossing the longitudinal cuts at one end. The knife shall then be worked under the PVC coating for 13 mm (1/2 inch) to free the coating from the metal.

Using pliers, the freed PVC tab shall be pulled with a force applied vertically and away from the conduit. The PVC tab shall tear rather than cause any additional PVC coating to separate from the substrate.

Boil Test:

Acceptable conduit coating bonds (exterior and interior) shall be confirmed if there is no disbondment after a minimum average of 200 hours in boiling water or exposure to steam vapor at one atmosphere. Certified test results from a national recognized independent testing laboratory shall be submitted for review and approval. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D870, a 6" length of conduit test specimen shall be placed in boiling water. The specimen shall be periodically removed, cooled to ambient temperature and immediately tested according to the bond test (RN1). When the PVC coating separates from the substrate, the boil time to failure in hours shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, a 6" conduit test specimen shall be cut in half longitudinally and placed in boiling water or directly above boiling water with the urethane surface facing down. The specimen shall be periodically removed, cooled to ambient temperature and tested in accordance with the Standard Method of Adhesion by Tape Test (ASTM D3359). When the coating disbonds, the time to failure in hours shall be recorded.

Heat/Humidity Test:

Acceptable conduit coating bonds shall be confirmed by a minimum average of 30 days in the Heat and Humidity Test. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D1151, D1735, D2247 and D4585, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. The specimens shall be periodically removed and a bond test (RN1) performed. When the PVC coating separates from the substrate, the exposure time to failure in days shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. When the coating disbonds, the time to failure in hours shall be recorded.

Add the following to Article 1088.01(a)(4) of the Standard Specifications:

“All liquid tight flexible metal conduit fittings shall have an insulated throat to prevent abrasion of the conductors and shall have a captive sealing O-ring gasket. The fittings shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C.”

Revise the second paragraph of Article 811.04 of the Standard Specifications to read:

“Expansion fittings and LFNC will not be measured for payment.”

Revise Article 811.05 of the Standard Specifications to read:

“811.05 Basis of Payment. This work will be paid for at the contract unit price per meter (foot) for **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL** or **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL, PVC COATED.**”

UNIT DUCT

Effective: January 1, 2012

Revise the first paragraph of Article 810.04 to read:

“The unit duct shall be installed at a minimum depth of 30-inches (760 mm) unless otherwise directed by the Engineer.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit. General:

The duct shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 2447, for schedule 40. The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade P33. The wall thickness shall be in accordance with Table 2 for ASTM D 2447.

The duct shall be UL Listed per 651-B for continuous length HDPE coiled conduit. The duct shall also comply with NEC Article 354.100 and 354.120.

Submittal information shall demonstrate compliance with the details of these requirements.

Dimensions:

Duct dimensions shall conform to the standards listed in ASTM D2447. Submittal information shall demonstrate compliance with these requirements.

Nominal Size		Nominal I.D.		Nominal O.D.		Minimum Wall	
mm	in	mm	in	mm	in	mm	in
31.75	1.25	35.05	1.380	42.16	1.660	3.556 +0.51	0.140 +0.020
38.1	1.50	40.89	1.610	48.26	1.900	3.683 +0.51	0.145 +0.020

Nominal Size		Pulled Tensile	
mm	in	N	lbs

31.75	1.25	3322	747
38.1	1.50	3972	893

Marking:

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 3.05 meters (10 feet) with the material designation (HDPE for high density polyethylene), nominal size of the duct and the name and/or trademark of the manufacturer.

Performance Tests:

Polyethylene Duct testing procedures and test results shall meet the requirements of UL 651. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct. Duct crush test results shall meet or exceed the following requirements:

Duct Diameter		Min. force required to deform sample 50%	
mm	in	N	lbs
35	1.25	4937	1110
41	1.5	4559	1025

WIRE AND CABLE

Effective: January 1, 2012

Add the following to the first paragraph of Article 1066.02(a):

“The cable shall be rated at a minimum of 90°C dry and 75°C wet and shall be suitable for installation in wet and dry locations, and shall be resistant to oils and chemicals.”

Revise the Aerial Electric Cable Properties table of Article 1066.03(a)(3) to read:

Aerial Electric Cable Properties

Size AWG	Stranding	Phase Conductor		Messenger wire	
		Average Insulation Thickness	Minimum Size AWG	Stranding	
		mm	mils		
6	7	1.1	(45)	6	6/1
4	7	1.1	(45)	4	6/1
2	7	1.1	(45)	2	6/1
1/0	19	1.5	(60)	1/0	6/1
2/0	19	1.5	(60)	2/0	6/1
3/0	19	1.5	(60)	3/0	6/1
4/0	19	1.5	(60)	4/0	6/1

Add the following to Article 1066.03(b) of the Standard Specifications:

“Cable sized No. 2 AWG and smaller shall be U.L. listed Type RHH/RHW and may be Type RHH/RHW/USE. Cable sized larger than No. 2 AWG shall be U.L. listed Type RHH/RHW/USE.”

Revise Article 1066.04 to read:

“Aerial Cable Assembly. The aerial cable shall be an assembly of insulated aluminum conductors according to Section 1066.02 and 1066.03. Unless otherwise indicated, the cable assembly shall be composed of three insulated conductors and a steel reinforced bare aluminum conductor (ACSR) to be used as the ground conductor. Unless otherwise indicated, the code word designation of this cable assembly is “Palomino”. The steel reinforced aluminum conductor shall conform to ASTM B-232. The cable shall be assembled according to ANSI/ICEA S-76-474.”

Revise the second paragraph of Article 1066.05 to read:

“The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing.”

LUMINAIRE

Effective: January 1, 2012

Add the following to first paragraph of Article 1067(c) of the Standard Specifications:

“The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable”

Add the following to Article 1067(f) of the Standard Specifications:

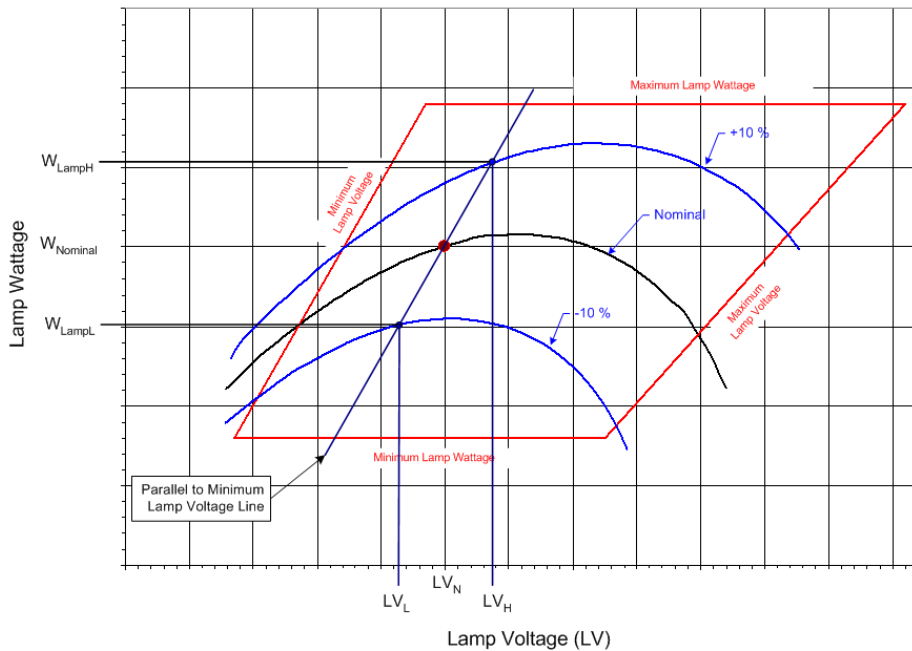
“The ballast shall be a High Pressure Sodium, high power factor, constant wattage auto-regulator, lead type (CWA) for operation on a nominal 240 volt system.”

Revise Article 1067(f)(1) of the Standard Specifications to read:

“The high pressure sodium, auto-regulator, lead type (CWA) ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
750	25%
400	26%
310	26%
250	26%
150	24%
70	18%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:

W_{LampH} = lamp watts at +10% line voltage when Lamp voltage = LV_H
 W_{LampL} = lamp watts at - 10% line voltage when lamp voltage = LV_L
 W_{LampN} = lamp watts at nominal lamp operating voltage = LV_N

Wattage	Nominal Lamp Voltage, LV_N	LV	LV
750	120v	↑15v	↓125v
400	100v	95v	105v
310	100v	95v	105v
250	100v	95v	105v
150	55v	50v	60v
70	52v	47v	57v

Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
750	15%
400	20%
310	21%
250	24%
150	26%
70	34%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:

W_{line} = line watts at nominal system voltage
 W_{lamp} = lamp watts at nominal system voltage

Ballast output to lamp. At nominal system voltage and nominal lamp voltage, the ballast shall deliver lamp wattage with the variation specified in the following table.

Nominal Ballast Wattage	Output to lamp variation
750	± 7.5%
400	± 7.5%
310	± 7.5%
250	± 7.5%
150	± 7.5%
70	± 7.5%

Example: For a 400w luminaire, the ballast shall deliver 400 watts ±7.5% at a lamp voltage of 100v for the nominal system voltage of 240v which is the range of 370w to 430w.

Ballast output over lamp life. Over the life of the lamp the ballast shall produce average output wattage of the nominal lamp rating as specified in the following table. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. Reading shall begin at the lamp voltage (L_v) specified in the table and continue at 5 volt increments until the right side of the trapezoid is reached. The lamp wattage values shall then be averaged and shall be within the specified value of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

Nominal Ballast Wattage	LV Readings begin at	Maximum Wattage Variation
750	110v	± 7.5%
400	90v	± 7.5%
310	90v	± 7.5%
250	90v	± 7.5%
150	50v	± 7.5%
70	45v	± 7.5%

Example: For a 400w luminaire, the averaged lamp wattage reading shall not exceed the range of ±7.5% which is 370w to 430w"

Add the following to Article 1067(h) of the Standard Specifications:

“Independent Testing. Independent testing of luminaires shall be required whenever the pay item quantity of luminaires of a given pay item, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan pay item quantity of 75 luminaires for a specific pay item would dictate that 2 be tested; 135 luminaires would dictate that three be tested.*” If the luminaire performance table is missing from the contract documents, the luminaire(s) shall be tested and the test results shall be evaluated against the manufacturer’s data as provided in the approved material submittal. The test luminaire(s) results shall be equal to or better than the published data. If the test results indicated performance not meeting the published data, the test luminaire will be designated as failed and corrective action as described herein shall be performed.

The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable”

The Contractor shall select one of the following options for the required testing with the Engineer's approval:

- a. Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.
- b. Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer’s facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.
- c. Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturers facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer.

The independent witness shall as a minimum meet the following requirements:

- Have been involved with roadway lighting design for at least 15 years.
- Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
- Not associated in any way (plan preparation, construction or supply) with the particular project being tested.
- Be a member of IESNA in good standing.
- Provide a list of professional references.

This list is not an all inclusive list and the Engineer will make the final determination as to the acceptability of the proposed independent witness.

- d. Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. At the Manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

Should any of the tested luminaires fail to satisfy the specifications and perform according to approved submittal information, the luminaire shall be unacceptable and be replaced by alternate equipment meeting the specifications with the submittal and testing process repeated in their entirety; or corrections made to achieve required performance. In the case of corrections, the Contractor shall advise the Engineer of corrections made and shall request a repeat of the specified testing and, if the corrections are deemed reasonable by the Engineer, the testing process shall be repeated. The number of luminaires to be tested shall be the same quantity as originally tested; i.e. if three luminaires were tested originally, one, two or three failed, another three must be tested after corrective action is taken.

Revise Article 1067.06(a)(1) of the Standard Specifications to read:

"The lamps shall be of the clear type and shall have a color of 1900° to 2200° Kelvin."

Add the following table(s) to Article 1067 of the Standard Specifications:

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE
 TABLE**

Illinois Route 132 (East
 Leg)

**GIVEN
 CONDITIONS**

ROADWAY DATA	Pavement Width	81(ft)
	Number of Lanes	6
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	47.5 (ft)
	Mast Arm Length	10 (ft)
	Pole Set-Back From Edge of Pavement	8 (ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	50000
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	Type III
	Total Light Loss Factor	0.65
LAYOUT DATA	Spacing	225 (ft)
	Configuration	Opposite
	Luminaire Overhang over edge of pavement	2 (ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

**PERFORMANCE
 REQUIREMENTS**

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

LUMINANCE	Average Luminance, L_{AVE}	0.6 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.5
	(Max) Uniformity Ratio, L_{MAX}/L_{MIN}	6
	(Max) Veiling Luminance Ratio, L_V/L_{AVE}	0.3
	(Max)	

UNDERPASS LUMINAIRE, HPS, STAINLESS STEEL HOUSING

Effective: January 1, 2012

1. **Description.** This item shall consist of furnishing, testing as required, and installing a luminaire suitable for roadway underpasses as specified herein.
2. **General.**
 - 2.1 The luminaire shall be optically sealed, mechanically strong and easy to maintain.
 - 2.2 All wiring within the fixture shall have a minimum temperature rating of 125° C. In addition, the unit shall be designed to allow for a maximum supply wire rating of 90° C.
 - 2.3 All hardware of the housing, reflector, and ballast assembly shall be captive
 - 2.4 The luminaire shall be UL Listed for Wet Locations.
 - 2.5 The underpass luminaire shall be suitable for lighting a roadway underpass at approximate mounting height of 16 feet from a position suspended directly above the roadway.
 - 2.6 The luminaire shall be certified by the U.L. testing laboratory to meet the IP66 criteria of the International Electrotechnical Commission Standard 529.
3. **Housing.**
 - 3.1 The housing shall be stainless steel and be made of 16 gauge minimum thickness stainless steel, Type 304, #2B finish.
 - 3.2 Since the installed location of the luminaires has severe space limitations that prohibit servicing the luminaire from the top or side of the fixture, the luminaire must be serviceable from the bottom of the housing when in the installed position. Both ballast and optical compartments must be serviceable from the bottom of the fixture. Fixtures which open from the top or sides are not acceptable.
 - 3.3 The housing shall have a maximum width of 13"
 - 3.4 All internal and external hardware, unless specifically specified otherwise, shall be made of stainless steel.
 - 3.5 **Stainless Steel Housing**
 - 3.5.1 The stainless steel housing, and lens frame shall be made of 16 gauge minimum thickness stainless steel, Type 304 #2B.

- 3.5.2 All housing and frame components shall be cut within with a laser with a positioning accuracy of +/- .004" for assembly accuracy and machine welded to minimize irregularities in the weld joint.
- 3.5.3 All seams in the housing enclosure shall be welded by continuous welding. Stainless steel weld wire shall be used for all welds. A sample weld shall be submitted for review and approval.
- 3.5.4 The luminaire lens shall be flush, within 3.1 mm (0.122"), of the lens frame.
- 3.5.5 The lens frame shall be flat and the frame and luminaire housing shall not have any protruding flanges.
- 3.5.6 The lens frame assembly shall consist of a one-piece 16 gauge 304 stainless steel external frame with the lens facing toward the housing and a 16 gauge 304 stainless internal frame with the legs facing away from the housing. The internal frame shall have seam welded corners for added strength. The two panels will sandwich the glass lens and be fastened together with the use of no less than 10 #10 stainless steel fasteners.
- 3.5.7 The lens frame and the door frame shall each be secured through the use of two stainless steel draw latches secured to the fixture housing.
- 3.5.8 When in open position, it shall be possible to un-hinge and remove the lens frame for maintenance. The lens frame hinge shall be stainless steel and designed so that there must be a conscious action of the maintenance personnel to remove the lens frame. The frame hinging method shall not be designed so that bumping the frame accidentally could allow the frame to fall to the roadway surface. The removal method must be accomplished without the use of tools or hardware. The hinge pin shall be a minimum of 6.35 mm (0.250") in diameter. The pin shall be spring loaded and retractable with a safety catch to hold the pin in the retracted position for ease of maintenance.
- 3.5.9 The suspended housing shall be divided into two compartments, one for the ballast and optical assembly, the other for wire connections. The optical chamber shall be sealed from the environment. The wire portal between compartments shall be sealed so as to prevent air exchange through the portal. There shall be an internally mounted breather mechanism to allow internal and external air pressure to equalize without permitting dust or water into the unit.

- 3.5.10 The ballast and all electrical equipment shall be mounted to a removable aluminum chassis with a minimum thickness of 3.175, (0.125"). The chassis shall be held in place with captive stainless steel hardware. The hardware shall include a bracket that can be loosened and shifted to allow the chassis to pivot away from fastened position for removal. The splice box shall include a heavy-duty 3 pole terminal block to accommodate #6 conductors and a KTK 2 amp fuse with HPC fuse holder or approved equal. Quick-connect power distribution terminal blocks shall be a molded thermoset plastic, rated 70A, 600V and have 3 poles, each with (4) .250 quick connect terminals. Operating temperature rating to be 150° C. Input wire size shall accommodate #2-#14 AWG. Torque rating shall be 45 in./lb. Maximum. Agency approvals shall be UL E62622; CSA LR15364.
- 3.5.11 Ballast compartment surfaces shall be deburred and free of sharp edges, points or corners that may come in contact with installers or service personnel.

4. Gasketing:

- 4.1 The junction between the lens frame and the ballast housing door and the housing shall be sealed with a one-piece vulcanized or molded high temperature solid silicone rubber gasket with the equivalent of a 60 Shore A durometer rating. The gasket between the lens frame and the luminaire housing shall be securely attached by mechanical means, such a retaining lip to prevent the movement of the gasket. The gasket may not be secured by adhesive means exclusively. The lens and ballast housing doors shall be designed and constructed so they seal to the gasket on a flat surface. The frame shall not seal to the gasket using the edge of leg on a doorframe. The lens shall be sealed inside of the lens frame with the use of a one-piece solid silicone rubber gasket with ribbed flanges and a rating of 60 Shore A Durometer
- 4.2 The junction between conduit connections to the luminaire and the lens frame junction to the housing shall withstand entry of water when subjected to a water jet pressure of 207 kPa (30 lbs. Per sq. inch), tested under laboratory conditions. Submittal information shall include data relative to gasket thickness and density and the means of securing it in place.

5. Mounting Brackets

- 5.1 The brackets shall be properly sized to accommodate the weight of the luminaire with calculations or other suitable reference documentation submitted to support the material choice.
- 5.2 The luminaire shall have an opening in the housing for installation (by others) of a 28.1 mm (3/4 inch) diameter flexible conduit. The location of the opening will be determined by the Engineer during the shop drawing review.

6. Lamp Socket:

- 6.1 The lamp socket shall be a 4KV pulse rated mogul type, porcelain glazed enclosed, and be provided with grips, or other suitable means to hold the lamp against vibration. The rating of the socket shall exceed the lamp starting voltage, or starting pulse voltage rating.
- 6.2 If the lamp socket is of the sealed removable type, proper alignment of the socket shall be provided and molded into the socket assembly and indicated in a contrasting color.
- 6.3 If the lamp socket is adjustable, the factory setting must be indicated legibly in the luminaire housing.

7. ANSI Identification Decal:

A decal, complying to ANSI standard C136-15 for luminaire wattage and distribution type, shall be factory attached permanently to the luminaire. The information contained in the decal shall enable a viewer, from the ground level, to identify the lamp wattage and type of luminaire distribution.

8. Optical Assembly:

- 8.1 Lens and Lens Frame. The lens shall be made of crystal clear, impact and heat resistant tempered glass a minimum of 6.35 mm (0.25") thick. The lens shall be held in such a manner as to allow for its expansion and contraction, due to temperature variation. The lens shall be a flat glass design.
- 8.2 Reflector:
 - 8.2.1 The reflector shall be hydro formed aluminum, 0.063" thick, bright-dip and clear anodized finish.
 - 8.2.2 The reflector shall be secured with a stainless steel aircraft cable during maintenance operations.
 - 8.2.3 If the reflector has multiple light distribution positions, each position must have positive stop/mounting with the original factory distribution identified.
 - 8.2.4 The luminaire shall be photometrically efficient. Luminaire efficiency, defined by the I.E.S. as "the ratio of luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used within", shall not be less than 67%. Submittal information shall include published efficiency data.
 - 8.2.5 The reflector, the refractor or lens, and the entire optical assembly shall not develop any discoloration over the normal life span of the luminaire.

8.2.6 The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable

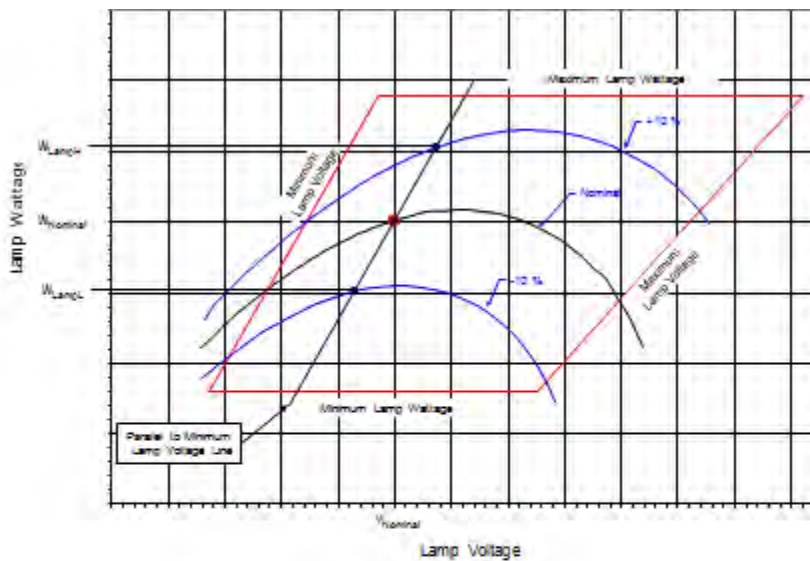
9. Ballast:

- 9.1 The ballast shall be a High Pressure Sodium, high power factor, lead type, Isolated Regulator Ballast (CWI) or a Constant Wattage Auto-regulator (CWA), for operation on a nominal 240 volt system.
- 9.2 The ballast shall be designed to furnish proper electrical characteristics for starting and operating a high pressure sodium vapor lamp of the specified rating at ambient temperatures of -29 degrees to +40 degrees C. The ballast windings shall be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class H insulation, and able to withstand the NEMA standard dielectric test.
- 9.3 The ballast shall include an electronic starting assembly. The starter assembly shall be comprised of solid state devices capable of withstanding ambient temperatures of 85 degrees C. The starter shall provide timed pulsing with sufficient follow-through current to completely ionize and start all lamps. Minimum amplitude of the pulse shall be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and shall be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate as recommended by the lamp manufacturer for the 60 cycle wave. The lamp peak pulse current shall be a minimum of 0.2 amperes. Proper ignition shall be provided over a range of input voltage from 216 to 264 volts. The starter component shall be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component shall have push-on type electrical terminations to provide good electrical and mechanical integrity and ease of replacement. Terminal configuration shall preclude improper insertion of plug-in components. The starter circuit board shall be treated in an approved manner to provide a water and contaminant-resistant coating.
- 9.4 The ballast shall have an overall power factor of at least 0.9 when operated under rated lamp load.
- 9.5 The ballast shall withstand a 2,500 volt dielectric test between the core and windings without damage to the insulation.
- 9.6 The ballast shall not subject the lamp to a crest factor exceeding 1.8 and shall operate the lamp without affecting adversely the lamp life and performance.

9.7 The ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
400	25%
310	26%
250	22%
150	22%
70	17%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:

W_{LampH} = lamp watts at +10% line voltage (264v)

W_{LampL} = lamp watts at - 10% line voltage (216v)

W_{LampN} = lamp watts at 240v

9.8 Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
400	16.0%
310	19.0%
250	17.5%
150	26.0%
70	34.0%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:

W_{line} = line watts at 240v

W_{lamp} = lamp watts at 240v

- 9.9 Ballast output to lamp. At nominal system voltage and a lamp voltage of 52v, the ballast shall deliver a lamp wattage within $\pm 4\%$ of the nominal lamp wattage. For a 70w luminaire, the ballast shall deliver 70 watts $\pm 4\%$ at a lamp voltage of 52v for the nominal system voltage of 240v.
- 9.10 Ballast output over lamp life. Over the life of the lamp the ballast shall produce an average of the nominal lamp rating $\pm 5\%$. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. The lamp wattage values shall then be averaged within the trapezoid and shall be within $\pm 5\%$ of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.
- 9.11 The ballast shall be integral to the luminaire. The ballast components shall be mounted on a removable door or on a removable mounting tray. The ballast tray or mounting door shall be manufactured with dissimilar metal conflicts kept to a minimum.
- 9.12 Ballast wiring and lamp socket wiring shall be connected by means of keyed plugs. Upon unplugging the ballast wiring the entire ballast assembly shall be removable for maintenance. The plugs shall not be interchangeable to avoid improper connection of the assemblies.
- 9.13 The mounting adjustments and wiring terminals shall be readily accessible. The removable door or pad shall be secure when fastened in place and all individual components shall be secure upon the removable element. Upon ballast assembly removal, each component shall be readily removable for replacement.

- 9.14 The luminaire shall be completely wired. All wiring connections within the luminaire shall be made with insulated compression connectors or insulated terminal blocks. An insulated terminal block shall be provided to terminate the incoming supply wires. The terminal block shall be rated for 600 volts and shall accommodate wire sizes from #10 to #6 AWG. The use of "wire nuts" is unacceptable. A ground terminal shall be provided for the connection of a ground wire.
- 9.15 Ballast and lamp Leads shall not be smaller than #16 AWG conductors rated at a minimum temperature rating of 90° C.
- 9.16 All wires shall be coded by tagging and/or color coding for proper identification. A complete legible permanently attached wiring diagram (no smaller than 3" x 4" with a min. font size of 8 pts.) coordinated with the wire identifications shall be displayed at the convenient location on the interior of the luminaire. The wiring diagram shall be oriented so that it is right side up and readable when the luminaire is in the installed position.
- 9.17 The ballast shall not be excessively noisy. Noticeable noisy ballasts, as determined by the Engineer, shall be replaced at no additional cost to the State.
- 9.18 The ballast shall provide lamp operation within lamp specifications for the rated lamp life at the input design voltage range. It shall have a 6 month operation capability with a cycling lamp.
- 9.19 Submittal information shall include manufacturer's literature and data to confirm compliance with all specified requirements including an ANSI Standard Ballast Characteristic Graph (Trapezoid) diagram, with all items clearly identified.

10. Photometric Performance:

- 10.1 The luminaire photometric performance shall produce results equal to or better than those listed in the included Luminaire Performance Table. Submittal information shall include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. The computer calculations shall be done according to I.E.S. recommendations and the submitted calculations shall include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios as applicable. Calculations shall be performed with AGI32. The program used to perform the calculations shall be identified on the submittal. The submittal data shall also include all photometric calculations files with the proposed photometric data on a CD ROM. The performance requirements shall define the minimum number of decimal places used in the calculations. Rounding of calculations shall not be allowed.
- 10.2 In addition to computer printouts of photometric performance, submittal information shall include: Descriptive literature; an Isofootcandle chart of horizontal lux (footcandles); Utilization curve; Isocandela diagram; Luminaire classification per ANSI designation; Candlepower values at every 2.5 degree intervals; Candlepower tables are to be provided on CD ROM in the IES format as specified in IES publication LM-63.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE

**#1
 5 Lane Cross
 Section**

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	60 ft
	Number of Lanes	5
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
LUMINAIRE DATA	Lamp Type	
	HPS	Lamp
		Lumens
		9,5
	00	
	I.E.S.	Vertical
		Distribution
	Mediu	
	Cutoff	
	IV	
	Total Light Loss Factor	
	0.65	
LAYOUT DATA	Spacing	35 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	:1
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	2.5:1
	(Max) Uniformity Ratio, L_{MAX}/L_{MIN}	4:1
	(Max) Veiling Luminance Ratio, L_V/L_{AVE}	0.25:1
	(Max)	

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
#2
4 Lane Cross
Section

GIVEN

CONDITIONS

ROADWAY DATA	Pavement Width	48 ft
	Number of Lanes	4
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
LUMINAIRE DATA	Lamp Type	
	HPS	Lamp
		Lumens
		9,5
	00	
	I.E.S.	Vertical
		Distribution
		Mediu
	m I.E.S. Control Of Distribution	
		Cutoff
	I.E.S. Lateral Distribution	IV
	Total Light Loss Factor	0.65
LAYOUT DATA	Spacing	35 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE

REQUIREMENTS

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux
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IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #3
3 Lane Cross Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	36 ft
	Number of Lanes	3
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
LAYOUT DATA	Spacing	45 ft
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-2 ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	2.5:1
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	2.5:1
	Uniformity Ratio, L_{MAX}/L_{MIN}	4:1
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #4
2 Lane Cross Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	24 ft
	Number of Lanes	2
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	2 ft
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
LAYOUT DATA	Spacing	30 ft
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-2 ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
#5
1 Lane Cross
Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	16 ft
	Number of Lanes	1
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 ft
	Mast Arm Length	0 ft
	Pole Set-Back From Edge of Pavement	5 ft
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.65
LAYOUT DATA	Spacing	35 ft
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-5 ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	2.5:1
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	2.5:1
	Uniformity Ratio, L_{MAX}/L_{MIN}	4:1
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1

11. Independent Testing:

- 11.1 Independent testing of luminaires shall be required whenever the quantity of luminaires of a given wattage and distribution, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan quantity of 75 luminaires would dictate that 2 to be tested; 135 luminaires would dictate that three be tested.*
- 11.2 The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable.
- 11.3 Commitment to test. The Vendor shall select one of the following options for the required testing with the Engineer's approval:
- a. Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.
 - b. Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.
 - c. Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer. The independent witness shall:
 - Have been involved with roadway lighting design for at least 15 years.
 - Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
 - Be a member of IESNA in good standing.
 - Provide a list of professional references.

- d. Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the manufacturing facility is within the state of Illinois. At the manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

In all cases, the selection of luminaires shall be a random selection from the entire completed lot of luminaires required for the contract. Selections from partial lots will not be allowed. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information.

- 11.4 The testing performed shall include photometric, electrical, heat and water jet testing.
- 11.5 Photometric testing shall be in accordance with IES recommendations except that the selected luminaire(s) shall be tested as manufactured without any disassembly or modification and, as a minimum shall yield an isofootcandle chart, with max candela point and half candela trace indicated, an isocandela diagram, maximum plane and cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, and complete calculations based on specified requirements and tests.
- 11.6 Electrical testing shall conform to NEMA and ANSI standards and as a minimum, shall yield a complete check of wiring connections, a ballast dielectric test, total ballast losses in watts and percent of input, a lamp volt-watt trace, regulation data, a starter test, lamp current crest factor, power factor (minimum over the design range of input voltage at nominal lamp voltage) and, a table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace. Ballast test data shall also be provided in an electronic format acceptable to the Engineer to demonstrate compliance with sections 9.7, 9.8, 9.9 and 9.10.
- 11.7 Heat Testing. Heat testing shall be conducted to ensure that the luminaire complies with UL 1572. An ambient temperature of 40 degrees centigrade (104 degrees F) shall be used for the test.

11.8 Water spray test. The luminaires must pass the following water spray test.:

A spray apparatus consisting of four spray nozzles set at an angle of 30 degrees from the vertical plane space 30 inches apart on a 2 inch pipe, each delivering 12 gallons of water per minute at a minimum of 100 psi at each nozzle in a 90 degree cone. A water pressure gauge shall be installed at the first nozzle.

The luminaires shall be mounted in a ceiling configuration and with each nozzle set a distance of 18 inches below the fixture in the vertical plane and 18 inches away in the horizontal plane from the fixture lens, apply spray for a duration of 3 minutes at a minimum of 100 psi. When opened, the fixture shall not show any signs of leakage.

The above test shall be repeated in the opposite horizontal plane from the fixture lens with no signs of leakage.

The summary report and the test results shall be certified by the independent test laboratory or the independent witness, as applicable, and shall be sent by certified mail directly to the Engineer. A copy of this material shall be sent to the Contractor and luminaire manufacturer at the same time.

11.9 Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform according to approved submittal information, the luminaire of that distribution type and wattage shall be unacceptable and be replaced by alternate equipment meeting the specifications with the submittal and testing process repeated in their entirety; or corrections made to achieve required performance. In the case of corrections, the Vendor shall advise the Engineer of corrections made and shall request a repeat of the specified testing and, if the corrections are deemed reasonable by the Engineer, the testing process shall be repeated. The number of luminaires to be tested shall be the same quantity as originally tested. Luminaires which are not modified or corrected shall not be re- tested without prior approval from the Engineer.

Coordination shall be the Vendor's responsibility. Failure to coordinate arrangements and notice shall not be grounds for additional compensation or extension of time.

Submittal information shall include a statement of intent to provide the testing as well as a request for approval of the chosen laboratory.

12. Installation.

12.1 Underpass luminaires shall be either attached to structures (such as piers, etc.) or suspended from structures (such as bridge decks) as indicated or implied by the configuration on the Plans. Mounting, including all hardware and appurtenant items, shall be included as part of this item.

12.2 Unless otherwise indicated, suspended underpass luminaires shall be installed one-inch above the lowest underpass beam and shall be mounted using vibration dampening assemblies. All mounting hardware shall be corrosion resistant and shall be stainless steel unless otherwise indicated.

12.3 The Engineer reserves the right to select the final light distribution pattern, luminaire aiming angle and change it as deemed necessary to produce the proper pavement luminance.

12.4 Surface mounted luminaires, all luminaires not mounted on suspension rods, shall have one-inch thick stainless steel spacers installed between the luminaire and the deck or wall.

13. Guarantee.

The Vendor shall provide a written guarantee for materials, and workmanship for a period of 6 months after final acceptable of the lighting system.

14. Documentation.

All instruction sheets required to be furnished by the manufacturer for materials and supplies and for operation of the equipment shall be delivered to the Engineer.

The manufacturer shall have been incorporated for at least five years and shall have at least five years in the design and manufacturing of roadway underpass lighting. The manufacturer shall provide evidence of financial strength to finance the production of the project by submitting the name of at least three projects completed in the previous calendar year of greater than \$250,000 each. All steel used in the project shall be certified to be provided domestically, and all fixture components used shall be manufactured domestically.

15. Method of Measurement. Luminaires shall be counted, each.

16. Basis of Payment. This item shall be paid at the contract unit price each for **UNDERPASS LUMINAIRE**, of the wattage specified, **HIGH PRESSURE SODIUM VAPOR**, which shall be payment in full for the material and work described herein.

LIGHT POLE, INSTALL ONLY

Replace the first sentence of Article 830.01 with:

“This work shall consist of retrieving and installing a light pole complete with an arm(s), when specified, and all hardware and accessories required for the intended use of the pole.”

Replace Article 830.05 with the following:

“Basis of Payment. This work will be paid for at the contract unit price per each for **LIGHT POLE, ALUMINUM, WITH MAST ARM, INSTALL ONLY** of the material type, mounting height, arm (quantity and length) as specified in the plans.

LUMINAIRE SAFETY CABLE ASSEMBLY

Effective: January 1, 2012

Description: This item shall consist of providing a luminaire safety cable assembly as specified herein and as indicated in the plans.

Materials. Materials shall be according to the following:

Wire Rope. Cables (wire rope) shall be manufactured from Type 304 or Type 316 stainless steel having a maximum carbon content of 0.08 % and shall be a stranded assembly. Cables shall be 3.18 mm (0.125") diameter, 7x19 Class strand core and shall have no strand joints or strand splices.

Cables shall be manufactured and listed for compliance with Federal Specification RR-W-410 and Mil-DTL-83420.

Cable terminals shall be stainless steel compatible with the cable and as recommended by the cable manufacturer. Terminations and clips shall be the same stainless steel grade as the wire rope they are connected to.

U-Bolts. U-Bolts and associated nuts, lock washers, and mounting plates shall be manufactured from Type 304 or Type 316 stainless steel.

CONSTRUCTION REQUIREMENTS

General. The safety cable assembly shall be installed as indicated in the plan details. One end of the cable assembly shall have a loop fabricated from a stainless steel compression sleeve. The other end of the cable assembly shall be connected with stainless steel wire rope clips as indicated. Slack shall be kept to a minimum to prevent the luminaire from creeping off the end of the mast arm. Unless otherwise indicated in the plans, the luminaire safety cable shall only be used in conjunction with luminaires which are directly above the traveled pavement.

Basis of Payment: This work shall be paid for at the contract price each for **LUMINAIRE SAFETY CABLE ASSEMBLY**, which shall be payment for the work as described herein and as indicated in the plans.

MAINTENANCE OF LIGHTING SYSTEMS

Effective: January 1, 2012

Replace Article 801.11 and 801.12 of the Standard Specifications with the following:

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed lighting systems which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for a maintenance transfer and preconstruction inspection, as specified elsewhere herein, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the electrical equipment and systems to be maintained.

Maintenance of Existing Lighting Systems

Existing lighting systems. Existing lighting systems shall be defined as any lighting system or part of a lighting system in service at the time of contract Letting. The contract drawings indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

Extent of Maintenance.

Partial Maintenance. Unless otherwise indicated, if the number of circuits affected by the contract is equal to or less than 40% of the total number of circuits in a given controller and the controller is not part of the contract work, the Contractor needs only to maintain the affected circuits. The affected circuits shall be isolated by means of in-line waterproof fuse holders as specified elsewhere and as approved by the Engineer.

Full Maintenance. If the number of circuits affected by the contract is greater than 40% of the total number of circuits in a given controller, or if the controller is modified in any way under the contract work, the Contractor shall maintain the entire controller and all associated circuits.

Maintenance of Proposed Lighting Systems

Proposed Lighting Systems. Proposed lighting systems shall be defined as any lighting system or part of a lighting system, temporary or permanent, which is to be constructed under this contract.

The Contractor shall be fully responsible for maintenance of all items installed under this contract. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, vandalism, or other means. The potential cost of replacing or repairing any malfunctioning, damaged, or vandalized equipment shall be included in the bid price of this item and will not be paid for separately.

Lighting System Maintenance Operations

The Contractor's responsibility shall include all applicable responsibilities of the Electrical Maintenance Contract, State of Illinois, Department of Transportation, Division of Highways, District One. These responsibilities shall include the maintenance of lighting units (including sign lighting), cable runs and lighting controls. In the case of a pole knockdown or sign light damage, the Contractor shall promptly clear the lighting unit and circuit discontinuity and restore the system to service. The equipment shall then be re-set by the contractor within the time limits specified herein.

If the equipment damaged by normal vehicular traffic, not contractor operations, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind with payment made for such equipment under Article 109.04. If the equipment damaged by any construction operations, not normal vehicular traffic, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind and the cost of the equipment shall be included in the cost of this pay item and shall not be paid for separately.

Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein.

The following chart lists the maximum response, service restoration, and permanent repair time the Contractor will be allowed to perform corrective action on specific lighting system equipment.

INCIDENT OR PROBLEM	SERVICE RESPONSE TIME	SERVICE RESTORATION TIME	PERMANENT REPAIR TIME
Control cabinet out	1 hour	4 hours	7 Calendar days
Hanging mast arm	1 hour to clear	n/a	7 Calendar days
Radio problem	1 hour	4 hours	7 Calendar days
Motorist caused damage or leaning light pole 10 degrees or more	1 hour to clear	4 hours	7 Calendar days
Circuit out – Needs to reset breaker	1 hour	4 hours	na
Circuit out – Cable trouble	1 hour	24 hours	21 Calendar days
Outage of 3 or more successive lights	1 hour	4 hours	na
Outage of 75% of lights on one tower	1 hour	4 hours	na
Outage of light nearest RR crossing approach, Islands and gores	1 hour	4 hours	na
Outage (single or multiple) found on night outage survey or reported to EMC	n/a	n/a	7 Calendar days
Navigation light outage	n/a	n/a	24 hours

- **Service Response Time** -- amount of time from the initial notification to the Contractor until a patrolman physically arrives at the location.
- **Service Restoration Time** – amount of time from the initial notification to the Contractor until the time the system is fully operational again (In cases of motorist caused damage the undamaged portions of the system are operational.)
- **Permanent Repair Time** – amount of time from initial notification to the Contractor until the time permanent repairs are made if the Contractor was required to make temporary repairs to meet the service restoration requirement.

Failure to provide this service will result in liquidated damages of \$500 per day per occurrence. In addition, the Department reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$500 per month per occurrence. Unpaid bills will be deducted from any monies owed to the Contractor. Repeated failures and/or a gross failure of maintenance shall result in the State's Electrical Maintenance Contractor being directed to correct all deficiencies and the resulting costs deducted from any monies owed the contractor.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract.

Operation of Lighting

The lighting shall be operational every night, dusk to dawn. Duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously. Lighting systems shall not be kept in operation during long daytime periods.

Method of Measurement

The contractor shall demonstrate to the satisfaction of the Engineer that the lighting system is fully operational prior to submitting a pay request. Failure to do so will be grounds for denying the pay request. Months in which the lighting systems are not maintained and not operational will not be paid for. Payment shall not be made retroactively for months in which lighting systems were not operational.

Basis of Payment. Maintenance of lighting systems shall be paid for at the contract unit price per calendar month for MAINTENANCE OF LIGHTING SYSTEM, which shall include all work as described herein.

CHAIN LINK FENCE REMOVAL

664.01 Description. This work shall consist of the removal and disposal of the existing chain link fence from approximate stations 23+25 to 24+97 along Illinois Route 132 on the north side of the ROW as shown on the drawings. The work shall be done in accordance with Section 664 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions.

664.02 Basis of Payment. The work will be paid for at the unit cost per foot for CHAIN LINK FENCE REMOVAL which also includes disposal from the site.

PLUG EXISTING INLETS

004.01 Description. This work shall consist of the plugging of existing storm sewers after the removal of the existing inlet as shown on the drawings. The work shall be done in accordance with Sections 605.04 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions. The storm sewer outlet connection shall be securely sealed with SI concrete.

004.02 Basis of Payment. The work will be paid for at the unit cost per each for PLUG EXISTING INLETS.

ISLAND REMOVAL

440.01 Description. This work shall consist of the removal of the existing PCC Islands in the intersection of Illinois Route 132 and Ramps A, B, and D of US Route 41. The work shall be done in accordance with Section 440 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions and the Supplemental Specification 440 adopted effective January 1, 2016.

440.02 Basis of Payment. The work will be paid for at the unit cost per square foot for ISLAND REMOVAL which includes all offsite disposal.

CONCRETE CURB TYPE B

Description: This work includes the materials, labor, and equipment for installing complete CONCRETE CURB TYPE B. This work shall consist of installing CONCRETE CURB TYPE B at the locations as shown in the Drawings. This work shall include the installation of a minimum 6 inches of Aggregate Subbase Course, in accordance with Section 351 of the Standard Specifications; installation of Portland Cement Concrete at the thickness and width identified on the Drawings, 2 inches of Hot-Mix Asphalt Surface Course over an 8 inches of Aggregate Gravel. Concrete shall be High Early Strength Portland Cement, IDOT Class PP in accordance with the Standard Specifications Sections 420 and 1020. The Hot_Mix Asphalt Surface shall be put in accordance with Section 406 and the Aggregate shall be in accordance with Section 1004. Concrete mix design to be approved by the Engineer. This work includes the materials, labor, and equipment for. The Hot-Mix Asphalt surface is to be placed at a 2-inch thickness.

Concrete Curb Type B complete shall be paid for at the contract unit price per lineal foot for CONCRETE CURB TYPE B which shall be payment in full for furnishing all materials, labor and equipment necessary to complete the work as herein specified and to the satisfaction of the Engineer. Measurement shall be the lineal foot of the installed Curb Type B.

CONCRETE PAVER PAVEMENT

Description: This work includes the materials, labor, and equipment for installing complete CONCRETE PAVER PAVEMENT-SPECIAL. This work shall consist of installing paver block crosswalks at locations as shown in the Drawings and per the Cross-Section detail. This work shall include the installation of a minimum 4 inches of Aggregate Base Course, in accordance with Section 351 of the Standard Specifications; installation of Portland Cement Concrete band and Portland Cement Concrete base at the thickness and width identified on the Drawings. Concrete shall be High Early Strength Portland Cement, IDOT Class PP in accordance with the Standard Specifications Sections 420 and 1020. Concrete mix design to be approved by the Engineer. This work includes the materials, labor, and equipment for installing rebar, dowel bars, joint filler, bituminous setting bed, tack coat, paver blocks, filling and brushing the joints with fine sand, and compacting the paver blocks with a vibrating plate compactor. The bituminous setting bed is to be placed at a 1-inch thickness and vibrated in place using a plate-type vibrator.

PAVER BLOCK

The Contractor shall submit to the Engineer for approval the manufacturer, layout, pattern and color(s) of the brick paver crosswalk. The Contractor can utilize paver block manufacturers Unilock, Paveloc, Belgard or equal as approved by the Engineer. The paver block and associated work shall be installed per the manufactures recommendations.

QUALIFICATIONS

Contractor shall provide evidence that his firm or other entity proposed for the paver block work has specific experience performing comparable projects. If requested the paving firm shall submit a list of comparable projects setting forth description, square footage, location and knowledgeable references with addresses and phone numbers.

PCC BAND AND PCC BASE (UNDERLAYMENT) GENERAL

Contractor shall provide:

All equipment and materials, and do all work necessary to construct concrete underlayment for concrete paver blocks as indicated on the drawings and as specified herein.

REFERENCE STANDARDS

Work for P.C.C. Underlayment shall conform with Section 420 of the Standard Specifications, except as hereinafter modified or specified.

SUBMITTALS

Submittals shall be in accordance with the Standard Specifications and Special Provisions for Brick and Concrete Paver Pavement and Sidewalk (#LRS 14). Submit manufacturer's data for approval by the Engineer. Submit concrete mix report for approval by the Engineer.

PROVISIONS FOR CURING TEST SAMPLES

The Contractor shall be required to provide storage space, meeting the approval of the Engineer, for the initial curing of quality control test specimens made on the project. The storage space shall be such that it will give full protection against direct sunlight, the elements, pilfering and damage. When requested by the Engineer, heat shall be provided by the contractor, with a minimum temperature of 60°F maintained for as long as required.

PROTECTION

Contractor shall protect adjacent surfaces from concrete splash and damage. Contractor shall immediately clean, repair or replace adjacent surfaces to original condition or better, after installation of new concrete surfaces.

ACCESS

Contractor shall maintain access to building entrances, drives and alleys during concrete work. Where possible, Contractor shall schedule concrete work for times of the day outside of the business hours of the adjacent business. Construction of underlayment shall be staged to maintain vehicular and pedestrian traffic.

PRODUCTS:

CONCRETE MATERIALS

In accordance with Article 1020 of the Standard Specifications. Unless otherwise specified, concrete shall be High-Early-Strength PCC, Class PP having a minimum 48 hour strength of 3500 psi.

JOINT FILLER MATERIAL

Joint filler material shall be a non-extruding asphalt-impregnated fiber board of a width as specified on the Drawings and in accordance with Article 751 of the Standard Specifications. Joint filler shall extend from the bottom of the slab to the top of the joint or, where sealant is required, to the depth necessary to accommodate the sealant system.

REBAR AND DOWEL ROD

Reinforcing bars and dowel rods used for expansion joints and other reinforcement of concrete shall be epoxy coated and of the size and type specified on the Drawings. One end of doweled rods shall be sleeved to permit free movement within one side of the slab.

EXECUTION

GENERAL:

The existing subgrade shall be thoroughly compacted and aggregate base course material installed in accordance with the applicable sections of the SSRB prior to installation of concrete underlayment.

CONCRETE UNDERLAYMENT

Oil forms prior to placing concrete. Cross-slope all underlayments a minimum of ¼" per foot or as indicated on the plans or otherwise directed by the Engineer. Place concrete in one course construction of specified thickness. Surface of P.C.C. Underlayment shall have a rough broom finish.

Expansion and isolation joints:

- Install premolded joint filler where indicated on drawings and where walks abut vertical surfaces, other walks, and existing concrete construction. Extend Joint fillers to the full width and depth of the joint. Furnish joint fillers in one-piece lengths for the full width of slab to be placed, wherever possible.
- Concrete pours shall be ended at expansion or construction joints as indicated on the drawings. Partial (horizontal) slabs shall not be allowed.

CLEAN UP

In accordance with Section 424 of the Standard Specifications.

PROTECTION

Cure all concrete for not less than seven (7) days after placement.

Protect all surfaces from sun with membrane curing compounds.

During hot weather, keep temperature of concrete below 90 F.

During cold weather, keep temperature of concrete between 50°F and 70°F for 3 to 5 days.

Protect from frost and rapid drying for 6 days.

Properly erect warning barricades to prevent premature loading or tracking of fresh concrete.

Concrete Paver Pavement complete shall be paid for at the contract unit price per square foot for CONCRETE PAVER PAVEMENT which shall be payment in full for furnishing all materials, labor and equipment necessary to complete the work as herein specified and to the satisfaction of the Engineer. Measurement shall be the square foot of the installed paver block

REMOVE STONE PAVERS

Description. This work shall consist of the removal of the existing pavers at the Waveland and Magnolia Avenue crosswalks in as shown on the plans. The contractor will remove the stone pavers and dispose.

Basis of Payment. The work will be paid for at the unit cost per square foot for REMOVE STONE PAVERS which includes disposal.

REMOVE AND SALVAGE LIMESTONE RETAINING WALL BLOCKS

Description. This work shall consist of the removal and salvage of the limestone retaining wall blocks along IL Route 132 as shown on the plans.

Basis of Payment

The work will be paid for at the square foot price for REMOVE AND SALVAGE LIMESTONE RETAINING WALL BLOCKS and delivery to the Village of Gurnee at a location to be determined by the Village.

Contact for delivery location: Gurnee Public Works Department
Attn: Thomas Rigwood, Director of Public Works
Phone: 847-599-6800
1151 Kilbourne Road
Gurnee IL 60031

SUPPLEMENTAL WATERING

Description: This work will include watering turf, trees, shrubs, vines and perennial plants at the rates specified and as directed by the Engineer.

Schedule: Watering will only begin after the successful completion of all period of establishment requirements.

Watering must be completed in a timely manner. When the Engineer directs the Contractor to do supplemental watering, the Contractor must begin the watering operation within 24 hours of notice. A minimum of 10 units of water per day must be applied until the work is complete. Damage to plant material that is a result of the Contractor's failure to water in a timely way must be repaired or replaced at the Contractor's expense.

Source of Water: The Contractor shall notify the Engineer of the source of water used and provide written certification that the water does not contain chemicals harmful to plant growth.

Rate of Application: The normal rates of application for watering are as follows. The Engineer will adjust these rates as needed depending upon weather conditions.

Turf and Perennial Plants:	3 gallons per square yard
Trees:	10 gallons per tree
Shrubs:	3 gallons per shrub
Vines:	2 gallons per vine

Method of Application: A spray nozzle that does not damage small plants must be used when watering perennial plants or turf. Water shall be applied at the base of the plant to keep as much water as possible off plant leaves. An open hose may be used to water trees, shrubs, and vines if mulch and soil are not displaced by watering. Water shall trickle slowly into soil and completely soak the root zone. The Contractor must supply metering equipment as needed to assure the specified application rate of water.

Method of Measurement: Supplemental watering will be measured in units of 1000 gallons (3,785 liters) of water applied as directed.

Basis of Payment: This work will be paid for at the contract unit price per unit of SUPPLEMENTAL WATERING, measured as specified. Payment will include the cost of all water, equipment and labor needed to complete the work specified herein and to the satisfaction of the Engineer.

TREE PROTECTION AND PRESERVATION

Description: This work consists of digging, transporting and planting various sizes of trees.

The trees designated by the Engineer to be salvaged shall be removed and immediately replanted as directed by the Engineer. Mechanically dug plants must be replanted immediately in their permanent locations and not stored. These trees will be placed within five miles of the extraction site at locations staked by the Engineer within the highway right-of-way.

All work methods, transplanting of salvaged plant material and all other related landscape work shall be done in accordance with Section 253 of the Standard Specifications except as follows:

Article 253.03 - add the following:

Digging and planting times for transplanted trees shall be as required by the Engineer and shall not cause delay of the project.

Planting times for replacement plants shall be as required in Article 253.03.

Article 253.04 - add the following:

Trees to be transplanted shall not be dug more than 24 hours prior to the time the Contractor is ready to transport these materials from their original locations. All trees shall be balled and burlapped or mechanically dug to the sizes specified by the American Standard for Nursery Stock. Earth balls of balled and burlapped plant material shall be watered and shall be protected against drying out. Balled plants shall not be left in open holes overnight.

Article 253.09(a) - add the following:

All tree pruning shall be done prior to installation.

Article 253.14 - add to paragraph three the following:

Any transplanted tree which is not acceptable at the time of final inspection shall be replaced with a 5' - 6' or a 2" caliper balled and burlapped tree of the same type and habit form as that which is unacceptable.

Article 253.15(a) – replace the first paragraph with the following:

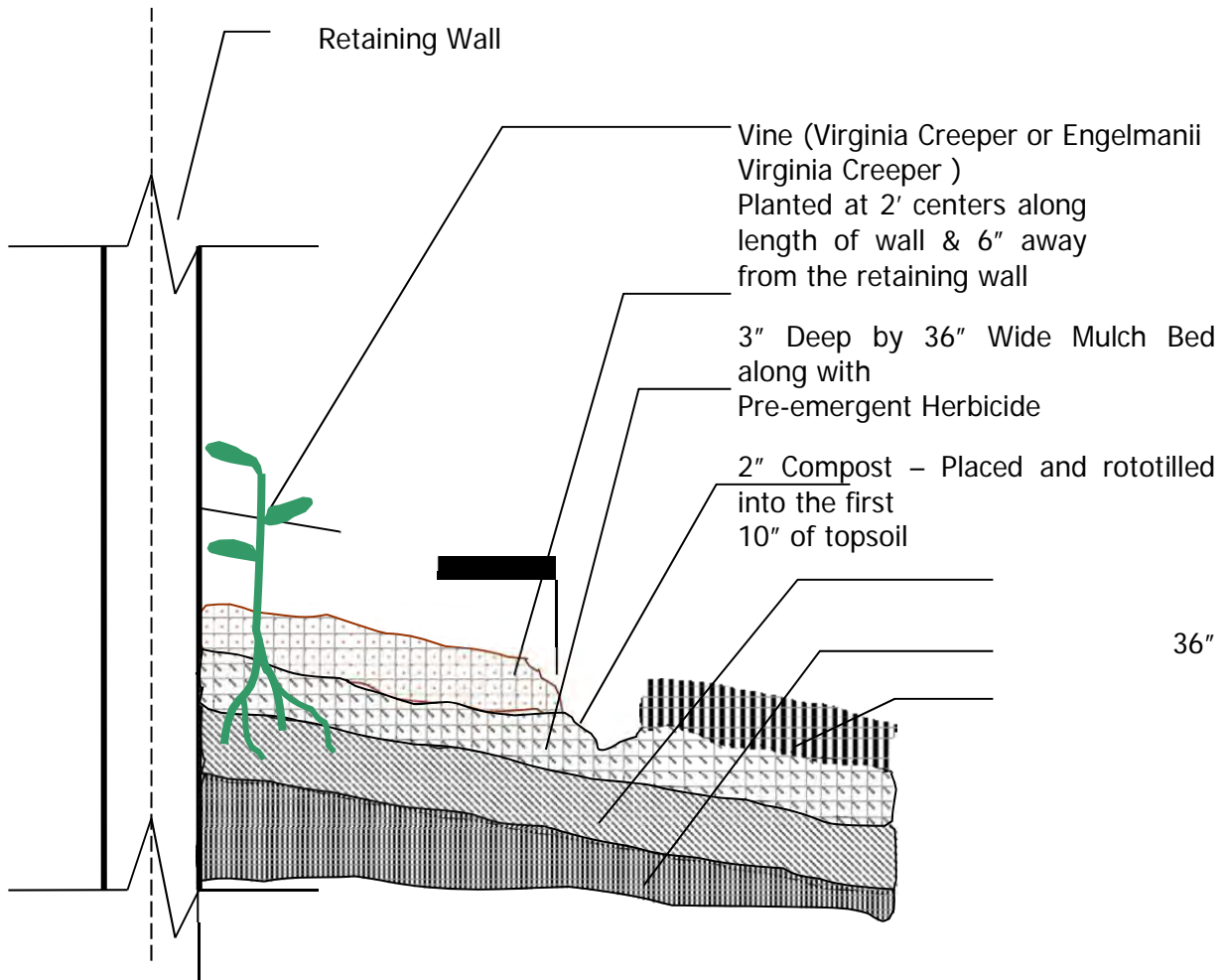
During the period of establishment, additional watering of 35 gallons per tree shall be performed at least once every 2 weeks during the months of May through December. The Engineer may direct the Contractor to adjust the watering rate and frequency depending upon weather conditions.

Method of Measurement:

Trees to be transplanted shall be measured for payment as each in place at the proposed planting location. A root ball with multiple stems shall be measured as one tree.

Basis of Payment:

This work will be paid for at the contract unit price each for TRANSPLANTED SALVAGED TREES, which price shall include all labor, equipment and materials



4" Depth Spaded Edge at a 45 degree angle

12" - Topsoil

24" - Clean Embankment

Seeding, Class 2A

NOTES:

1. See Landscape Plans for specific locations of vines.
2. Compost and Topsoil shall be thoroughly rototilled to a depth of 10" prior to planting.
3. The Contractor shall order material for Parthenocissus sp. (Virginia Creeper) vines immediately following execution of the contract to assure availability of the plant material for spring planting at the conclusion of the contract.
4. Mulch bed shall be placed over rototilled compost/topsoil as shown in vine planting detail and according to IDOT Standard Specification 253.11 except that no weed barrier fabric is required. Cost of mulch cover is included with payment for "Vine- Parthenocissus quinquefolia (Virginia Creeper), 1-Gallon Pot" and for "Vine- Parthenocissus quinquefolia Engelmanii (Engelmanii Virginia Creeper), 1-Gallon Pot."
5. Pre-emergent Herbicide shall be placed in mulched beds according to the Special Provision.

VINE PLANTING DETAIL

WEED CONTROL, PRE-EMERGENT HERBICIDE

Description: This work shall consist of spraying a pre-emergent herbicide in areas as shown on the plans or as directed by the Engineer. This item will be used in all tree planting, perennial plant beds, mulched plant beds, and mulched rings.

Materials: The pre-emergent herbicide (Pendulum® AquaCap™ or equivalent) shall have the following formulation:

A. Active Ingredient	
*Pendimethalin, N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	38.7%
B. Inert Ingredients:	<u>61.3%</u>
	TOTAL 100.0%

The Contractor shall submit a certificate to the Engineer for approval, including the following, at least seventy-two (72) hours prior to starting work:

1. The chemical names of the compound and the percentage by volume of the ingredients which must match the above specified formulation.
2. A statement that the material is in a solution which will form a satisfactory emulsion for use when diluted with water for normal spraying conditions.
3. A statement that the Pendulum® AquaCap™ or equal, when mixed with water, will be completely soluble and dispersible and remain in suspension with continuous agitation.
4. A statement describing the products proposed for use when the manufacturer of Pendulum® AquaCap™ or equal requires that surfactants, drift control agents, or other additives be used with the product. These tank mix additives shall be used as specified by the manufacturer. Required additives will not be paid for separately.

All material shall be brought to the spray area in the original, unopened containers supplied by the manufacturer.

Schedule: Spraying will not be allowed when temperatures exceed 90°F or under 60°F, when wind velocities exceed ten (10) miles per hour, when foliage is wet or rain is eminent, when visibility is poor or during legal holiday periods.

Application Rate: Apply the herbicide at the rate of 1 gallons/acre (9.4 L/ha).

One (1) gallon of Pendulum® AquaCap™ or equal formulation shall be diluted with one hundred (100) gallons of water and applied as a mixture. Water for dilution of the mixture will not be paid for separately.

Method: The pre-emergent herbicide shall be used in accordance with the manufacturer's directions on the package. The herbicide is to be applied within 48 hours after planting perennial plants. See specification for Planting Perennial Plants. Uniformly apply with properly calibrated ground equipment in sufficient water per acre to uniformly treat the area with a spray pressure of 25 to 50 psi. Maintain continuous agitation during spraying with good mechanical or bypass agitation. Avoid overlaps that will increase rates above those recommended. DO NOT apply to newly-transplanted ornamentals until plants have been watered and soil has been thoroughly packed and settled around roots. See specification for Planting Perennial Plants.

DO NOT allow for overspraying. If staining occurs on stone outcropping, Contractor will be required and responsible for cleaning to an acceptable condition approved by the Engineer. Cleaning will be done at the Contractor's expense.

Method of Measurement: Pre-emergent herbicide will be measured in place in Gallons (Liters) of Pre-emergent Herbicide applied.

Basis of Payment: This work will be paid for at the contract unit price per gallon (liters) of WEED CONTROL, PRE-EMERGENT HERBICIDE. Water for dilution of the mixture and additives required for application will not be paid for as separate items, but the costs shall be considered as included in the contract unit price for WEED CONTROL, PRE-EMERGENT HERBICIDE, and no additional compensation will be allowed.

FORM LINER TEXTURED SURFACE

Description. This work shall consist of designing, developing, furnishing and installing form liners and forming concrete using reusable, high strength urethane form liners to achieve the various concrete treatments as shown in the drawings and specifications. This item also consists of providing and applying a concrete stain to the textured surface to replicate actual stone masonry of different colors. Work shall be performed in accordance with applicable portions of Section 503 of the IDOT Standard Specifications as specified herein.

General. The following form liner manufacturers have been pre-approved to provide RANDOM BLOCK ASHLAR STONE patterned form liners.

Spec Formliners, Inc.

530 E. Dyer Rd.

Santa Ana, CA 92707 (714) 425-9500

Pattern: RANDOM BLOCK ASHLAR STONE (No. 1506)

Other manufacturer's products will be considered, provided sufficient information is submitted at least 30 days prior to use to allow the Engineer to determine that products proposed are equivalent to those named.

Concrete facing patterns shall consist of a RANDOM BLOCK ASHLAR STONE finish with 3" to 42" stones and a maximum relief of 1 1/2". All manufacturers of form liners shall adhere to the provisions listed herein and in the plans.

Submittals. Shop drawings of the concrete facing patterns shall be submitted for each area of textured concrete. Shop drawing submittals shall include:

(1) Individual form liner pattern descriptions, dimensions, and sequencing of form liner sections. Include details showing typical cross sections, joints, corners, step footings, stone relief, stone size, pitch/working line, mortar joint and bed depths, joint locations, edge treatments, and any other special conditions.

(2) Elevation views of the form liner panel layouts for the RANDOM BLOCK ASHLAR STONE texture showing the full length and height of the structures including the footings with each form liner panel outlined. The arrangement of the form liner panels shall provide a continuous pattern of desired textures and colors with no interruption of the pattern made at the panel joints.

(3) Color samples for stain color selection by the Engineer.

Materials. Form liners shall be of high quality, highly reusable and capable of withstanding anticipated concrete pour pressures without causing leakage or causing physical defects. Form liners shall attach easily to pour-in-place forms and be removable without causing concrete surface damage or weakness in the substrate. Liners used for the stone texture shall be made from high-strength elastomeric urethane material which shall not compress more than 0.02 feet when poured at a rate of 10 vertical feet per hour. Form release agents shall be non-staining, non-residual, non-reactive and shall not contribute to the degradation of the form liner material. Forms for smooth faced surfaces shall be plastic coated or metal to provide a smooth surface free of any impression or pattern.

Stain. Deliver materials in original and sealed containers, clearly marked with the manufacturer's name, brand name, type of material, batch number, and date of manufacture.

Store concrete stain materials in an area where temperatures will not be less than 50°F (10°C) or more than 100°F (38°C) and in accordance with OSHA and local Fire Code Requirements.

If the contractor elects to use form ties for concrete forming, only fiberglass form ties will be permitted. Use of the removable metallic form ties will not be allowed.

Qualifications of Contractor. The concrete stain applicator shall have a minimum of five (5) years demonstrated experience in applying stains to simulate rock. The contractor shall submit evidence of appropriate experience, job listings, and project photographs from previous work.

Cast Concrete Mockup. The Contractor shall provide a cast concrete mockup containing the RANDOM BLOCK ASHLAR STONE form liner surface. The form liner manufacturer's technical representative shall be on-site for technical supervision during the installation and removal operations.

Purpose of the mockup is to select and verify the masonry pattern and different color concrete stains to be used for the RANDOM BLOCK ASHLAR STONE pattern.

- (1) Locate mockup on site as directed by the Engineer.
- (2) The mockup shall be a minimum 5 ft. x 5 ft. x 6 in. thick.
- (3) Apply the concrete stain to one side of the mock-up wall located on the jobsite. Stain shall be of a type and color which will be used on actual walls. Application procedures and absorption rates shall be as hereinafter specified, unless otherwise recommended by the manufacturer in writing to achieve color uniformity.
 - a. Approval by the Engineer shall serve as a standard of comparison with respect to color and overall appearance.
 - b. General application to actual surfaces on the bridge elements shall not proceed until jobsite mockup has been approved in writing by the Engineer.
- (4) Include examples of each condition required for construction, i.e. liner joints, construction joints, expansion joints, steps, corners, and special conditions due to topography or manmade elements, etc.
- (5) Upon receipt of comments from inspection of the mockup, adjustments or corrections shall be made to the molds where imperfections are found. If required, additional mockups shall be prepared when the initial mockup is found to be unsatisfactory.
- (6) After concrete work on mockup is completed and cured for a minimum of 28 days, and after surface is determined to be acceptable for coloring, apply color stain system.
- (7) After coloring is determined to be acceptable by the Engineer, construction of project may proceed, using mockup as quality standard.

Concrete Stain. Special penetrating stain mix as provided by manufacturer, shall achieve color variations present in the natural stone being simulated for this project which is required to match the existing walls along US 41 and as required by the Engineer. Submit manufacturer's literature, certificates and color samples to the Engineer. The stain color shall be selected by the Engineer from the stain manufacturer's standard colors after viewing the mock-up.

Stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight or weathering. Stain mix shall be water borne, low V.O.C. material, less than 1.5 lb/gal, and shall meet requirements for weathering resistance of 2000 hours accelerated exposure.

Installation. Form liners shall be installed in accordance with the manufacturers' recommendations to achieve the highest quality concrete appearance possible. Form liners shall withstand concrete placement pressures without leakage causing physical or visual defects. A form release agent shall be applied to all surfaces of the liner which will come in contact with concrete as per the manufacturer's recommendations. After each use, liners shall be cleaned and made free of build-up prior to the next placement, and visually inspected for blemishes or tears. If necessary, the form liners shall be repaired in accordance with the manufacturer's recommendations.

All form liner panels that will not perform as intended or are no longer repairable shall be replaced. An on-site inventory of each panel type shall be established based on the approved form liner shop drawings and anticipated useful life for each liner type.
liner type.

The liner shall be securely attached to the forms according to the manufacturer's recommendations. Liners shall be attached to each other with flush seams and seams filled as necessary to eliminate visible evidence of seams in cast concrete. Liner butt joints shall be blended into the pattern so as to create no visible vertical or horizontal seams or conspicuous form butt joint marks. Liner joints must fall within pattern joints or reveals. Finished textures shall be continuous without visual disruption and properly aligned over adjacent and multiple liner panels. Continuous or single liner panels shall be used where liner joints may interrupt the intended pattern. Panel remnants shall not be pieced together.

The Contractor shall coordinate concrete pours to prevent visible differences between individual pours or batches. Concrete pours shall be continuous between construction or expansion joints. Cold joints shall not occur within continuous form liner pattern fields. Wall ties shall be coordinated with the liner and form to achieve the least visible results. Liners shall be stripped between 12 and 24 hours as recommended by the manufacturer. Curing methods shall be compatible with the desired aesthetic result. Use of curing compounds will not be allowed. Concrete slump requirements shall meet the form liner manufacturer's recommendations for optimizing the concrete finish, as well as IDOT's material specifications.

With the use of standard Portland cement concrete mixtures, the Contractor shall employ proper consolidation methods to ensure the highest quality finish. Internal vibration shall be achieved with a vibrator of appropriate size, the highest frequency and low to moderate amplitude. Concrete placement shall be in lifts not to exceed 1.5 feet. Internal vibrator operation shall be at appropriate intervals and depths and withdrawn slowly enough to assure a minimal amount of surface air voids and the best possible finish without causing segregation.

External form vibrators may be required to assure the proper results. Any use of external form vibrators must be approved by the form liner manufacturer and the County. The use of internal or external vibratory action shall not be allowed with the use of self-consolidating concrete mixtures. It is the intention of this specification that no rubbing of flat areas or other repairs shall be required after form removal. The finished exposed formed concrete surfaces shall be free of visible vertical seams, horizontal seams, and butt joint marks. Grinding and chipping of finished formed surfaces shall be avoided.

The concrete staining work described herein shall be performed after the grading is finished. Final coloration of cast stone concrete surface shall accurately simulate the appearance of real stone including the multiple colors, shades, flecking and veining that is apparent in real stone. It shall also demonstrate the colors that may be apparent from aging, such as staining from oxidation, rusting and/or organic staining from soil and/or vegetation.

Applying Color Stain. Clean surface prior to application of stain materials to assure that surface is free of latency, dirt, dust, grease, efflorescence, paint or other foreign material, following manufacturer's instructions for surface preparation. Do not sandblast.

Preferred method to remove latency is pressure washing with water, minimum 3000 psi (a rate of three to four gallons per minute), using fan nozzle perpendicular to and at a distance of one or two feet from surface. Completed surface shall be free of blemishes, discoloration, surface voids and unnatural form marks.

Surfaces to receive stain shall be structurally sound, clean, dry, fully cured, and free from dust, curing agents or form release agents, efflorescence, scale or other foreign materials. Methods and materials used for cleaning of substrate shall be as recommended by the manufacturer of the water-repellant stain. Concrete shall be at least 30 days old prior to concrete stain application. Curing agents must be removed a minimum of 14 days prior to coating to allow the concrete to dry out.

The stain shall be thoroughly mixed in accordance with the manufacturer's directions using an air-driven or other explosion-proof power mixer. Mix all containers thoroughly prior to application. Do not thin the material.

Materials shall be applied at the rate as recommended by the manufacturer. Absorption rates could be increased or decreased depending upon surface texture and porosity of the substrate so as to achieve even staining.

Temperature and relative humidity conditions during time of concrete stain application shall be per manufacturer's application instructions. Do not apply materials under rainy conditions or within three (3) days after surfaces become wet from rainfall or other moisture. Do not apply when weather is foggy or overcast. Take precaution to ensure that workmen and work areas are adequately protected from fire and health hazards resulting from handling, mixing and application of materials. Furnish all the necessary equipment to complete the work. Provide drop clothes and other forms of protection necessary to protect all adjoining work and surfaces to render them completely free of overspray and splash from the concrete stain work. Any surfaces, which have been damaged or splattered, shall be cleaned, restores, or replaced to the satisfaction of the Engineer.

Avoid staining the "mortar joints" by providing suitable protection over the joints during the staining process.

Sequencing: Schedule color stain application with earthwork and back-filling of any wall areas making sure that all simulated stone texture is colored to the minimum distance below grade.

Delay adjacent plantings until color application is completed. Coordinate work to permit coloring applications without interference from other grades.

Where exposed soil or pavement is adjacent which may spatter dirt or soil from rainfall, or where surface may be subject to over-spray from other processes, provide temporary cover of completed work.

Guidelines for the use of Form Liners. Form liners are being used on this project to achieve very specific architectural results. The Contractor shall not deviate from the guidelines contained - herein unless authorized by the Engineer in writing.

Method of Measurement. This work shall be measured and paid for in place and the area computed in square feet of actual concrete surface area formed with concrete form liners and stained as specified herein.

Cast concrete form liner mockups with finished stain surfaces will not be measured for payment but included in the square foot price for this item. Required adjustments or corrections needed to address mockup comments and the cost of additional mockups, if required, will not be paid for separately, but shall be included in the square foot price for this item.

Basis of Payment. RANDOM BLOCK ASHLAR STONE form lined surfaces will be paid for at the contract unit price per square foot for FORM LINER TEXTURED SURFACE. The staining of the form lined surfaces will be paid for at the contract unit price per square foot for STAINING CONCRETE STRUCTURES. The unit price bid for these items shall include all labor and material costs associated with forming, pouring, surface coloring and disposal of forms, including a satisfactory cast concrete mockup panel to the requirements included herein.

PAVEMENT REPLACEMENT, SPECIAL

Description. This work shall consist of the removal and replacement of the driveway pavement displaced by the construction of the shoofly tracks. The pavement replacement will be replaced in kind with the existing pavement. The work shall be done in accordance with Section 446 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions adopted effective April 1, 2016.

446.02 Basis of Payment. The work will be paid for at the unit cost per square foot for PAVEMENT REPLACEMENT, SPECIAL which includes all offsite disposal of the existing pavement.

SLIPFORM PAVING (D-1)

Effective: November 1, 2014

Revise Article 1020.04 Table 1, Note (5) of Standard Specifications to read: "The slump range for slipform construction shall be 1/2 to 1 1/2 in."

Revise Article 1020.04 Table 1 (metric), Note (5) of Standard Specifications to read: "The slump range for slipform construction shall be 13 to 40 mm".

CALCIUM ALUMINATE CEMENT (BMPR)

Effective: July 1, 2013

Revise Article 1001.01(e) to read:

“(e) Calcium Aluminate Cement. Calcium aluminate cement shall be used according to Article 1020.04 or when approved by the Engineer. The cement shall meet the standard physical requirements for Type I cement according to AASHTO M 85, except the time of setting shall not apply. The chemical requirements shall be determined according to AASHTO T 105 and shall be as follows: minimum 37 percent aluminum oxide (Al₂O₃), maximum 42 percent calcium oxide (CaO), maximum 1 percent magnesium oxide (MgO), maximum 0.4 percent sulfur trioxide (SO₃), maximum 1.75 percent loss on ignition, and maximum 7 percent insoluble residue.”

PIPE UNDERDRAINS FOR STRUCTURES

Effective: May 17, 2000

Revised: January 22, 2010

Description. This work shall consist of furnishing and installing a pipe underdrain system as shown on the plans, as specified herein, and as directed by the Engineer.

Materials. Materials shall meet the requirements as set forth below:

The perforated pipe underdrain shall be according to Article 601.02 of the Standard Specifications. Outlet pipes or pipes connecting to a separate storm sewer system shall not be perforated.

The drainage aggregate shall be a combination of one or more of the following gradations, FA1, FA2, CA5, CA7, CA8, CA11, or CA13 thru 16, according to Sections 1003 and 1004 of the Standard Specifications.

The fabric surrounding the drainage aggregate shall be Geotechnical Fabric for French Drains according to Article 1080.05 of the Standard Specifications.

Construction Requirements. All work shall be according to the applicable requirements of Section 601 of the Standard Specifications except as modified below.

The pipe underdrains shall consist of a perforated pipe drain situated at the bottom of an area of drainage aggregate wrapped completely in geotechnical fabric and shall be installed to the lines and gradients as shown on the plans.

Method of Measurement. Pipe Underdrains for Structures shall be measured for payment in feet (meters), in place. Measurement shall be along the centerline of the pipe underdrains. All connectors, outlet pipes, elbows, and all other miscellaneous items shall be included in the measurement. Concrete headwalls shall be included in the cost of Pipe Underdrains for Structures, but shall not be included in the measurement for payment.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for PIPE UNDERDRAINS FOR STRUCTURES of the diameter specified. Furnishing and installation of the drainage aggregate, geotechnical fabric, forming holes in structural elements and any excavation required, will not be paid for separately, but shall be included in the cost of the pipe underdrains for structures.

WEEP HOLE DRAINS FOR ABUTMENTS, WINGWALLS, RETAINING WALLS AND CULVERTS

Effective: April 19, 2012

Revised: October 22, 2013

Delete the last paragraphs of Articles 205.05 and 502.10 and replace with the following.

“If a geocomposite wall drain according to Section 591 is not specified, a prefabricated geocomposite strip drain according to Section 1040.07 shall be placed at the back of each drain hole. The strip drain shall be 24 inches (600 mm) wide and 48 inches (1.220 m) tall. The strip drain shall be centered over the drain hole with the bottom located 12 inches (300 mm) below the bottom of the drain hole. All form boards or other obstructions shall be removed from the drain holes before placing any geocomposite strip drain.”

Revise the last sentence of the first paragraph of Article 503.11 to read as follows.

“Drain holes shall be covered to prevent the leakage of backfill material according to Article 502.10.”

Revise the title of Article 1040.07 to Geocomposite Wall Drains and Strip Drains.

DRILLED SHAFTS

Effective: October 5, 2015

Revised: October 4, 2016

Revise Section 516 of the Standard Specifications to read:

“SECTION 516. DRILLED SHAFTS

516.01 Description. This work shall consist of constructing drilled shaft foundations.

516.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete (Note 1).....	1020
(b) Reinforcement Bars	1006.10
(c) Grout (Note 2)	1024.01
(d) Permanent Steel Casing	1006.05(d)
(e) Slurry (Note 3)	

Note 1. When the soil contains sulfate contaminates, ASTM C 1580 testing will be performed to assess the severity of sulfate exposure to the concrete. If the sulfate contaminate is >0.10 to < 0.20 percent by mass, a Type II (MH) cement shall be used. If the sulfate contaminate is >0.20 to < 2.0 percent by mass, a Type V cement shall be used. If the sulfate contaminate is \geq 2.0 percent by mass, refer to ACI 201.2R for guidance.

Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be two to five parts sand and one part Type I or II cement. The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).

Note 3. Slurry shall be bentonite, emulsified polymer, or dry polymer, and shall be approved by the Engineer.

516.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Concrete Equipment	1020.03
(b) Drilling Equipment (Note 1)	
(c) Hand Vibrator	1103.17(a)
(d) Underwater Concrete Placement Equipment	1103.18

Note 1. The drilling equipment shall have adequate capacity, including power, torque and down thrust, to create a shaft excavation of the maximum diameter specified to a depth of 20 percent beyond the depths shown on the plans.

516.04 Submittals. The following information shall be submitted on form BBS 133.

(a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation.

(1) References. A list containing at least three projects completed within the three years prior to this project's bid date which the Contractor performing this work has installed drilled shafts of similar diameter, length, and site conditions to those shown in the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.

(2) Experience. Name and experience record of the drilled shaft supervisor, responsible for all facets of the shaft installation, and the drill operator(s) who will be assigned to this project. The supervisor and operator(s) shall each have a minimum of three years experience in the construction of drilled shafts.

(b) Installation Procedure. A detailed installation procedure shall be submitted to the Engineer for acceptance at least 28 days prior to drilled shaft construction and shall address each of the following items unless otherwise directed by the Engineer in writing.

(1) Equipment List. List of proposed equipment to be used including cranes, drill rigs, augers, boring tools, casing, vibratory hammers, core barrels, bailing buckets, final cleaning equipment, slurry equipment, tremies, or concrete pumps, etc.

(2) General Sequence. Details of the overall construction operation sequence, equipment access, and the sequence of individual shaft construction within each substructure bent or footing group. The submittal shall address the Contractor's proposed time delay and/or the minimum concrete strength necessary before initiating a shaft excavation adjacent to a recently installed drilled shaft.

(3) Shaft Excavation. A site specific step by step description of how the Contractor anticipates the shaft excavation to be advanced based on their evaluation of the subsurface data and conditions expected to be encountered. This sequence shall note the method of casing advancement, anticipated casing lengths, tip elevations and diameters, the excavation tools used and drilled diameters created. The Contractor shall indicate whether wet or dry drilling conditions are expected and if groundwater will be sealed from the excavation.

(4) Slurry. When the use of slurry is proposed, details on the types of additives to be used and their manufacturers shall be provided. In addition, details covering the measurement and control of the hardness of the mixing water, agitation, circulation, de-sanding, sampling, testing, and chemical properties of the slurry shall be submitted.

(5) Shaft Cleaning. Method(s) and sequence proposed for the shaft cleaning operation.

- (6) Reinforcement Cage and Permanent Casing. Details of reinforcement placement including rolling spacers to be used and method to maintain proper elevation and location of the reinforcement cage within the shaft excavation during concrete placement. The method(s) of adjusting the reinforcement cage length and permanent casing if rock is encountered at an elevation other than as shown on the plans. As an option, the Contractor may perform soil borings and rock cores at the drilled shaft locations to determine the required reinforcement cage and permanent casing lengths.
- (7) Concrete Placement. Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods. The sequence and method of casing removal shall also be stated along with the top of pour elevation, and method of forming through water above streambed.
- (8) Mix Design. The proposed concrete mix design(s).
- (9) Disposal Plan. Containment and disposal plan for slurry and displaced water. Containment and disposal plan for contaminated concrete pushed out of the top of the shaft by uncontaminated concrete during concrete placement.
- (10) Access and Site Protection Plan. Details of access to the drilled shafts and safety measures proposed. This shall include a list of casing, scaffolding, work platforms, temporary walkways, railings, and other items needed to provide safe access to the drilled shafts. Provisions to protect open excavations during non-working hours shall be included.

The Engineer will evaluate the drilled shaft installation procedure and notify the Contractor of acceptance, need for additional information, or concerns with the installation's effect on the existing or proposed structure(s).

CONSTRUCTION REQUIREMENTS

516.05 General. Excavation for drilled shaft(s) shall not proceed until written authorization is received from the Engineer. The Contractor shall be responsible for verification of the dimensions and alignment of each shaft excavation as directed by the Engineer.

Unless otherwise approved in the Contractor's installation procedure, no shaft excavation, casing installation, or casing removal with a vibratory hammer shall be made within four shaft diameters center to center of a shaft with concrete that has a compressive strength less than 1500 psi (10,300 kPa). The site-specific soil strengths and installation methods selected will determine the actual required minimum spacing, if any, to address vibration and blow out concerns.

Lost tools shall not remain in the shaft excavation without the approval of the Engineer.

Blasting shall not be used as a method of shaft excavation.

516.06 Shaft Excavation Protection Methods. The construction of drilled shafts may involve the use of one or more of the following methods to support the excavation during the various phases of shaft excavation, cleaning, and concrete placement dependent on the site conditions encountered. Surface water shall not flow uncontrolled into the shaft excavation, however water may be placed into the shaft excavation in order to meet head pressure requirements according to Articles 516.06(c) and 516.13.

The following are general descriptions indicating the conditions when these methods may be used.

- (a) Dry Method. The dry construction method shall only be used at sites where the groundwater and soil conditions are suitable to permit the drilling and dewatering of the excavation without causing subsidence of adjacent ground, boiling of the base soils, squeezing, or caving of the shaft side walls. The dry method shall consist of drilling the shaft excavation, removing accumulated water, cleaning the shaft base, and placing the reinforcement cage and concrete in a predominately dry excavation.
- (b) Slurry Method. The slurry construction method may be used at sites where dewatering the excavation would cause collapse of the shaft sidewalls or when the volume and head of water flowing into the shaft is likely to contaminate the concrete during placement resulting in a shaft defect. This method uses slurry, or in rare cases water, to maintain stability of the shaft sidewall while advancing the shaft excavation. After the shaft excavation is completed, the slurry level in the shaft shall be kept at an elevation to maintain stability of the shaft sidewall, maintain stability of the shaft base, and prevent additional groundwater from entering the shaft. The shaft base shall be cleaned, the reinforcement cage shall be set, and the concrete shall be discharged at the bottom of the shaft excavation, displacing the slurry upwards.
- (c) Temporary Casing Method. Temporary casing shall be used when either the dry or slurry methods provide inadequate support to prevent sidewall caving or excessive deformation of the shaft excavation. Temporary casing may be used with slurry or be used to reduce the flow of water into the excavation to allow dewatering and concrete placement in a dry shaft excavation. Temporary casing shall not be allowed to remain permanently without the approval of the Engineer.

During removal of the temporary casing, the level of concrete in the casing shall be maintained at a level such that the head pressure inside the casing is a minimum of 1.25 times the head pressure outside the casing, but in no case is less than 5 ft (1.5 m) above the bottom of the casing. Casing removal shall be at a slow, uniform rate with the pull in line with the shaft axis. Excessive rotation of the casing shall be avoided to limit deformation of the reinforcement cage. In addition, the slump requirements during casing removal shall be according to Article 516.12.

When called for on the plans, the Contractor shall install a permanent casing as specified. Permanent casing may be used as a shaft excavation support method or may be installed after shaft excavation is completed using one of the above methods. After construction, if voids are present between the permanent casing and the drilled excavation, the voids shall be filled with grout. Permanent casing shall not remain in place beyond the limits shown on the plans without the specific approval of the Engineer.

When the shaft extends above the streambed through a body of water and permanent casing is not shown, the portion above the streambed shall be formed with removable casings, column forms, or other forming systems as approved by the Engineer. The forming system shall not scar or spall the finished concrete or leave in place any forms or casing within the removable form limits as shown on the plans unless approved as part of the installation procedure. The forming system shall not be removed until the concrete has attained a minimum compressive strength of 2500 psi (17,200 kPa) and cured for a minimum of 72 hours. For shafts extending through water, the concrete shall be protected from water action after placement for a minimum of seven days.

516.07 Slurry. When slurry is used, the Contractor shall provide a technical representative of the slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry will be used, and during drilling and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions. During construction, the level of the slurry shall be maintained a minimum of 5 feet (1.5 m) above the height required to prevent caving of the shaft excavation. In the event of a sudden or significant loss of slurry in the shaft excavation, the construction of that foundation shall be stopped and the shaft excavation backfilled or supported by temporary casing, until a method to stop slurry loss, or an alternate construction procedure, has been approved by the Engineer.

- (a) **General Properties.** The material used to make the slurry shall not be detrimental to the concrete or surrounding ground. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

If approved by the Engineer, the Contractor may use water and excavated soils as drilling slurry. In this case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry shall be met.

When water is used as the slurry to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing shall not apply if the entire fluid column is replaced with fresh water after drilling. To do so, fresh water shall be introduced at the top of the shaft excavation and existing water used during drilling shall be pumped out of the shaft excavation from the bottom of the shaft excavation until the entire volume of fluid has been replaced.

- (b) Preparation. Prior to introduction into the shaft excavation, the manufactured slurry admixture shall be pre-mixed thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer's recommendations. Slurry tanks of adequate capacity shall be used for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without approval from the Engineer. Adequate desanding equipment shall be provided to control slurry properties during the drilled shaft excavation in accordance with the values provided in Table 1.
- (c) Quality Control. Quality control tests shall be performed on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the shaft excavation. Tests of slurry samples from within two feet of the bottom and at mid-height of the shaft excavation shall be conducted in each shaft excavation during the excavation process to measure the consistency of the slurry. A minimum of four sets of tests shall be conducted during the first eight hours of slurry use on the project. When a series of four test results do not change more than 1% from the initial test, the testing frequency may be decreased to one set every four hours of slurry use. Reports of all tests, signed by an authorized representative of the Contractor, shall be furnished to the Engineer upon completion of each drilled shaft. The physical properties of the slurry shall be as shown in Table 1.

The slurry shall be sampled and tested less than 1 hour before concrete placement. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be removed. The contractor shall perform final shaft bottom cleaning after suspended solids have settled from the slurry. Concrete shall not be placed if the slurry does not have the required physical properties.

Table 1 – SLURRY PROPERTIES				
	Bentonite	Emulsified Polymer	Dry Polymer	Test Method
Density, lb/cu ft (kg/cu m) (at introduction)	65.2 ± 1.6 ¹ (1043.5 ± 25.6)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Density, lb/cu ft (kg/cu m) (prior to concrete placement)	67.0 ± 3.5 ¹ (1073.0 ± 56.0)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Viscosity ² , sec/qt (sec/L)	46 ± 14 (48 ± 14)	38 ± 5 (40 ± 5)	65 ± 15 (69 ± 16)	ASTM D 6910
pH	9.0 ± 1.0	9.5 ± 1.5	9.0 ± 2.0	ASTM D 4972
Sand Content, percent by volume (at introduction)	4 max.	1 max.	1 max.	ASTM D 4381
Sand Content, percent by volume (prior to concrete placement)	10 max.	1 max.	1 max.	ASTM D 4381
Contact Time ³ , hours	4 max.	72 max.	72 max.	

Note 1. When the slurry consists of only water and excavated soils, the density shall not exceed 70 lb/cu ft (1121 kg/cu m).

Note 2. Higher viscosities may be required in loose or gravelly sand deposits.

Note 3. Contact time is the time without agitation and sidewall cleaning.

516.08 Obstructions. An obstruction is an unknown isolated object that causes the shaft excavation method to experience a significant decrease in the actual production rate and requires the Contractor to core, break up, push aside, or use other means to mitigate the obstruction. Subsurface conditions such as boulders, cobbles, or logs and buried infrastructure such as footings, piling, or abandoned utilities, when shown on the plans, shall not constitute an obstruction. When an obstruction is encountered, the Contractor shall notify the Engineer immediately and upon concurrence of the Engineer, the Contractor shall mitigate the obstruction with an approved method.

516.09 Top of Rock. The top of rock will be considered as the point where rock, defined as bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the Engineer, is encountered which cannot be drilled with augers and/or underreaming tools configured to be effective in the soils indicated in the contract documents.

516.10 Design Modifications. If the top of rock elevation differs from that shown on the plans by more than 10 percent of the length of the drilled shaft above the rock, the Engineer shall be contacted to determine if any drilled shaft design changes may be required. In addition, if the type of soil or rock encountered is not similar to that shown in the subsurface exploration data, the Contractor may be required to extend the drilled shaft length(s) beyond those specified in the plans. In either case, the Engineer will determine if revisions are necessary and the extent of the modifications required.

516.11 Excavation Cleaning and Inspection. Materials removed or generated from the shaft excavations shall be disposed of according to Article 202.03.

After excavation, each shaft shall be cleaned. For a drilled shaft terminating in soil, the depth of sediment or debris shall be a maximum of 1 1/2 in. (38 mm). For a drilled shaft terminating in rock, the depth of sediment or debris shall be a maximum of 1/2 in. (13 mm).

A shaft excavation shall be overreamed when, in the opinion of the Engineer, the sidewall has softened, swelled, or has a buildup of slurry cake. Overreaming may also be required to correct a shaft excavation which has been drilled out of tolerance. Overreaming may be accomplished with a grooving tool, overreaming bucket, or other approved equipment. Overreaming thickness shall be a minimum of 1/2 in. (13 mm) and a maximum of 3 in. (75 mm).

516.12 Reinforcement. This work shall be according to Section 508 and the following.

The shaft excavation shall be cleaned and inspected prior to placing the reinforcement cage. The reinforcement cage shall be completely assembled prior to drilling and be ready for adjustment in length as required by the conditions encountered. The reinforcement cage shall be lifted using multiple point sling straps or other approved methods to avoid reinforcement cage distortion or stress. Cross frame stiffeners may be required for lifting or to keep the reinforcement cage in proper position during lifting and concrete placement.

The Contractor shall attach rolling spacers to keep the reinforcement cage centered within the shaft excavation during concrete placement and to ensure that at no point will the finished shaft have less than the minimum concrete cover(s) shown on the plans. The rolling spacers or other approved non-corrosive spacing devices shall be installed within 2 ft (0.6 m) of both the top and bottom of the drilled shaft and at intervals not exceeding 10 ft (3 m) throughout the length of the shaft to ensure proper reinforcement cage alignment and clearance for the entire shaft. The number of rolling spacers at each level shall be one for each 1.0 ft (300 mm) of shaft diameter, with a minimum of four rolling spacers at each level. For shafts with different shaft diameters throughout the length of the excavation, different sized rolling spacers shall be provided to ensure the reinforcement cage is properly positioned throughout the entire length of the shaft.

When a specific concrete cover between the base of the drilled shaft and the reinforcement cage is shown on the plans, the bottom of the reinforcement cage shall be supported so that the proper concrete cover is maintained.

If the conditions differ such that the length of the shaft is increased, additional longitudinal bars shall be either mechanically spliced or lap spliced to the lower end of the reinforcement cage and confined with either hoop ties or spirals. The Contractor shall have additional reinforcement available or fabricate the reinforcement cages with additional length as necessary to make the required adjustments in a timely manner as dictated by the encountered conditions. The additional reinforcement may be non-epoxy coated.

516.13 Concrete Placement. Concrete work shall be performed according to the following.

Throughout concrete placement the head pressure inside the drilled shaft shall be at least 1.1 times the head pressure outside the drilled shaft.

Concrete placement shall begin within 1 hour of shaft cleaning and inspection. The pour shall be made in a continuous manner from the bottom to the top elevation of the shaft as shown on the contract plan or as approved in the Contractor's installation procedure. Concrete placement shall continue after the shaft excavation is full and until 18 in. (450 mm) of good quality, uncontaminated concrete is expelled at the top of shaft. Vibration of the concrete will not be allowed when the concrete is displacing slurry or water. In dry excavations, the concrete in the top 10 ft (3 m) of the shaft shall be vibrated.

When using temporary casing or placing concrete under water or slurry, a minimum of seven days prior to concrete placement, a 4 cu yd (3 cu m) trial batch of the concrete mixture shall be performed to evaluate slump retention. Temporary casing shall be withdrawn before the slump of the concrete drops below 6 in. (150 mm). For concrete placed using the slurry method of construction, the slump of all concrete placed shall be a minimum of 6 in. (150 mm) at the end of concrete placement.

Devices used to place concrete shall have no aluminum parts in contact with concrete.

When the top of the shaft is at the finished elevation and no further concrete placement above the finished elevation is specified, the top of the shaft shall be level and finished according to Article 503.15(a).

Concrete shall be placed by free fall, tremie, or concrete pump subject to the following conditions.

- (a) Free Fall Placement. Concrete shall only be placed by free fall when the rate of water infiltration into the shaft excavation is less than 12 in. (300 mm) per hour and the depth of water in the shaft excavation is less than 3 in. (75 mm) at the time of concrete placement.

Concrete placed by free fall shall fall directly to the base without contacting the reinforcement cage, cross frame stiffeners, or shaft sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that free fall does not exceed 60 ft (18.3 m) for conventional concrete or 30 ft (9.1 m) for self-consolidating concrete. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, either a tremie or pump shall be used to accomplish the pour.

- (b) Tremie and Concrete Pump Placement. Concrete placement shall be according to Article 503.08, except the discharge end of the steel pipe shall remain embedded in the concrete a minimum of 10 ft (3.0 m) throughout concrete placement when displacing slurry or water.

516.14 Construction Tolerances. The following construction tolerances shall apply to all drilled shafts.

- (a) Center of Shaft. The center of the drilled shaft shall be within 3 in. (75 mm) of the plan station and offset at the top of the shaft.
- (b) Center of Reinforcement Cage. The center of the reinforcement cage shall be within 1 1/2 in. (40 mm) of plan station and offset at the top of the shaft.
- (c) Vertical Plumbness of Shaft. The out of vertical plumbness of the shaft shall not exceed 1.5 percent.
- (d) Vertical Plumbness of Reinforcement Cage. The out of vertical plumbness of the shaft reinforcement cage shall not exceed 0.83 percent.
- (e) Top of Shaft. The top of the shaft shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.
- (f) Top of Reinforcement Cage. The top of the reinforcement cage shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.

- (g) Bottom of shaft. Excavation equipment and methods used to complete the shaft excavation shall have a nearly planar bottom. The cutting edges of excavation equipment used to create the bottom of shafts in rock shall be normal to the vertical axis of the shaft within a tolerance of 6.25 percent.

516.15 Method of Measurement. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be computed using the plan diameter of the shaft multiplied by the measured length of the shaft. The length of shaft in soil will be computed as the difference in elevation between the top of the drilled shaft shown on the plans, or as installed as part of the Contractor's installation procedure, and the bottom of the shaft or the top of rock (when present) whichever is higher. The length of shaft in rock will be computed as the difference in elevation between the measured top of rock and the bottom of the shaft.

When permanent casing is specified, it will be measured for payment in place, in feet (meters). Permanent casing installed at the Contractor's option will not be measured for payment.

Reinforcement furnished and installed will be measured for payment according to Article 508.07.

516.16 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for DRILLED SHAFT IN SOIL, and/or DRILLED SHAFT IN ROCK.

Permanent casing will be paid for at the contract unit price per foot (meter) for PERMANENT CASING.

Reinforcement furnished and installed will be paid for according to Article 508.08.

Obstruction mitigation will be paid for according to Article 109.04."

WET REFLECTIVE TEMPORARY PAVEMENT MARKING

783.01 Description. This work shall consist of the furnishing, installing, maintaining, and removing short term and temporary pavement markings in accordance with Section 703 of the Standard Specifications as adopted April 1, 2016 and as amended by these Special Provisions.

783.02 Basis of Payment. The work will be paid for at the unit cost per foot for WET REFLECTIVE TEMPORARY TAPE TYPE III 4 INCH, WET REFLECTIVE TEMPORARY TAPE TYPE III 6 INCH, WET REFLECTIVE TEMPORARY TAPE TYPE III 24 INCH, and per square foot for WET REFLECTIVE TEMPORARY TAPE TYPE III- LETTERS AND SYMBOLS which also includes eventual disposal from the site.

BRIDGE DRAINAGE SYSTEM

Description. This work shall consist of furnishing and installing a railroad bridge ballast drainage system as shown on the plans, including all piping, bottom pans, fittings, support brackets, inserts, bolts, and splash blocks when specified.

Material. Perforated galvanized corrugated steel pipe shown on the plans shall conform to the requirements of article 1006.01 of the Standard Specifications. Perforations shall be as shown on the design drawings. All slots in the pipe and bottom pan shall be coated as required for end cuts according to AASHTO M 36. The bottom pan shall be galvanized 12 gauge steel plate conforming to ASTM A653.

The pipe and fittings below the bottom pan shall be reinforced fiberglass according to ASTM D 2996 RTRP with a 30,000 psi (207 MPa) minimum short-time rupture strength hoop tensile stress. The reinforced fiberglass shall also have an apparent stiffness factor at 5 percent deflection exceeding 200 cu in.-lbf/sq. in. (22.6 cu mm-kPa) and a minimum wall thickness of 0.10 in. (2.54 mm). The adhesive for joining pipe and fittings shall be as recommended by the manufacturer.

All pipe supports and associated hardware shall be hot dip galvanized according to AASHTO M 232 (M 232M). The fiberglass pipe and fittings furnished shall be pigmented throughout, or have a resin-rich pigmented exterior coat, specifically designed for over-coating fiberglass, as recommended by the manufacturer. The color shall be as specified by the Engineer. The resin in either case shall have an ultraviolet absorber designed to prevent ultraviolet degradation. The ultraviolet protection shall be designed to withstand a minimum of 2,500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-8 (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet exposure at 140°F (60°C), and then 4 hours of condensate exposure at 120°F (49°C). After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change. The supplier shall certify the material supplied meets or exceeds these requirements.

Design. The drainage system shall be designed as an open system with allowances for the differential expansion and contraction expected between the superstructure and the substructure to which the drainage system is attached. Runs of pipe shall be supported at spacings not exceeding those recommended by the manufacturer of the pipe. Standard slings, clamps, clevis hangers and shoe supports designed for use with steel pipe may be used. A minimum strap width for hangers shall be 1 1/2 in. (40 mm) for all pipe under 12 in. (300 mm) in diameter and 2 in. (50 mm) for diameters 12 in. (300 mm) or greater. Straps shall have 120 degrees of contact with the pipe. Pipes supported on less than 120 degrees of contact shall have a split fiberglass pipe protective sleeve bonded in place with adhesive.

All reinforced fiberglass pipe, fittings, and expansion joints shall be handled and installed according to guidelines and procedures recommended by the manufacturer or supplier of the material.

Basis of Payment. This work will be paid for at the contract lump sum price for DRAINAGE SYSTEM.

PLANTING WOODY PLANTS (MODIFIED)

Effective: January 1, 2012

Revised: August 1, 2012

This work shall consist of planting woody plants as specified in Section 253 of the Standard Specifications with the following revisions, including BDE revisions for 2012:

Revise the second sentence of Article 253.01 of the Standard Specifications to read:

“ This work shall consist of furnishing, transporting, and planting woody plants such as trees, shrubs, evergreens, vines, and seedlings.”

Revise Article 253.02(a) of the Standard Specifications to read:

“ (a) Trees, Shrubs, Evergreens, Vines and Seedlings 1081.01”

Delete the third sentence of Article 253.07 and substitute the following:

“The Contractor shall place the marking flags and outline each area for mass or solid planting. The Engineer will contact the Roadside Development Unit at (847) 705-4171, at least 72 hours prior to any digging to verify the layout.”

Revise the first sentence of Article 253.08(a) of the Standard Specifications to read:

“ (a) Excavation for Deciduous Trees and Evergreen Trees.”

Revise the first sentence of Article 253.08(b) of the Standard Specifications to read:

“ (b) Excavation for Deciduous Shrubs, Evergreen Shrubs, Vines, and Seedlings.”

Delete the fourth paragraphs of Article 253.10 and substitute the following:

“Trees, shrubs, and vines shall be thoroughly watered with a method approved by the Engineer. Place backfill in 6 inch-thick layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plumb during backfilling. When backfill is approximately 2/3 complete, saturate backfill with water and repeat until no more water can be absorbed. Place and compact remainder of backfill and thoroughly water again. Approved watering equipment shall be at the site of the work and in operational condition prior to starting the planting operation and during all planting operations or planting will not be allowed.”

Add the following to Article 253.10(e):

“Spade a planting bed edge at approximately a 45 degree angle and to a depth of approximately 3-inches (75 mm) around the perimeter of the tree bed. Remove any debris created in the spade edging process and disposed of as specified in Article 202.03.”

Delete Article 253.11 and substitute the following:

“Within 48 hours after planting, mulch shall be placed around all plants in the entire mulched bed or saucer area specified to a depth of 4 inches (100 mm). Mulch shall not be in contact with the base of the trunk. No weed barrier fabric will be required for tree and shrub planting. Pre-emergent Herbicide will be used instead of weed barrier fabric. The Pre-emergent Herbicide shall be applied prior to mulching. See specification for Weed Control, Pre-Emergent Granular Herbicide.”

Revise the first sentence of Article 253.13 of the Standard Specifications to read:

“ All deciduous and evergreen trees, with the exception of multi-stem or clump form specimens, over 8 ft (2.5 m) in height shall require three 6 ft (2 m) long steel posts so placed that they are equidistant from each other and adjacent to the outside of the ball.”

Revise the first sentence of the second paragraph of Article 253.14 of the Standard Specifications to read:

“ This period of establishment for the plants shall not delay acceptance of the entire project and final payment due if the contractor requires and receives from the subcontractor a third party performance bond naming the Department as obligee in the full amount of the planting quantities subject to this period of establishment, multiplied by their contract unit prices.”

Revise the third sentence of Article 253.16 of the Standard Specifications to read:

“ Trees, shrubs, evergreens, and vines will be measured as each individual plant.”

Revise Article 253.17 of the Standard Specifications to read:

“ **253.17 Basis of Payment.** This work will be paid for at the contract unit price per each for TREES, SHRUBS, EVERGREENS, or VINES, of the species, root type, and plant size specified; and per unit for SEEDLINGS. Payment will be made according to the following schedule.

(a) Initial Payment. Upon completion of planting, mulch covering, wrapping, and bracing, 90 percent of the pay item(s) will be paid.

(b) Final Payment. Upon inspection and acceptance of the plant material, or upon execution of a third party bond, the remaining ten percent of the pay item(s) will be paid.”

Revise the first paragraph of Article 1081.01 of the Standard Specifications to read:

“ **1081.01 Trees, Shrubs, Evergreens, Vines, and Seedlings.** Trees, shrubs, evergreens, vines, and seedlings shall be according to the current standards adopted by the ANLA.”

COMPOST FURNISH AND PLACE

Effective: June 6, 2006

Delete the first sentence of Article 211.01 Description and substitute the following:

This work shall consist of furnishing, transporting and placing topsoil, special types of topsoil, compost, or compost/topsoil blend to the depth specified in areas as shown in the plans or as directed by the Engineer.

Delete the first sentence of the first paragraph of Article 211.04 Placing Topsoil and Compost and substitute the following:

Topsoil, compost, or compost/topsoil blend shall not be placed until the area to be covered has been shaped, trimmed and finished according to Section 212.

Delete the second sentence of the second paragraph of Article 211.04 Placing Topsoil and Compost and substitute the following:

After verification of proper depth, the Contractor shall completely incorporate the placed material into the existing surface to a minimum depth of 12 inches below finished grade by tilling.

Delete the first sentence of the second paragraph of Article 211.04 Placing Topsoil and Compost and substitute the following:

The Engineer will verify that that the proper topsoil, compost, or compost/topsoil blend depth has been applied.

Add the following to Article 211.06 Clearing Area and Disposal of Surplus Material:

Prior to placing topsoil, compost or compost/topsoil blend, the contractor shall remove all litter (including plastic bags, bottles, rocks, etc.) and plant debris.

Add the following to Article 211.08 Basis of Payment:

Payment shall include all costs for materials, equipment and labor required to complete the work specified herein, including the cost of removing and disposing of any debris.

EMBANKMENT I

Effective: March 1, 2011

Revised: November 1, 2013

Description. This work shall be according to Section 205 of the Standard Specifications except for the following.

Material. All material shall be approved by the District Geotechnical Engineer. The proposed material must meet the following requirements.

- a) The laboratory Standard Dry Density shall be a minimum of 90 lb/cu ft (1450 kg/cu m) when determined according to AASHTO T 99 (Method C).
- b) The organic content shall be less than ten percent determined according to AASHTO T 194 (Wet Combustion).
- c) Soils which demonstrate the following properties shall be restricted to the interior of the embankment and shall be covered on both the sides and top of the embankment by a minimum of 3 ft (900 mm) of soil not considered detrimental in terms of erosion potential or excess volume change.
 - 1) A grain size distribution with less than 35 percent passing the number 75 um (#200) sieve.
 - 2) A plasticity index (PI) of less than 12.
 - 3) A liquid limit (LL) in excess of 50.
- d) Reclaimed asphalt shall not be used within the ground water table or as a fill if ground water is present.
- e) The RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications". Gradation deleterious count shall not exceed 10% of total RAP and 5% of other by total weight.

CONSTRUCTION REQUIREMENTS

Samples. Embankment material shall be sampled, tested, and approved before use. The contractor shall identify embankment sources, and provide equipment as the Engineer requires, for the collection of samples from those sources. Samples will be furnished to the Geotechnical Engineer a minimum of three weeks prior to use in order that laboratory tests for approval and compaction can be performed. Embankment material placement cannot begin until tests are completed and approval given.

Placing Material. In addition to Article 202.03, broken concrete, reclaimed asphalt with no expansive aggregate, or uncontaminated dirt and sand generated from construction or demolition activities shall be placed in 6 inches (150 mm) lifts and disked with the underlying lift until a uniform homogenous material is formed. This process also applies to the overlaying lifts. The disk must have a minimum blade diameter of 24 inches (600 mm).

When embankments are to be constructed on hillsides or existing slopes that are steeper than 3H:1V, steps shall be keyed into the existing slope by stepping and benching as shown in the plans or as directed by the engineer.

Compaction. Soils classification for moisture content control will be determined by the Soils Inspector using visual field examination techniques and the IDH Textural Classification Chart.

When tested for density in place each lift shall have a maximum moisture content as follows.

- a) A maximum of 110 percent of the optimum moisture for all forms of clay soils.
- b) A maximum of 105 percent of the optimum moisture for all forms of clay loam soils.

Stability. The requirement for embankment stability in Article 205.04 will be measured with a Dynamic Cone Penetrometer (DCP) according to the test method in the IDOT Geotechnical Manual. The penetration rate must be equal or less than 1.5 inches (38 mm) per blow.

Basis of Payment. This work will not be paid separately but will be considered as included in the various items of excavation.

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010

Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term “equipment” refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment’s respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 ^{1/}	600-749	2002
	750 and up	2006
June 1, 2011 ^{2/}	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 ^{2/}	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/cleandiesel/verification/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected. Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)

Effective: September 1, 2000

Revised: July 2, 2016

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract that the Contractor signs with a subcontractor.

The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (a) Withholding progress payments;
- (b) Assessing sanctions;
- (c) Liquidated damages; and/or
- (d) Disqualifying the Contractor from future bidding as non-responsible.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined that the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates that, in the absence of unlawful discrimination, and in an arena of fair and open competition, DBE companies can be expected to perform **14.00%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

- (a) The bidder documents that enough DBE participation has been obtained to meet the goal or,
- (b) The bidder documents that a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217) 785-4611, or by visiting the Department's website at: <http://www.idot.illinois.gov/doing-business/certifications/disadvantaged-business-enterprise-certification/il-ucp-directory/index>.

BIDDING PROCEDURES. Compliance with this Special Provision is required prior to the award of the contract and the failure of the low bidder to comply will render the bid not responsive.

In order to assure the timely award of the contract, the low bidder shall submit:

- (a) The bidder shall submit a DBE Utilization Plan on completed Department forms SBE 2025 and 2026.
 - (1) The final Utilization Plan must be submitted within five calendar days after the date of the letting in accordance with subsection (a)(2) of Bidding Procedures herein.
 - (2) To meet the five day requirement, the bidder may send the Utilization Plan electronically by scanning and sending to **DOT.DBE.UP@illinois.gov** or faxing to (217) 785-1524. The subject line must include the bid Item Number and the Letting date. The Utilization Plan should be sent as one .pdf file, rather than multiple files and emails for the same Item Number. It is the responsibility of the bidder to obtain confirmation of email or fax delivery.

Alternatively, the Utilization Plan may be sent by certified mail or delivery service within the five calendar day period. If a question arises concerning the mailing date of a Utilization Plan, the mailing date will be established by the U.S. Postal Service postmark on the certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service when the Utilization Plan is received by the Department. It is the responsibility of the bidder to ensure the postmark or receipt date is affixed within the five days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Utilization Plan is to be submitted to:

Illinois Department of Transportation
Bureau of Small Business Enterprises
Contract Compliance Section
2300 South Dirksen Parkway, Room 319
Springfield, Illinois 62764

The Department will not accept a Utilization Plan if it does not meet the five day submittal requirement and the bid will be declared not responsive. In the event the bid is declared not responsive due to a failure to submit a Utilization Plan or failure to comply with the bidding procedures set forth herein, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty, and may deny authorization to bid the project if re-advertised for bids. The Department reserves the right to invite any other bidder to submit a Utilization Plan at any time for award consideration.

- (b) The Utilization Plan shall indicate that the bidder either has obtained sufficient DBE participation commitments to meet the contract goal or has not obtained enough DBE participation commitments in spite of a good faith effort to meet the goal. The Utilization Plan shall further provide the name, telephone number, and telefax number of a responsible official of the bidder designated for purposes of notification of Utilization Plan approval or disapproval under the procedures of this Special Provision.
- (c) The Utilization Plan shall include a DBE Participation Commitment Statement, Department form SBE 2025, for each DBE proposed for the performance of work to achieve the contract goal. For bidding purposes, submission of the completed SBE 2025 forms, signed by the DBEs and scanned or faxed to the bidder will be acceptable as long as the original is available and provided upon request. All elements of information indicated on the said form shall be provided, including but not limited to the following:
 - (1) The names and addresses of DBE firms that will participate in the contract;
 - (2) A description, including pay item numbers, of the work each DBE will perform;
 - (3) The dollar amount of the participation of each DBE firm participating. The dollar amount of participation for identified work shall specifically state the quantity, unit price, and total subcontract price for the work to be completed by the DBE. If partial pay items are to be performed by the DBE, indicate the portion of each item, a unit price where appropriate and the subcontract price amount;
 - (4) DBE Participation Commitment Statements, form SBE 2025, signed by the bidder and each participating DBE firm documenting the commitment to use the DBE subcontractors whose participation is submitted to meet the contract goal;
 - (5) If the bidder is a joint venture comprised of DBE companies and non-DBE companies, the Utilization Plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s); and,
 - (6) If the contract goal is not met, evidence of good faith efforts; the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor is selected over a DBE for work on the contract.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan submitted by the apparent successful bidder is approved. All information submitted by the bidder must be complete, accurate and adequately document that enough DBE participation has been obtained or document that good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. The Utilization Plan will not be approved by the Department if the Utilization Plan does not document sufficient DBE participation to meet the contract goal unless the apparent successful bidder documented in the Utilization Plan that it made a good faith effort to meet the goal. This means that the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts, in other words, efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

- (a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases, and will be considered by the Department.
 - (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.
 - (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.
 - (3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

- (4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.
 - b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable. In accordance with subsection (c)(6) of the above Bidding Procedures, the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.
- (5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
 - (6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
 - (7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.
 - (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.

- (b) If the Department determines that the apparent successful bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided that it is otherwise eligible for award. If the Department determines that the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification shall include a statement of reasons for the determination. If the Utilization Plan is not approved because it is deficient as a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no more than a five calendar day period in order to cure the deficiency.
- (c) The bidder may request administrative reconsideration of a determination adverse to the bidder within the five working days after the receipt of the notification date of the determination by delivering the request to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764 (Telefax: (217) 785-1524). Deposit of the request in the United States mail on or before the fifth business day shall not be deemed delivery. The determination shall become final if a request is not made and delivered. A request may provide additional written documentation or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be forwarded to the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person in order to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for consideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

- (a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.

- (b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.
- (c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the prime Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.
- (d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:
 - (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
 - (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission is receives as a result of the lease arrangement.
- (e) DBE as a material supplier:
 - (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100 percent goal credit for the cost of materials of supplies obtained from a DBE manufacturer.
 - (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a DBE regular dealer or DBE manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the DBE Participation Commitment Statement.

- (a) **NO AMENDMENT.** No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be submitted to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764. Telephone number (217) 785-4611. Telefax number (217) 785-1524.
- (b) **CHANGES TO WORK.** Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A or AER 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, then a new Request for Approval of Subcontractor shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.
- (c) **SUBCONTRACT.** The Contractor must provide DBE subcontracts to IDOT upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.

- (d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:
- (1) That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or
 - (2) That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
 - (3) That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.
- (e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in this Special Provision. The Contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Contractor obtains the Department's written consent as provided in subsection (a) of this part. Unless Department consent is provided for termination of a DBE subcontractor, the Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the DBE in the Utilization Plan.

As stated above, the Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor, with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

- (1) The listed DBE subcontractor fails or refuses to execute a written contract;
- (2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
- (3) The listed DBE subcontractor fails or refuses to meet the prime Contractor's reasonable, nondiscriminatory bond requirements;
- (4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1200 or applicable state law.
- (6) You have determined that the listed DBE subcontractor is not a responsible contractor;
- (7) The listed DBE subcontractor voluntarily withdraws from the projects and provides to you written notice of its withdrawal;
- (8) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (9) A DBE owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract;
- (10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the prime Contractor can substitute another DBE or non-DBE contractor after contract award.

When a DBE is terminated, or fails to complete its work on the Contract for any reason the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal. The good faith efforts shall be documented by the Contractor. If the Department requests documentation under this provision, the Contractor shall submit the documentation within seven days, which may be extended for an additional seven days if necessary at the request of the Contractor. The Department shall provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

- (f) PAYMENT RECORDS. The Contractor shall maintain a record of payments for work performed to the DBE participants. The records shall be made available to the Department for inspection upon request. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than thirty calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Resident Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes that the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.
- (g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.
- (h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

DOWEL BAR INSERTER (BDE)

Effective: January 1, 2017

Add the following to Article 420.03 of the Standard Specifications.

"(l) Mechanical Dowel Bar Inserter 1103.20"

Revise Article 420.05(c) of the Standard Specifications to read:

"(c) Transverse Contraction Joints. Transverse contraction joints shall consist of planes of weakness created by sawing grooves in the surface of the pavement and shall include load transfer devices consisting of dowel bars. Transverse contraction joints shall be according to the following."

Revise Article 420.05(c)(2) of the Standard Specifications to read:

“(2) Dowel Bars. Dowel Bars shall be installed parallel to the centerline of the pavement and parallel to the proposed pavement surface. Installation shall be according to one of the following methods.

- a. Dowel Bar Assemblies. The assembly shall act as a rigid unit with each component securely held in position relative to the other members of the assembly. The entire assembly shall be held securely in place by means of nails which shall penetrate the stabilized subbase. At least ten nails shall be used for each 10, 11, or 12 ft (3, 3.3, or 3.6 m) section of assembly.

Metal stakes shall be used instead of nails, with soil or granular subbase. The stakes shall loop over or attach to the top parallel spacer bar of the assembly and penetrate the subgrade or subbase at least 12 in. (300 mm).

At the location of each dowel bar assembly, the subgrade or subbase shall be reshaped and re-tamped when necessary.

Prior to placing concrete, any deviation of the dowel bars from the correct horizontal or vertical alignment (horizontal skew or vertical tilt) greater than 3/8 in. in 12 in (9 mm in 300 mm) shall be corrected and a light coating of oil shall be uniformly applied to all dowel bars.

Care shall be exercised in depositing the concrete at the dowel bar assemblies so the horizontal and vertical alignment will be retained.

- b. Dowel Bar Insertion. The dowel bars may be placed in the pavement slab with a mechanical dowel bar inserter (DBI) attached to a formless paver for pavements ≥ 7.0 in. (175 mm) in thickness. A light coating of oil shall be uniformly applied to all dowel bars.

The DBI shall insert the dowel bars with vibration into the plastic concrete after the concrete has been struck off and consolidated without deformation of the slab. After the bars have been inserted, the concrete shall be refinished and no voids shall exist around the dowel bars. The forward movement of the paver shall not be interrupted by the inserting of the dowel bars.

The location of each row of dowel bars shall be marked in a manner to facilitate where to insert the bars, and where to saw the transverse joint.

1. Placement Tolerances for Dowel Bars. The DBI shall place the dowel bars in the concrete pavement within the following tolerances.

- (a.) Longitudinal Translation (Mislocation). Longitudinal translation (mislocation) shall be defined as the position of the center of the dowel bar along the longitudinal axis, in relation to the sawed joint.

The quality control tolerance for longitudinal translation shall not exceed 2.0 in (50 mm). If this tolerance is exceeded, adjustments shall be made to the paving operation.

Any joint having two or more dowel bars with an embedment length less than 4.0 in. (100 mm) within 12 in. (300 mm) of the same wheelpath will be considered unacceptable. Any joint having an average dowel bar embedment length less than 5.25 in. (130 mm) will also be considered unacceptable. Embedment length shall be defined as the length of dowel bar embedded on the short side of the sawed joint. An unacceptable joint shall be replaced with a minimum of 6 ft (1.8 m) of pavement centered over the joint according to Section 442 for Class B patches.

- (b.) Horizontal Translation (Mislocation). Horizontal translation (mislocation) shall be defined as the difference in the actual dowel bar location parallel to the longitudinal or edge joint from its theoretical position as shown on the plans.

The quality control tolerance for horizontal translation shall not exceed 2.0 in. (50 mm). If this tolerance is exceeded, adjustments shall be made to the paving operation.

Any joint having a dowel bar with a translation greater than 4.0 in. (100 mm) will be considered unacceptable, but may remain in place unless the Engineer determines the joint will not function. If the joint is unable to remain in place, the joint shall be replaced with a minimum of 6 ft (1.8 m) of pavement centered over the joint according to Section 442 for Class B patches.

(c.) Vertical Translation (Mislocation). Vertical translation (mislocation) shall be defined as the difference in the vertical position of the dowel bar relative to the theoretical midpoint of the slab.

The quality control tolerance for vertical translation shall be as shown in the following table. If these tolerances are exceeded, adjustments shall be made to the paving operation.

Pavement Thickness	Dowel Bar Diameter	Vertical Translation Tolerance Above Midpoint	Vertical Translation Tolerance Below Midpoint
≥7 in. to <8 in. (≥175 mm to <200 mm)	1.25 in. (31 mm)	0.25 in. (6 mm)	0.5 in. (13 mm)
≥8 in. to <9 in. (≥200 mm to <225 mm)	1.50 in. (38 mm)	0.25 in. (6 mm)	0.5 in. (13 mm)
≥9 in. to <10 in. (≥225 mm to <250 mm)	1.50 in. (38 mm)	0.75 in. (19 mm)	0.75 in. (19 mm)
≥10 in. (≥250 mm)	1.50 in. (38 mm)	0.75 in. (19 mm)	1.0 in. (25 mm)

Any joint having a dowel bar with top concrete cover less than T/3, where T is slab thickness, will be considered unacceptable. Any joint having 2 or more dowel bars with bottom concrete cover less than 2.0 in. (50 mm) will also be considered unacceptable. An unacceptable joint shall be replaced with a minimum of 6 ft (1.8 m) of pavement according to Section 442 for Class B patches.

(d.) Vertical Tilt or Horizontal Skew (Misalignment). Vertical tilt or horizontal skew (misalignment) shall be defined as the difference in position of the dowel bar ends with respect to each other. Vertical tilt is measured in the vertical axis whereas horizontal skew is measured in the horizontal axis. Misalignment shall be measured in terms of a joint score. The joint score shall be defined as the degree of misalignment evaluated for a single transverse joint for each lane of pavement. The joint score shall be determined as follows:

$$\text{Joint Score} = \left(1 + \left(\frac{x}{x-n} \right) \sum_{i=1}^n W_i \right)$$

where:

W_i = weighting factor (Table 1) for dowel i

x = number of dowels in a single joint

n = number of dowels excluded from the joint score calculation due to measurement interference

Single Dowel Misalignment – The degree of misalignment applicable to a single dowel bar, calculated as:

$$\text{Single Dowel Misalignment} = \sqrt{(\text{Horizontal Skew})^2 + (\text{Vertical Tilt})^2}$$

Table 1. Weighting Factors in Joint Score Determination	
Single Dowel Bar Misalignment (SDM)	W, Weighting Factor
SDM ≤ 0.6 in. (15 mm)	0
0.6 in. (15 mm) < SDM ≤ 0.8 in. (20 mm)	2
0.8 in. (20 mm) < SDM ≤ 1 in. (25 mm)	4
1 in. (25 mm) < SDM ≤ 1.5 in. (38 mm)	5
1.5 in. (38 mm) < SDM	10

The quality control tolerance for vertical tilt or horizontal skew shall not exceed 0.6 in. (15 mm). If the tolerance is exceeded for either one, adjustments shall be made to the paving operation.

Any joint having a dowel bar with a vertical tilt or horizontal skew greater than 1.5 in. (38 mm) shall be cut. If more than one dowel bar is required to be cut in the joint, the joint will be considered unacceptable and shall be replaced with a minimum of 6 ft (1.8 m) of pavement centered over the joint according to Section 442 for Class B patches.

Single dowel bar misalignment shall be controlled to provide the joint scores shown in the following table.

Number of Dowel Bars in the Joint	Maximum Joint Score
< 5	4
≥ 5 but ≤ 9	8
> 9	12

A joint score greater than the specified maximum will be considered locked. Three consecutive joints with a score greater than the specified maximum total score will all be considered unacceptable.

Three consecutive locked joints shall be corrected by selecting one joint and cutting a dowel bar. Preference shall be given to cutting a dowel bar within the middle 2.5 ft (0.8 m) of the pavement lane to avoid the wheelpaths. If none of the three locked joints will have a joint score less than or equal to the specified maximum after selecting one dowel bar to cut, one of the joints shall be replaced with a minimum of 6 ft (1.8 m) of pavement centered over the joint according to Section 442 for Class B patches.

(e.) For unacceptable work, the Contractor may propose alternative repairs for consideration by the Engineer.

2. Testing of Dowel Bar Placement. The placement of the dowel bars shall be tested within 24 hours of paving with a calibrated MIT Scan-2 device according to "Use of Magnetic Tomography Technology to Evaluate Dowel Placement" (Publication No. FHWA-IF-06-006) by the Federal Highway Administration.

A trained operator shall perform the testing, and all testing shall be performed in the presence of the Engineer. The device shall be calibrated to the type and size dowel bar used in the work according to the manufacturer's instructions. Calibration documentation shall be provided to the Engineer prior to construction. The device shall be recalibrated and/or validate readings as required by the Engineer. The device may be utilized as a process control and make necessary adjustments to ensure the dowel bars are placed in the correct location.

(a.) Test Section. Prior to start of production paving, a test section consisting of 30 transverse joints shall be constructed. The test section may be performed on the actual pavement, but production paving shall not begin until an acceptable test section has been constructed. The test section will be considered acceptable when all of the following are met:

- (1.) 90 percent of the dowel bars meet the quality control tolerance for longitudinal, horizontal, or vertical translation (mislocation);

- (2.) 90 percent of the dowel bars meet the quality control tolerance for vertical tilt or horizontal skew deviation (misalignment); and
- (3.) none of the joints are considered unacceptable prior to a corrective measure for mislocation or misalignment.

If the test section fails, another test section consisting of 30 joints shall be constructed.

The test section requirement may be waived by the Engineer if the Contractor has constructed an acceptable test section and successfully used the DBI on a Department contract within the same calendar year.

- (b.) Production Paving. After the test section is approved, production paving may begin. The mislocation and misalignment of each dowel bar for the first ten joints constructed, and every tenth joint thereafter, shall be tested.

If two consecutive days of paving result in 5 percent or more of the joints on each day being unacceptable prior to a corrective measure, production paving shall be discontinued and a new test section shall be constructed.

If any joint is found to be unacceptable prior to a corrective measure, testing of additional joints on each side of the unacceptable joint shall be performed until acceptable joints are found.

- (c.) Test Report. Test reports shall be provided to the Engineer within two working days of completing each day's testing. The test report shall include the following.

- (1.) Contract number, placement date, county-route-section, direction of traffic, scan date, Contractor, and name of individual performing the tests.
- (2.) Provide the standard report generated from the on-board printer of the imaging technology used for every dowel and joint measured.
- (3.) For every dowel measured, provide the joint identification number, lane number and station, dowel bar number or x-location, direction of testing and reference joint location/edge location, longitudinal translation, horizontal translation, vertical translation, vertical tilt, and horizontal skew.
- (4.) Identify each dowel bar with a maximum longitudinal, horizontal, or vertical translation that has been exceeded. Identify each dowel bar with a maximum vertical tilt or horizontal skew deviation that has been exceeded.

- (5.) Joint Score Details: Provide the joint identification number, lane number, station, and calculated joint score for each joint.
- (6.) Locked Joint Identification: Identify each joint with a joint score > 12.
- (d.) Exclusions. Exclude the following from dowel bar mislocation and misalignment measurements.
- (1.) Transverse construction joints (headers).
 - (2.) Dowel bars within 24 in. (610 mm) of metallic manholes, inlets, metallic castings, or other nearby or underlying steel reinforced objects.
 - (3.) The outside dowel bar when tie bars are installed with mechanical equipment in fresh concrete. For tie bar installations involving preformed or drilled holes, installation shall be performed after testing with the MIT Scan-2 device.
 - (4.) Joints located directly under high voltage power lines.
 - (5.) Subject to the approval of the Engineer, any other contributors to magnetic interference.
- (e.) Deficiency Deduction. When the Contractor has cut 25 dowel bars to correct unacceptable joints, the Contractor shall be liable and shall pay to the Department a deficiency deduction of \$500.00 for the cost of the bars. Thereafter, an additional deficiency deduction of \$20.00 for each additional bar cut will be assessed.”

Add the following to Section 1103 of the Standard Specifications.

“1103.20 Mechanical Dowel Bar Inserter. The mechanical dowel bar inserter (DBI) shall be self-contained and supported on the formless paver with the ability to move separately from the paver. The DBI shall be equipped with insertion forks along with any other devices necessary for finishing the concrete the full width of the pavement. The insertion forks shall have the ability to vibrate at a minimum frequency of 3000 VPM.”

HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)

Effective: January 1, 2010

Revised: April 1, 2016

Description. This work shall consist of testing the density of longitudinal joints as part of the quality control/quality assurance (QC/QA) of hot-mix asphalt (HMA). Work shall be according to Section 1030 of the Standard Specifications except as follows.

Quality Control/Quality Assurance (QC/QA). Delete the second and third sentence of the third paragraph of Article 1030.05(d)(3) of the Standard Specifications.

Add the following paragraphs to the end of Article 1030.05(d)(3) of the Standard Specifications:

“Longitudinal joint density testing shall be performed at each random density test location. Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 4 in. (100 mm), from each pavement edge. (i.e. for a 5 in. (125 mm) lift the near edge of the density gauge or core barrel shall be within 5 in. (125 mm) from the edge of pavement.) Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.

b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced 10 ft (3 m) apart longitudinally along the unconfined pavement edge and centered at the random density test location.”

Revise the Density Control Limits table in Article 1030.05(d)(4) of the Standard Specifications to read:

Mixture Composition	Parameter	Individual Test (includes confined edges)	Unconfined Edge Joint Density Minimum
IL-4.75	Ndesign = 50	93.0 – 97.4% ^{1/}	91.0%
IL-9.5	Ndesign = 90	92.0 – 96.0%	90.0%
IL-9.5,IL-9.5L	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0	Ndesign = 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L	Ndesign < 90	93.0 ^{2/} – 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%”

HOT-MIX ASPHALT – TACK COAT (BDE)

Effective: November 1, 2016

Revise Article 1032.06(a) of the Standard Specifications to read:

“(a) Anionic Emulsified Asphalt. Anionic emulsified asphalts shall be according to AASHTO M 140. SS-1h emulsions used as a tack coat shall have the cement mixing test waived.”

PAVEMENT MARKING REMOVAL (BDE)

Effective: July 1, 2016

Revise Article 783.02 of the Standard Specifications to read:

“783.02 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Grinders (Note 1)	
(b) Water Blaster with Vacuum Recovery	1101.12

Note 1. Grinding equipment shall be approved by the Engineer.”

Revise the first paragraph of Article 783.03 of the Standard Specifications to read:

“783.03 Removal of Conflicting Markings. Existing pavement markings that conflict with revised traffic patterns shall be removed. If darkness or inclement weather prohibits the removal operations, such operations shall be resumed the next morning or when weather permits. In the event of removal equipment failure, such equipment shall be repaired, replaced, or leased so removal operations can be resumed within 24 hours.”

Revise the first and second sentences of the first paragraph of Article 783.03(a) of the Standard Specifications to read:

“The existing pavement markings shall be removed by the method specified and in a manner that does not materially damage the surface or texture of the pavement or surfacing. Small particles of tightly adhering existing markings may remain in place, if in the opinion of the Engineer, complete removal of the small particles will result in pavement surface damage.”

Revise the first paragraph of Article 783.04 of the Standard Specifications to read:

“783.04 Cleaning. The roadway surface shall be cleaned of debris or any other deleterious material by the use of compressed air or water blast.”

Revise the first paragraph of Article 783.06 of the Standard Specifications to read:

“783.06 Basis of Payment. This work will be paid for at the contract unit price per each for RAISED REFLECTIVE PAVEMENT MARKER REMOVAL, or at the contract unit price per square foot (square meter) for PAVEMENT MARKING REMOVAL – GRINDING and/or PAVEMENT MARKING REMOVAL – WATER BLASTING.”

Delete Article 1101.13 from the Standard Specifications.

PROGRESS PAYMENTS (BDE)

Effective: November 2, 2013

Revise Article 109.07(a) of the Standard Specifications to read:

“(a) Progress Payments. At least once each month, the Engineer will make a written estimate of the quantity of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than \$1000.00 will be approved for payment other than the final payment.

Progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics’ Lien Act, 770 ILCS 60/23(c).

If a Contractor or subcontractor has defaulted on a loan issued under the Department’s Disadvantaged Business Revolving Loan Program (20 ILCS 2705/2705-610), progress payments may be reduced pursuant to the terms of that loan agreement. In such cases, the amount of the estimate related to the work performed by the Contractor or subcontractor, in default of the loan agreement, will be offset, in whole or in part, and vouchered by the Department to the Working Capital Revolving Fund or designated escrow account. Payment for the work shall be considered as issued and received by the Contractor or subcontractor on the date of the offset voucher. Further, the amount of the offset voucher shall be a credit against the Department’s obligation to pay the Contractor, the Contractor’s obligation to pay the subcontractor, and the Contractor’s or subcontractor’s total loan indebtedness to the Department. The offset shall continue until such time as the entire loan indebtedness is satisfied. The Department will notify the Contractor and Fund Control Agent in a timely manner of such offset. The Contractor or subcontractor shall not be entitled to additional payment in consideration of the offset.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved.”

TRAINING SPECIAL PROVISIONS (BDE)

Effective: October 15, 1975

This Training Special Provision supersedes Section 7b of the Special Provision entitled “Specific Equal Employment Opportunity Responsibilities,” and is in implementation of 23 U.S.C. 140(a).

As part of the Contractor’s equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be 1. In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The Contractor shall provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

Method of Measurement. The unit of measurement is in hours.

Basis of Payment. This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price, and total price have been included in the schedule of prices.

IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION (TPG)

Effective: August 1, 2012

Revised: February 1, 2014

In addition to the Contractor's equal employment opportunity affirmative action efforts undertaken as elsewhere required by this Contract, the Contractor is encouraged to participate in the incentive program to provide additional on-the-job training to certified graduates of IDOT funded pre-apprenticeship training programs outlined by this Special Provision.

It is the policy of IDOT to fund IDOT pre-apprenticeship training programs throughout Illinois to provide training and skill-improvement opportunities to assure the increased participation of minority groups, disadvantaged persons and women in all phases of the highway construction industry. The intent of this IDOT Training Program Graduate (TPG) Special Provision is to place certified graduates of these IDOT funded pre-apprentice training programs on IDOT project sites when feasible, and provide the graduates with meaningful on-the-job training intended to lead to journey-level employment. IDOT and its sub-recipients, in carrying out the responsibilities of a state contract, shall determine which construction contracts shall include "Training Program Graduate Special Provisions." To benefit from the incentives to encourage the participation in the additional on-the-job training under this Training Program Graduate Special Provision, the Contractor shall make every reasonable effort to employ certified graduates of IDOT funded Pre-apprenticeship Training Programs to the extent such persons are available within a reasonable recruitment area.

Participation pursuant to IDOT's requirements by the Contractor or subcontractor in this Training Program Graduate (TPG) Special Provision entitles the Contractor or subcontractor to be reimbursed at \$15.00 per hour for training given a certified TPG on this contract. As approved by the Department, reimbursement will be made for training persons as specified herein. This reimbursement will be made even though the Contractor or subcontractor may receive additional training program funds from other sources for other trainees, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving other reimbursement. For purposes of this Special Provision the Contractor is not relieved of requirements under applicable federal law, the Illinois Prevailing Wage Act, and is not eligible for other training fund reimbursements in addition to the Training Program Graduate (TPG) Special Provision reimbursement.

No payment shall be made to the Contractor if the Contractor or subcontractor fails to provide the required training. It is normally expected that a TPG will begin training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project through completion of the contract, so long as training opportunities exist in his work classification or until he has completed his training program. Should the TPG's employment end in advance of the completion of the contract, the Contractor shall promptly notify the designated IDOT staff member under this Special Provision that the TPG's involvement in the contract has ended and supply a written report of the reason for the end of the involvement, the hours completed by the TPG under the Contract and the number of hours for which the incentive payment provided under this Special Provision will be or has been claimed for the TPG.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting its performance under this Special Provision.

METHOD OF MEASUREMENT: The unit of measurement is in hours.

BASIS OF PAYMENT: This work will be paid for at the contract unit price of \$15.00 per hour for certified TRAINEES TRAINING PROGRAM GRADUATE. The estimated total number of hours, unit price and total price have been included in the schedule of prices.

The Contractor shall provide training opportunities aimed at developing full journeyworker in the type of trade or job classification involved. The initial number of TPGs for which the incentive is available under this contract is 1. During the course of performance of the Contract the Contractor may seek approval from the Department for additional incentive eligible TPGs. In the event the Contractor subcontracts a portion of the contract work, it shall determine how many, if any, of the TPGs are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Special Provision. The Contractor shall also insure that this Training Program Graduate Special Provision is made applicable to such subcontract if the TPGs are to be trained by a subcontractor and that the incentive payment is passed on to each subcontractor.

For the Contractor to meet the obligations for participation in this TPG incentive program under this Special Provision, the Department has contracted with several entities to provide screening, tutoring and pre-training to individuals interested in working in the applicable construction classification and has certified those students who have successfully completed the program and are eligible to be TPGs. A designated IDOT staff member, the Director of the Office of Business and Workforce Diversity (OBWD), will be responsible for providing assistance and referrals to the Contractor for the applicable TPGs. For this contract, the Director of OBWD is designated as the responsible IDOT staff member to provide the assistance and referral services related to the placement for this Special Provision. For purposes of this Contract, contacting the Director of OBWD and interviewing each candidate he/she recommends constitutes reasonable recruitment.

Prior to commencing construction, the Contractor shall submit to the Department for approval the TPGs to be trained in each selected classification. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. No employee shall be employed as a TPG in any classification in which he/she has successfully completed a training course leading to journeyman status or in which he/she has been employed as a journeyman. Notwithstanding the on-the-job training purpose of this TPG Special Provision, some offsite training is permissible as long as the offsite training is an integral part of the work of the contract and does not comprise a significant part of the overall training.

Training and upgrading of TPGs of IDOT pre-apprentice training programs is intended to move said TPGs toward journeyman status and is the primary objective of this Training Program Graduate Special Provision. Accordingly, the Contractor shall make every effort to enroll TPGs by recruitment through the IDOT funded TPG programs to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that it has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance and entitled to the Training Program Graduate Special Provision \$15.00 an hour incentive.

The Contractor or subcontractor shall provide each TPG with a certificate showing the type and length of training satisfactorily completed.

TUBULAR MARKERS (BDE)

Effective: January 1, 2017

Revise Article 701.03(j) of the Standard Specifications to read:

“(j) Tubular Markers 1106.02”

Revise Article 701.15(g) of the Standard Specifications to read:

“(g) Tubular Markers. Tubular markers are used to channelize traffic. They shall only be used when specified.”

Revise the second paragraph of Article 701.18(f) of the Standard Specifications to read:

“Devices no greater than 24 in. (600 mm) wide, may be used in place of tubular markers when the two-way operation is to be in place four days or less.”

Revise the second sentence of the second paragraph of Article 1106.02 of the Standard Specifications to read:

“These include cones, tubular markers, and plastic drums with no attachments.”

Revise the third sentence of the seventh paragraph of Article 1106.02 of the Standard Specifications to read:

“Sheeting used on cones, drums, and tubular markers shall be reboundable as tested according to ASTM D 4956.”

Revise Article 1106.02(f) of the Standard Specifications to read:

“(f) Tubular Markers. Tubular Markers shall be designed to bend under repeated impacts and return to an upright position without damage to the impacting vehicle or the markers. The markers shall be readily removable from the bases to permit field replacement.

The markers shall be orange in color having two white and two fluorescent orange bands.”

WARM MIX ASPHALT (BDE)

Effective: January 1, 2012

Revised: April 1, 2016

Description. This work shall consist of designing, producing and constructing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) at the Contractor’s option. Work shall be according to Sections 406, 407, 408, 1030, and 1102 of the Standard Specifications, except as modified herein. In addition, any references to HMA in the Standard Specifications, or the special provisions shall be construed to include WMA.

WMA is an asphalt mixture which can be produced at temperatures lower than allowed for HMA utilizing approved WMA technologies. WMA technologies are defined as the use of additives or processes which allow a reduction in the temperatures at which HMA mixes are produced and placed. WMA is produced by the use of additives, a water foaming process, or combination of both. Additives include minerals, chemicals or organics incorporated into the asphalt binder stream in a dedicated delivery system. The process of foaming injects water into the asphalt binder stream, just prior to incorporation of the asphalt binder with the aggregate.

Approved WMA technologies may also be used in HMA provided all the requirements specified herein, with the exception of temperature, are met. However, asphalt mixtures produced at temperatures in excess of 275 °F (135 °C) will not be considered WMA when determining the grade reduction of the virgin asphalt binder grade.

Equipment.

Revise the first paragraph of Article 1102.01 of the Standard Specifications to read:

“1102.01 Hot-Mix Asphalt Plant. The hot-mix asphalt (HMA) plant shall be the batch-type, continuous-type, or dryer drum plant. The plants shall be evaluated for prequalification rating and approval to produce HMA according to the current Bureau of Materials and Physical Research Policy Memorandum, “Approval of Hot-Mix Asphalt Plants and Equipment”. Once approved, the Contractor shall notify the Bureau of Materials and Physical Research to obtain approval of all plant modifications. The plants shall not be used to produce mixtures concurrently for more than one project or for private work unless permission is granted in writing by the Engineer. The plant units shall be so designed, coordinated and operated that they will function properly and produce HMA having uniform temperatures and compositions within the tolerances specified. The plant units shall meet the following requirements.”

Add the following to Article 1102.01(a) of the Standard Specifications.

“(11) Equipment for Warm Mix Technologies.

- a. Foaming. Metering equipment for foamed asphalt shall have an accuracy of ± 2 percent of the actual water metered. The foaming control system shall be electronically interfaced with the asphalt binder meter.
- b. Additives. Additives shall be introduced into the plant according to the supplier's recommendations and shall be approved by the Engineer. The system for introducing the WMA additive shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes.”

Mix Design Verification.

Add the following to Article 1030.04 of the Standard Specifications.

“(e) Warm Mix Technologies.

- (1) Foaming. WMA mix design verification will not be required when foaming technology is used alone (without WMA additives). However, the foaming technology shall only be used on HMA designs previously approved by the Department.
- (2) Additives. WMA mix designs utilizing additives shall be submitted to the Engineer for mix design verification.”

Construction Requirements.

Revise the second paragraph of Article 406.06(b)(1) of the Standard Specifications to read:

“The HMA shall be delivered at a temperature of 250 to 350 °F (120 to 175 °C). WMA shall be delivered at a minimum temperature of 215 °F (102 °C).”

Basis of Payment.

This work will be paid at the contract unit price bid for the HMA pay items involved. Anti-strip will not be paid for separately, but shall be considered as included in the cost of the work.

WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012

Revised: April 2, 2015

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Monday through Sunday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

FUEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID)

Effective: April 1, 2009

Revised: July 1, 2015

Description. Fuel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in fuel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name and sign and date the form shall make this contract exempt of fuel cost adjustments for all categories of work. Failure to indicate "Yes" for any category of work will make that category of work exempt from fuel cost adjustment.

General. The fuel cost adjustment shall apply to contract pay items as grouped by category. The adjustment shall only apply to those categories of work checked "Yes", and only when the cumulative plan quantities for a category exceed the required threshold. Adjustments to work items in a category, either up or down, and extra work paid for by agreed unit price will be subject to fuel cost adjustment only when the category representing the added work was subject to the fuel cost adjustment. Extra work paid for at a lump sum price or by force account will not be subject to fuel cost adjustment. Category descriptions and thresholds for application and the fuel usage factors which are applicable to each are as follows:

(a) Categories of Work.

- (1) Category A: Earthwork. Contract pay items performed under Sections 202, 204, and 206 including any modified standard or nonstandard items where the character of the work to be performed is considered earthwork. The cumulative total of all applicable item plan quantities shall exceed 25,000 cu yd (20,000 cu m). Included in the fuel usage factor is a weighted average 0.10 gal/cu yd (0.50 liters/cu m) factor for trucking.
- (2) Category B: Subbases and Aggregate Base Courses. Contract pay items constructed under Sections 311, 312 and 351 including any modified standard or nonstandard items where the character of the work to be performed is considered construction of a subbase or aggregate, stabilized or modified base course. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is a 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.
- (3) Category C: Hot-Mix Asphalt (HMA) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 355, 406, 407 and 482 including any modified standard or nonstandard items where the character of the work to be performed is considered HMA bases, pavements and shoulders. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.
- (4) Category D: Portland Cement Concrete (PCC) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 353, 420, 421 and 483 including any modified standard or nonstandard items where the character of the work to be performed is considered PCC base, pavement or shoulder. The cumulative total of all applicable item plan quantities shall exceed 7500 sq yd (6000 sq m). Included in the fuel usage factor is 1.20 gal/cu yd (5.94 liters/cu m) factor for trucking.
- (5) Category E: Structures. Structure items having a cumulative bid price that exceeds \$250,000 for pay items constructed under Sections 502, 503, 504, 505, 512, 516 and 540 including any modified standard or nonstandard items where the character of the work to be performed is considered structure work when similar to that performed under these sections and not included in categories A through D.

(b) Fuel Usage Factors.

English Units		
Category	Factor	Units
A - Earthwork	0.34	gal / cu yd
B – Subbase and Aggregate Base courses	0.62	gal / ton
C – HMA Bases, Pavements and Shoulders	1.05	gal / ton
D – PCC Bases, Pavements and Shoulders	2.53	gal / cu yd
E – Structures	8.00	gal / \$1000

Metric Units		
Category	Factor	Units
A - Earthwork	1.68	liters / cu m
B – Subbase and Aggregate Base courses	2.58	liters / metric ton
C – HMA Bases, Pavements and Shoulders	4.37	liters / metric ton
D – PCC Bases, Pavements and Shoulders	12.52	liters / cu m
E – Structures	30.28	liters / \$1000

(c) Quantity Conversion Factors.

Category	Conversion	Factor
B	sq yd to ton	0.057 ton / sq yd / in depth
	sq m to metric ton	0.00243 metric ton / sq m / mm depth
C	sq yd to ton	0.056 ton / sq yd / in depth
	sq m to metric ton	0.00239 m ton / sq m / mm depth
D	sq yd to cu yd	0.028 cu yd / sq yd / in depth
	sq m to cu m	0.001 cu m / sq m / mm depth

Method of Adjustment. Fuel cost adjustments will be computed as follows.

$$CA = (FPI_P - FPI_L) \times FUF \times Q$$

Where: CA = Cost Adjustment, \$
 FPI_P = Fuel Price Index, as published by the Department for the month the work is performed, \$/gal (\$/liter)
 FPI_L = Fuel Price Index, as published by the Department for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, \$/gal (\$/liter)
 FUF = Fuel Usage Factor in the pay item(s) being adjusted
 Q = Authorized construction Quantity, tons (metric tons) or cu yd (cu m)

The entire FUF indicated in paragraph (b) will be used regardless of use of trucking to perform the work.

Basis of Payment. Fuel cost adjustments may be positive or negative but will only be made when there is a difference between the FPI_L and FPI_P in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(FPI_L - FPI_P) \div FPI_L\} \times 100$$

Fuel cost adjustments will be calculated for each calendar month in which applicable work is performed; and will be paid or deducted when all other contract requirements for the items of work are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Return With Bid

**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**OPTION FOR
FUEL COST ADJUSTMENT**

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of fuel cost adjustments in all categories. Failure to indicate "Yes" for any category of work at the time of bid will make that category of work exempt from fuel cost adjustment. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans for the following categories of work?

- | | | |
|--|-----|--------------------------|
| Category A Earthwork. | Yes | <input type="checkbox"/> |
| Category B Subbases and Aggregate Base Courses | Yes | <input type="checkbox"/> |
| Category C HMA Bases, Pavements and Shoulders | Yes | <input type="checkbox"/> |
| Category D PCC Bases, Pavements and Shoulders | Yes | <input type="checkbox"/> |
| Category E Structures | Yes | <input type="checkbox"/> |

Signature: _____ **Date:** _____

STEEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID)

Effective: April 2, 2004

Revised: July 1, 2015

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)
Structural Steel
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in have a contract value of \$10,000 or greater.

The adjustments shall apply to the above items when they are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply when the item is added as extra work and paid for at a lump sum price or by force account.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.
- (b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in lb (kg)
D = price factor, in dollars per lb (kg)

$$D = MPI_M - MPI_L$$

Where: MPI_M = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

MPI_L = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price,. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the MPI_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the MPI_L and MPI_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Mesh Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 - 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 - 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 - 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 - 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 - 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 - 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 - 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)

Return With Bid

**ILLINOIS DEPARTMENT
OF TRANSPORTATION**

**OPTION FOR
STEEL COST ADJUSTMENT**

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name: _____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans for the following items of work?

- | | | |
|--|-----|--------------------------|
| Metal Piling | Yes | <input type="checkbox"/> |
| Structural Steel | Yes | <input type="checkbox"/> |
| Reinforcing Steel | Yes | <input type="checkbox"/> |
| Dowel Bars, Tie Bars and Mesh Reinforcement | Yes | <input type="checkbox"/> |
| Guardrail | Yes | <input type="checkbox"/> |
| Steel Traffic Signal and Light Poles, Towers and Mast Arms | Yes | <input type="checkbox"/> |
| Metal Railings (excluding wire fence) | Yes | <input type="checkbox"/> |
| Frames and Grates | Yes | <input type="checkbox"/> |

Signature: _____ **Date:** _____

UPRR ENTRY & INSURANCE REQUIREMENTS

APPLICATION – RIGHT OF ENTRY

(Please allow 30-45 days for processing)

1. Name of Licensee
(Exact Name of the Owner of the Utility)
State of Incorporation _____; if not incorporated, please list entity's legal status

2. Address, email, phone and Fax number of Licensee

Email	Phone	Fax
-------	-------	-----

3. Name, address and phone number of individual to whom agreement is to be mailed
if different than Item 2.

4. Contact information for individual to contact in the event of questions.

Email	Phone	Fax
-------	-------	-----

5. Project site location:

(City, County and State)

6. Railroad site location information:

(Railroad Mile Post, Subdivision, or any other pertinent location detail.)

7. Time period for your project use of Railroad Company's property:
Start Date: _____ Stop Date: _____

8. Will there be any activity or equipment within 25 feet of a Railroad track
in connection with this property?
() No () Yes *(If Yes, a Flagman will be required on site at your cost.)*

9. Will there be any excavation involved?
() No () Yes *(If Yes, include shoring plans within Railroad standards.)*

10. Purpose of your request:

(This must be detailed & complete; attach engineering plans, shoring plans and any pertinent supporting details, including maps or prints.)

- Additional Fees and charges may be applicable to your request. These changes cannot be determined until your project is approved.

**UNION PACIFIC RAILROAD
1400 DOUGLAS STREET MS 1690
OMAHA NE 68179**

Contract 60K80: UP over IL Route 132 (Grand Ave) e/o US Route 41, Gurnee, IL
RAILROAD PROTECTIVE LIABILITY INSURANCE (5 AND 10) (BDE)

Revised: January 1, 2006

Description. Railroad Protective Liability and Property Damage Liability Insurance shall be carried according to Article 107.11 of the Standard Specifications, except the limits shall be a minimum of \$5,000,000 combined single limit per occurrence for bodily injury liability and property damage liability with an aggregate limit of \$10,000,000 over the life of the policy. A separate policy is required for each railroad unless otherwise noted.

NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
<u>UP over IL Route 132 in Gurnee</u>		
Union Pacific Railroad Finance/Insurance, Mail Stop 1870 1400 Douglas Street Omaha, NE 68179	-0-	23 trains/day @ 40mph
DOT/AAR No.: 176 813A RR Division: Wisconsin	RR Mile Post: 37.76 RR Sub-Division: New Line	
For Freight/Passenger Information Contact:	<u>Richard Ellison</u>	Phone: <u>312-777-2048</u>
For Insurance Information Contact:	<u>Connie Prokupek</u>	Phone: <u>402-544-2215</u>

Approval of Insurance. The original and one certified copy of each required policy shall be submitted to the following address for approval:

Illinois Department of Transportation
 Bureau of Design and Environment
 2300 South Dirksen Parkway, Room 326
 Springfield, Illinois 62764

The Contractor will be advised when the Department has received approval of the insurance from the railroad(s). Before any work begins on railroad right-of-way, the Contractor shall submit to the Engineer evidence that the required insurance has been approved by the railroad(s). The Contractor shall also provide the Engineer with the expiration date of each required policy.

Basis of Payment. Providing Railroad Protective Liability and Property Damage Liability Insurance will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.
 80157

EXHIBIT D

TO PUBLIC ROAD CROSSING OVERPASS/UNDERPASS AGREEMENT

MINIMUM CONSTRUCTION REQUIREMENTS

1.01 DESCRIPTION

This project includes construction work within the right-of-way and/or properties of the Union Pacific Railroad Company ("UPRR") and adjacent to its tracks, wire lines and other facilities. This section describes the minimum special requirements for coordination with UPRR when work by the Contractor will be performed upon, over or under the UPRR right-of-way or may impact current or future UPRR operations. The Contractor will coordinate with UPRR while performing the work outlined in this Contract, and shall afford the same cooperation with UPRR as it does with the Agency. All submittals and work shall be completed in accordance with UPRR Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the UPRR Designated Representative.

For purposes of this project, the UPRR Designated Representative shall be the person or persons designated by the UPRR Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 DEFINITION OF AGENCY AND CONTRACTOR

As used in these UPRR requirements, the term "Agency" shall mean the Political Body.

As used in these UPRR requirements, the term "Contractor" shall mean the contractor or contractor's hired by the Agency to perform any project work on any portion of UPRR's property and shall also include the contractor's subcontractor's and the contractor's and subcontractor's respective officer, agents and employees, and others acting under its or their authority.

1.03 UPRR CONTACTS

The primary UPRR point of contact for this project is:

*Richard Ellison
101 N Wacker Drive
Suite 1920
Chicago, IL 60606
312-777-2048*

For UPRR flagging services and track work, contact:

*Daryl Clark
708-649-5273*

1.04 REQUEST FOR INFORMATION / CLARIFICATION

All Requests for Information ("RFI") involving work within any UPRR right-of-way shall be in accordance with the procedures listed elsewhere in these bid documents. All RFI's shall be submitted to the Engineer of Record. The Engineer of Record will submit the RFI to the UPRR Designated Representative for review and approval for RFI's corresponding to work within the UPRR right-of-way. The Contractor shall allow four (4) weeks for the review and approval process by UPRR.

1.05 PLANS / SPECIFICATIONS

The plans and specifications for this project, affecting the UPRR, are subject to the written approval by the UPRR and changes in the plans may be required after award of the Contract. Such changes are subject to the approval of the Agency and the UPRR.

1.06 UTILITIES AND FIBER OPTICS

ALL INSTALLATIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CURRENT AREMA RECOMMENDATIONS AND UPRR SPECIFICATIONS AND REQUIREMENTS. UPRR GENERAL GUIDELINES AND THE REQUIRED APPLICATION FORMS FOR UTILITY INSTALLATIONS CAN BE FOUND ON THE UPRR WEBSITE AT UPRR.COM.

1.07 GENERAL

A. Contractor shall perform all its work in compliance with all applicable UPRR and FRA rules and regulations. Contractor shall arrange and conduct its work in such manner and at such times as shall not endanger or interfere with the safe operation of the tracks and property of UPRR and the traffic moving on such tracks, or the wires, signals and other property of UPRR, its tenants or licensees, at or in the vicinity of the Work. UPRR shall be reimbursed by Contractor or Agency for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities will be permitted within 12 feet of the operational tracks only if absolutely necessary and UPRR's Designated Representative grants approval. Construction activities within 12 feet of the operational track(s) must allow the tracks to stay operational.

C. Track protection is required for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail.

D. The Contractor is also advised that new railroad facilities within the project may be built by UPRR and that certain Contractor's activities cannot proceed until that work is completed. The Contractor shall be aware of the limits of responsibilities and allow sufficient time in the schedule for that work to be accomplished and shall coordinate its efforts with the UPRR.

1.08 RAILROAD OPERATIONS

A. The Contractor shall be advised that trains and/or equipment are expected on any track, at any time, in either direction. Contractor shall be familiar with the train schedules in this location and structure its bid assuming intermittent track windows in this period, as defined in Paragraph B below.

B. All railroad tracks within and adjacent to the Contract Site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. The Contractor shall coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Work windows for this Contract shall be coordinated with the Agency's and the UPRR's Designated Representatives. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and adjacent to the railroad tracks within 25 feet of the nearest track, a UPRR flag person will be required. At the direction of the UPRR flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the UPRR Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. **Absolute Work Window.** An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window the railroad tracks and/or signals must be completely operational for train operations and all UPRR, Public Utilities Commission (PUC) and Federal Railroad Administration (FRA) requirements, codes and regulations for operational tracks must be complied with. In the situation where the operating tracks and/or signals have been affected, the UPRR will perform inspections of the work prior to placing that track back into service. UPRR flag persons will be required for construction activities requiring an Absolute Work Window. **Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for UPRR review.**

1.09 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Prior to beginning any work on or over the property of, or affecting the facilities of, the UPRR, the Contractor shall enter into an agreement with the UPRR in the form of the "Contractor's Right of Entry Agreement", attached as **Exhibit E**, or latest version thereof provided by the UPRR. There is a fee for processing of the agreement. This cost shall be borne by the Contractor. Contractor shall submit a copy of the executed agreement and the insurance policies, binders, certificates and endorsements set forth therein to the Agency prior to commencing work on UPRR property. The right of entry agreement shall specify working time frames, flagging and inspection requirements, and any other items specified by the UPRR.

B. The Contractor shall give the advance notice to the UPRR as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over UPRR's right-of-way and shall observe UPRR's rules and regulations with respect thereto.

C. All work upon UPRR's right-of-way shall be done at such times and in such manner as not to interfere with or endanger the operations of UPRR. Whenever work may affect the operations or safety of trains, the method of doing such work shall first be submitted to UPRR's Designated Representative for approval, but such approval shall not relieve the Contractor from liability. Any work to be performed by the Contractor, which requires flagging service or inspection service, shall be deferred until the flagging protection required by UPRR is available at the job site. See Section 3.18 for railroad flagging requirements.

D. The Contractor shall make requests in writing for both Absolute and Conditional Work Windows, at least two weeks in advance of any work. The written request must include:

1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

The Contractor shall provide a written confirmation notice to the UPRR at least 48 hours before commencing work in connection with approved work windows when work will be performed within **25 feet of any track center line**. All work shall be performed in accordance with previously approved work plans.

E. Should a condition arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of UPRR, the Contractor shall make such provisions. If in the judgment of UPRR's Designated Representative such provisions are insufficient, the UPRR's Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the UPRR. UPRR or the Agency shall have the right to order Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the UPRR's Designated Representative, the Contractor's operations could endanger UPRR's operations. In the event such an order is given, Contractor shall immediately notify the Agency of the order.

1.10 INSURANCE

Contractor shall not begin work upon or over UPRR's right-of-way until UPRR has been furnished the insurance policies, binders, certificates and endorsements required by the "Contractor's Right-of-Entry Agreement" and UPRR's Designated Representative has advised the Agency that such insurance is in accordance with the Agreement. The required insurance shall be kept in full force and effect during the performance of work and thereafter until Contractor removes all tools, equipment, and material from UPRR's property and cleans the premises in a manner reasonably satisfactory to UPRR.

1.11 RAILROAD SAFETY ORIENTATION

All personnel employed by the Contractor and all subcontractors must complete the UPRR course "Orientation for Contractor's Safety", and be registered prior to working on UPRR property. This orientation is available at www.contractororientation.com. This course is required to be completed annually.

1.12 COOPERATION

UPRR will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of UPRR's right-of-way in performing the work.

1.13 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

The Contractor shall abide by the following minimum temporary clearances during the course of construction:

- A. 12' - 0" horizontal from centerline of track
- B. 21' - 0" vertically above top of rail.

For construction clearance less than listed above, local Operating Unit review and approval is required.

1.14 APPROVAL OF REDUCED CLEARANCES

- A. The minimum track clearances to be maintained by the Contractor during construction are specified in Section 3.07 herein. B.

Any proposed infringement on the specified minimum clearances due to the Contractor's operations shall be submitted to UPRR's Designated Representative through the Agency at least 30 days in advance of the work and shall not be undertaken until approved in writing by the UPRR's Designated Representative.

- C. No work shall commence until the Contractor receives in writing assurance from UPRR's Designated Representative that arrangements have been made for flagging service, as may be necessary and receives permission from UPRR's Designated Representative to proceed with the work.

1.15 CONSTRUCTION AND AS-BUILT SUBMITTALS

- A. Submittals are required for construction materials and procedures as outlined below. The submittals shall include all review comments from the Agency and the Engineer of Record. All design submittals shall be stamped and signed by a Professional Engineer registered in the State of Illinois.

B. The tables below provide UPRR's minimum submittal requirements for the construction items noted. Submittal requirements are in addition to those specified elsewhere in these bid documents. The minimum review times indicated below represent UPRR's requirements only. The Contractor shall allow additional time for the Agency's review time as stated elsewhere in these bid documents.

- C. Submittals shall be made by the Agency to the UPRR Manager of Industry and Public Projects unless otherwise directed by the Railroad. Items in Table 1 shall be submitted for both railroad overpass and underpass projects, as applicable. Items in Table 2 shall be submitted for railroad underpass projects only.

TABLE 1

ITEM	DESCRIPTION	SETS REQD.	UPRR's Minimum Review Time
1	Shoring design and details	4	4 weeks
2	Falsework design and details	4	4 weeks
3	Drainage design provisions	4	4 weeks
4	Erection diagrams and sequence	4	4 weeks
5	Demolition diagram and sequence	4	4 weeks

Prior to or during construction of railroad underpass structures, the UPRR requires the review of drawings, reports, test data and material data sheets to determine compliance with the specifications. Product information for items noted in Table 2 be submitted to UPRR's Designated Representative through the Agency for their own review and approval of the material. The signed submittal and the Agency's review comments will be reviewed by UPRR or their consultant. If a consultant performs the reviews, the consultant may reply directly to the Agency or its Designated Representative after consultation with UPRR. Review of the submittals will not be conducted until after review by the Agency or its Designated Representative. Review of the submittal items will require a minimum of four (4) weeks after receipt from the Agency.

TABLE 2

ITEM	DESCRIPTION	SETS REQD.	NOTES
1	Shop drawings	4	Steel and Concrete members
2	Bearings	4	For all structures
3	Concrete Mix Designs	4	For all structures
4	Rebar & Strand certifications	4	For superstructure only
5	28 day concrete strength	4	For superstructure only
6	Waterproofing material certifications and installation procedure	4	Waterproofing & protective boards
7	Structural steel certifications	4	All fracture critical members & other members requiring improved notch toughness
8	Fabrication and Test reports	4	All fracture critical members & other members requiring improved notch toughness
9	Welding Procedures and Welder Certification	4	AWS requirements
10	Foundation Construction Reports	4	Pile driving, drilled shaft construction, bearing pressure test reports for spread footings
11	Compaction testing reports for backfill at abutments	4	Must meet 95% maximum dry density, Modified Proctor ASTM D1557

D. As-Built Records shall be submitted to the UPRR within 60 days of completion of the structures. These records shall consist of the following items:

Overpass Projects

1. Electronic files of all structure design drawings with as-constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all structure design drawings with as-constructed modifications shown.

Underpass Projects

1. Electronic files of all structure design drawings with as-constructed modifications shown, in Microstation SE or Acrobat .PDF format.
2. Hard copies of all structure design drawings with as-constructed modifications shown.
3. Final approved copies of shop drawings for concrete and steel members.
4. Foundation Construction Reports
5. Compaction testing reports for backfill at abutments

1.16. APPROVAL OF DETAILS

The details of the construction affecting the UPRR tracks and property not already included in the Contract Plans shall be submitted to UPRR's Designated Representative through the Agency for UPRR's review and written approval before such work is undertaken. Review and approval of these submittals will require a minimum of four (4) weeks in addition to the Agency's review time as stated elsewhere in these bid documents.

1.17. MAINTENANCE OF RAILROAD FACILITIES

A. The Contractor shall be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from Contractor's operations; to promptly repair eroded areas within UPRR's right of way and to repair any other damage to the property of UPRR, or its tenants.

B. All such maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

C. The Contractor must submit a proposed method of erosion control and have the method reviewed by the UPRR prior to beginning any grading on the Project Site. Erosion control methods must comply with all applicable local, state and federal regulations.

1.18. SITE INSPECTIONS BY UPRR'S DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by UPRR's Designated Representative at significant points during construction, including the following if applicable:

1. Pre-construction meetings.
2. Pile driving/drilling of caissons or drilled shafts.
3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
4. Erection of precast concrete or steel bridge superstructure.
5. Placement of waterproofing (prior to placing ballast on bridge deck).
6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by UPRR.

C. A detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to be performed, shall be provided to the Agency for submittal to UPRR's Designated Representative for review prior to commencement of work. This schedule shall also include the anticipated dates when the above listed events will occur. This schedule shall be updated for the above listed events as necessary, but at least monthly so that site visits may be scheduled.

1.19. UPRR REPRESENTATIVES

A. UPRR representatives, conductors, flag person or watch person will be provided by UPRR at expense of the Agency or Contractor (as stated elsewhere in these bid documents) to protect UPRR facilities, property and movements of its trains or engines. In general, UPRR will furnish such personnel or other protective services as follows:

B. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

C. For any excavation below elevation of track subgrade if, in the opinion of UPRR's Designated Representative, track or other UPRR facilities may be subject to settlement or movement.

D. During any clearing, grubbing, excavation or grading in proximity to UPRR facilities, which, in the opinion of UPRR's Designated Representative, may endanger UPRR facilities or operations.

E. During any contractor's operations when, in the opinion of UPRR's Designated Representative, UPRR facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

F. The Contractor shall arrange with the UPRR Designated Representative to provide the adequate number of flag persons to accomplish the work.

1.20 WALKWAYS REQUIRED

Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than twelve feet (12') from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while UPRR's flagman service is provided shall be removed before the close of each work day. Walkways with railings shall be constructed by Contractor over open excavation areas when in close proximity of track, and railings shall not be closer than 8' - 6" horizontally from center line of tangent track or 9' - 6" horizontal from curved track.

1.21 COMMUNICATIONS AND SIGNAL LINES

If required, UPRR will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by UPRR's forces in connection with its operation at expense of the Agency. This work by UPRR will be done by its own forces and it is not a part of the Work under this Contract.

1.22 TRAFFIC CONTROL

Contractor's operations that control traffic across or around UPRR facilities shall be coordinated with and approved by the UPRR's Designated Representative.

1.23 CONSTRUCTION EXCAVATIONS

A. The Contractor shall be required to take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of OSHA, AREMA and UPRR "Guidelines for Temporary Shoring".

B. The Contractor shall contact UPRR's "Call Before Your Dig" at least 48 hours prior to commencing work at 1-800-336-9193 during normal business hours (6:30 a.m. to 8:00 p.m. central time, Monday through Friday, except holidays - also a 24 hour, 7 day a week number for emergency calls) to determine location of fiber optics. If a telecommunication system is buried anywhere on or near UPRR property, the Contractor will co-ordinate with UPRR and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near UPRR property.

1.24 RAILROAD FLAGGING

Performance of any work by the Contractor in which person(s) or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach within twenty-five (25) feet of any track, may require railroad flagging services or other protective measures. Contractor shall give the advance notice to the UPRR as required in the "Contractor's Right of Entry Agreement" before commencing any such work, so that the UPRR may determine the need for flagging or other protective measures to ensure the safety of the railroad's operations. Contractor shall comply with all other requirements regarding flagging services covered by the "Contractor's Right of Entry Agreement". Any costs associated with failure to abide by these requirements will be borne by the Contractor.

The estimated pay rate for each flag person is \$748.00 per day for an 8 hour work day with time and one-half for overtime, Saturdays, Sundays; double time and one-half for holidays. Flagging rates are set by the UPRR and are subject to change.

1.25 CLEANING OF RIGHT-OF-WAY

Contractor shall, upon completion of the work to be performed by Contractor upon the premises, over or beneath the tracks of UPRR, promptly remove from the right-of-way of UPRR all of Contractor's tools, implements, and other materials whether brought upon

the right-of-way by Contractor or any subcontractors, employee or agent of Contractor or of any subcontractor, and leave the right-of-way in a clean and presentable condition to satisfaction of UPRR.

EXHIBIT 'E'
CONTRACTOR'S
RIGHT OF ENTRY AGREEMENT

THIS AGREEMENT is made and entered into as of the _____ day of _____
20_____,
by and between **UNION PACIFIC RAILROAD COMPANY**, a Delaware corporation ("Railroad"), and
_____, a _____ corporation ("Contractor").

RECITALS:

Contractor has been hired by _____ to perform work
relating
to

(the "work"), with all or a portion of such work to be performed on property of Railroad in the vicinity of Railroad's Milepost
_____ on Railroad's _____ [Subdivision] [Branch] [at or near DOT No.
_____] located at or near _____, in _____ County, State of _____, as such location is
in the general location shown on the print marked **Exhibit A**, attached hereto and hereby made a part hereof, which work
is the subject of a contract dated _____ between Railroad and
_____.

Railroad is willing to permit Contractor to perform the work described above at the location described above
subject to the terms and conditions contained in this Agreement

AGREEMENT:

NOW, THEREFORE, it is mutually agreed by and between Railroad and Contractor, as follows:

ARTICLE 1 - DEFINITION OF CONTRACTOR.

For purposes of this Agreement, all references in this agreement to Contractor shall include Contractor's
contractors, subcontractors, officers, agents and employees, and others acting under its or their authority.

ARTICLE 2 - RIGHT GRANTED: PURPOSE.

Railroad hereby grants to Contractor the right, during the term hereinafter stated and upon and subject to each
and all of the terms, provisions and conditions herein contained, to enter upon and have ingress to and egress from the
property described in the Recitals for the purpose of performing the work described in the Recitals above. The right

herein granted to Contractor is limited to those portions of Railroad's property specifically described herein, or as designated by the Railroad Representative named in Article 4.

ARTICLE 3 - TERMS AND CONDITIONS CONTAINED IN EXHIBITS B, C AND D.

The terms and conditions contained in **Exhibit B**, **Exhibit C** and **Exhibit D**, attached hereto, are hereby made a part of this Agreement.

ARTICLE 4 - ALL EXPENSES TO BE BORNE BY CONTRACTOR: RAILROAD REPRESENTATIVE.

A. Contractor shall bear any and all costs and expenses associated with any work performed by Contractor, or any costs or expenses incurred by Railroad relating to this Agreement.

B. Contractor shall coordinate all of its work with the following Railroad representative or his or her duly authorized representative (the "Railroad Representative"):

Richard Ellison
101 N. Wacker Drive, Suite 1920
Chicago, IL 60606
(312) 777-2048

C. Contractor, at its own expense, shall adequately police and supervise all work to be performed by Contractor and shall ensure that such work is performed in a safe manner as set forth in Section 7 of **Exhibit B**. The responsibility of Contractor for safe conduct and adequate policing and supervision of Contractor's work shall not be lessened or otherwise affected by Railroad's approval of plans and specifications involving the work, or by Railroad's collaboration in performance of any work, or by the presence at the work site of a Railroad Representative, or by compliance by Contractor with any requests or recommendations made by Railroad Representative.

ARTICLE 5 - TERM: TERMINATION.

A. The grant of right herein made to Contractor shall commence on the date of this Agreement, and continue until _____, unless sooner terminated as herein provided, or at such time as Contractor has completed its work on Railroad's property, whichever is earlier. Contractor agrees to notify the Railroad Representative in writing when it has completed its work on Railroad's property.

B. This Agreement may be terminated by either party on ten (10) days written notice to the other party.

ARTICLE 6 - CERTIFICATE OF INSURANCE.

A. Before commencing any work, Contractor will provide Railroad with the (i) insurance binders, policies, certificates and endorsements set forth in **Exhibit C** of this Agreement, and (ii) the insurance endorsements obtained by each subcontractor as required under Section 12 of **Exhibit B** of this Agreement.

B. All insurance correspondence, binders, policies, certificates and endorsements shall be sent to:

Union Pacific Railroad Company
1400 Douglas St., MS 1690
Omaha, NE 68179
Attn: Kathy Nesser

Folder No. _____

ARTICLE 7 - DISMISSAL OF CONTRACTOR'S EMPLOYEE.

At the request of Railroad, Contractor shall remove from Railroad's property any employee of Contractor who fails to conform to the instructions of the Railroad Representative in connection with the work on Railroad's property, and any right of Contractor shall be suspended until such removal has occurred. Contractor shall indemnify Railroad against any claims arising from the removal of any such employee from Railroad's property.

ARTICLE 8 - ADMINISTRATIVE FEE.

Upon the execution and delivery of this Agreement, Contractor shall pay to Railroad _____ Dollars (\$_____) as reimbursement for clerical, administrative and handling expenses in connection with the processing of this Agreement.

ARTICLE 9 - CROSSINGS.

No additional vehicular crossings (including temporary haul roads) or pedestrian crossings over Railroad's trackage shall be installed or used by Contractor without the prior written permission of Railroad.

ARTICLE 10.- EXPLOSIVES.

Explosives or other highly flammable substances shall not be stored or used on Railroad's property without the prior written approval of Railroad.

IN WITNESS WHEREOF, the parties hereto have duly executed this agreement in duplicate as of the date first herein written.

UNION PACIFIC RAILROAD COMPANY

By: _____
Title: _____

(Name of Contractor)

By: _____
Title: _____

EXHIBIT A

Exhibit A will be a print showing the general location of the work site.

**EXHIBIT B
TO
CONTRACTOR'S RIGHT OF ENTRY AGREEMENT**

Section 1. NOTICE OF COMMENCEMENT OF WORK - FLAGGING.

A. Contractor agrees to notify the Railroad Representative at least ten (10) working days in advance of Contractor commencing its work and at least thirty (30) working days in advance of proposed performance of any work by Contractor in which any person or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach to within twenty-five (25) feet of any track. No work of any kind shall be performed, and no person, equipment, machinery, tool(s), material(s), vehicle(s), or thing(s) shall be located, operated, placed, or stored within twenty-five (25) feet of any of Railroad's track(s) at any time, for any reason, unless and until a Railroad flagman is provided to watch for trains. Upon receipt of such thirty (30)-day notice, the Railroad Representative will determine and inform Contractor whether a flagman need be present and whether Contractor needs to implement any special protective or safety measures. If flagging or other special protective or safety measures are performed by Railroad, Railroad will bill Contractor for such expenses incurred by Railroad, unless Railroad and a federal, state or local governmental entity have agreed that Railroad is to bill such expenses to the federal, state or local governmental entity. If Railroad will be sending the bills to Contractor, Contractor shall pay such bills within thirty (30) days of Contractor's receipt of billing. If Railroad performs any flagging, or other special protective or safety measures are performed by Railroad, Contractor agrees that Contractor is not relieved of any of its responsibilities or liabilities set forth in this Agreement.

B. The rate of pay per hour for each flagman will be the prevailing hourly rate in effect for an eight-hour day for the class of flagmen used during regularly assigned hours and overtime in accordance with Labor Agreements and Schedules in effect at the time the work is performed. In addition to the cost of such labor, a composite charge for vacation, holiday, health and welfare, supplemental sickness, Railroad Retirement and unemployment compensation, supplemental pension, Employees Liability and Property Damage and Administration will be included, computed on actual payroll. The composite charge will be the prevailing composite charge in effect at the time the work is performed. One and one-half times the current hourly rate is paid for overtime, Saturdays and Sundays, and two and one-half times current hourly rate for holidays. Wage rates are subject to change, at any time, by law or by agreement between Railroad and its employees, and may be retroactive as a result of negotiations or a ruling of an authorized governmental agency. Additional charges on labor are also subject to change. If the wage rate or additional charges are changed, Contractor (or the governmental entity, as applicable) shall pay on the basis of the new rates and charges.

C. Reimbursement to Railroad will be required covering the full eight-hour day during which any flagman is furnished, unless the flagman can be assigned to other Railroad work during a portion of such day, in which event reimbursement will not be required for the portion of the day during which the flagman is engaged in other Railroad work. Reimbursement will also be required for any day not actually worked by the flagman following the flagman's assignment to work on the project for which Railroad is required to pay the flagman and which could not reasonably be avoided by Railroad by assignment of such flagman to other work, even though Contractor may not be working during such time. When it becomes necessary for Railroad to bulletin and assign an employee to a flagging position in compliance with union collective bargaining agreements, Contractor must provide Railroad a minimum of five (5) days' notice prior to the cessation of the need for a flagman. If five (5) days' notice of cessation is not given, Contractor will still be required to pay flagging charges for the five (5) day notice period required by union agreement to be given to the employee, even though flagging is not required for that period. An additional thirty (30) days' notice must then be given to Railroad if flagging services are needed again after such five day cessation notice has been given to Railroad.

Section 2. LIMITATION AND SUBORDINATION OF RIGHTS GRANTED

A. The foregoing grant of right is subject and subordinate to the prior and continuing right and obligation of the Railroad to use and maintain its entire property including the right and power of Railroad to construct, maintain, repair, renew, use, operate, change, modify or relocate railroad tracks, roadways, signal, communication, fiber optics, or other wirelines, pipelines and other facilities upon, along or across any or all parts of its property, all or any of which may be freely done at any time or times by Railroad without liability to Contractor or to any other party for compensation or damages.

B. The foregoing grant is also subject to all outstanding superior rights (whether recorded or unrecorded and including those in favor of licensees and lessees of Railroad's property, and others) and the right of Railroad to renew and extend the same, and is made without covenant of title or for quiet enjoyment.

Section 3. NO INTERFERENCE WITH OPERATIONS OF RAILROAD AND ITS TENANTS.

A. Contractor shall conduct its operations so as not to interfere with the continuous and uninterrupted use and operation of the railroad tracks and property of Railroad, including without limitation, the operations of Railroad's lessees, licensees or others, unless specifically authorized in advance by the Railroad Representative. Nothing shall be done or permitted to be done by Contractor at any time that would in any manner impair the safety of such operations. When not in use, Contractor's machinery and materials shall be kept at least fifty (50) feet from the centerline of Railroad's nearest track, and there shall be no vehicular crossings of Railroad's tracks except at existing open public crossings.

B. Operations of Railroad and work performed by Railroad personnel and delays in the work to be performed by Contractor caused by such railroad operations and work are expected by Contractor, and Contractor agrees that Railroad shall have no liability to Contractor, or any other person or entity for any such delays. The Contractor shall coordinate its activities with those of Railroad and third parties so as to avoid interference with railroad operations. The safe operation of Railroad train movements and other activities by Railroad takes precedence over any work to be performed by Contractor.

Section 4. LIENS.

Contractor shall pay in full all persons who perform labor or provide materials for the work to be performed by Contractor. Contractor shall not create, permit or suffer any mechanic's or materialmen's liens of any kind or nature to be created or enforced against any property of Railroad for any such work performed. Contractor shall indemnify and hold harmless Railroad from and against any and all liens, claims, demands, costs or expenses of whatsoever nature in any way connected with or growing out of such work done, labor performed, or materials furnished. If Contractor fails to promptly cause any lien to be released of record, Railroad may, at its election, discharge the lien or claim of lien at Contractor's expense.

Section 5. PROTECTION OF FIBER OPTIC CABLE SYSTEMS.

A. Fiber optic cable systems may be buried on Railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. Contractor shall telephone Railroad during normal business hours (7:00 a.m. to 9:00 p.m. Central Time, Monday through Friday, except holidays) at 1-800-336-9193 (also a 24-hour, 7-day number for emergency calls) to determine if fiber optic cable is buried anywhere on Railroad's property to be used by Contractor. If it is, Contractor will telephone the telecommunications company(ies) involved, make arrangements for a cable locator and, if applicable, for relocation or other protection of the fiber optic cable. Contractor shall not commence any work until all such protection or relocation (if applicable) has been accomplished.

b. In addition to other indemnity provisions in this Agreement, Contractor shall indemnify, defend and hold Railroad harmless from and against all costs, liability and expense whatsoever (including, without limitation, attorneys' fees, court costs and expenses) arising out of any act or omission of Contractor, its agents and/or employees, that causes or contributes to (1) any damage to or destruction of any telecommunications system on Railroad's property, and/or (2) any injury to or death of any person employed by or on behalf of any telecommunications company, and/or its contractor, agents and/or employees, on Railroad's property. Contractor shall not have or seek recourse against Railroad for any claim or cause of action for alleged loss of profits or revenue or loss of service or other consequential damage to a telecommunication company using Railroad's property or a customer or user of services of the fiber optic cable on Railroad's property.

Section 6. PERMITS - COMPLIANCE WITH LAWS.

In the prosecution of the work covered by this Agreement, Contractor shall secure any and all necessary permits and shall comply with all applicable federal, state and local laws, regulations and enactments affecting the work including, without limitation, all applicable Federal Railroad Administration regulations.

Section 7. SAFETY.

A. Safety of personnel, property, rail operations and the public is of paramount importance in the prosecution of the work performed by Contractor. Contractor shall be responsible for initiating, maintaining and supervising all safety, operations and programs in connection with the work. Contractor shall at a minimum comply with Railroad's safety standards listed in **Exhibit D**, hereto attached, to ensure uniformity with the safety standards followed by Railroad's own forces. As a part of Contractor's safety responsibilities, Contractor shall notify Railroad if Contractor determines that any of Railroad's safety standards are contrary to good safety practices. Contractor shall furnish copies of **Exhibit D** to each of its employees before they enter the job site.

B. Without limitation of the provisions of paragraph A above, Contractor shall keep the job site free from safety and health hazards and ensure that its employees are competent and adequately trained in all safety and health aspects of the job.

C. Contractor shall have proper first aid supplies available on the job site so that prompt first aid services may be provided to any person injured on the job site. Contractor shall promptly notify Railroad of any U.S. Occupational Safety and Health Administration reportable injuries. Contractor shall have a nondelegable duty to control its employees while they are on the job site or any other property of Railroad, and to be certain they do not use, be under the influence of, or have in their possession any alcoholic beverage, drug or other substance that may inhibit the safe performance of any work.

D. If and when requested by Railroad, Contractor shall deliver to Railroad a copy of Contractor's safety plan for conducting the work (the "Safety Plan"). Railroad shall have the right, but not the obligation, to require Contractor to correct any deficiencies in the Safety Plan. The terms of this Agreement shall control if there are any inconsistencies between this Agreement and the Safety Plan.

Section 8. INDEMNITY.

A. To the extent not prohibited by applicable statute, Contractor shall indemnify, defend and hold harmless Railroad, its affiliates, and its and their officers, agents and employees (individually an "Indemnified Party" or collectively "Indemnified Parties") from and against any and all loss, damage, injury, liability, claim, demand, cost or expense (including, without limitation, attorney's, consultant's and expert's fees, and court costs), fine or penalty (collectively, "Loss") incurred by any person (including, without limitation, any Indemnified Party, Contractor, or any employee of Contractor or of any Indemnified Party) arising out of or in any manner connected with (i) any work performed by Contractor, or (ii) any act or omission of Contractor, its officers, agents or employees, or (iii) any breach of this Agreement by Contractor.

b. The right to indemnity under this Section 8 shall accrue upon occurrence of the event giving rise to the Loss, and shall apply regardless of any negligence or strict liability of any Indemnified Party, except where the Loss is caused by the sole active negligence of an Indemnified Party as established by the final judgment of a court of competent jurisdiction. The sole active negligence of any Indemnified Party shall not bar the recovery of any other Indemnified Party.

c. Contractor expressly and specifically assumes potential liability under this Section 8 for claims or actions brought by Contractor's own employees. Contractor waives any immunity it may have under worker's compensation or industrial insurance acts to indemnify the Indemnified Parties under this Section 8. Contractor acknowledges that this waiver was mutually negotiated by the parties hereto.

d. No court or jury findings in any employee's suit pursuant to any worker's compensation act or the Federal Employers' Liability Act against a party to this Agreement may be relied upon or used by Contractor in any attempt to assert liability against any Indemnified Party.

e. The provisions of this Section 8 shall survive the completion of any work performed by Contractor or the termination or expiration of this Agreement. In no event shall this Section 8 or any other provision of this Agreement be deemed to limit any liability Contractor may have to any Indemnified Party by statute or under common law.

Section 9. RESTORATION OF PROPERTY.

In the event Railroad authorizes Contractor to take down any fence of Railroad or in any manner move or disturb any of the other property of Railroad in connection with the work to be performed by Contractor, then in that event Contractor shall, as soon as possible and at Contractor's sole expense, restore such fence and other property to the same condition as the same were in before such fence was taken down or such other property was moved or disturbed. Contractor shall remove all of Contractor's tools, equipment, rubbish and other materials from Railroad's property promptly upon completion of the work, restoring Railroad's property to the same state and condition as when Contractor entered thereon.

Section 10. WAIVER OF DEFAULT.

Waiver by Railroad of any breach or default of any condition, covenant or agreement herein contained to be kept, observed and performed by Contractor shall in no way impair the right of Railroad to avail itself of any remedy for any subsequent breach or default.

Section 11. MODIFICATION - ENTIRE AGREEMENT.

No modification of this Agreement shall be effective unless made in writing and signed by Contractor and Railroad. This Agreement and the exhibits attached hereto and made a part hereof constitute the entire understanding between Contractor and Railroad and cancel and supersede any prior negotiations, understandings or agreements, whether written or oral, with respect to the work to be performed by Contractor.

Section 12. ASSIGNMENT - SUBCONTRACTING.

Contractor shall not assign or subcontract this Agreement, or any interest therein, without the written consent of the Railroad. Contractor shall be responsible for the acts and omissions of all subcontractors. Before Contractor commences any work, the Contractor shall, except to the extent prohibited by law; (1) require each of its subcontractors to include the Contractor as "Additional Insured" in the subcontractor's Commercial General Liability policy and Business Automobile policies with respect to all liabilities arising out of the subcontractor's performance of work on behalf of the Contractor by endorsing these policies with ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage); (2) require each of its subcontractors to endorse their Commercial General Liability Policy with "Contractual Liability Railroads" ISO Form CG 24 17 10 01 (or a substitute form providing equivalent coverage) for the job site, and (3) require each of its subcontractors to endorse their Business Automobile Policy with "Coverage For Certain Operations In Connection With Railroads" ISO Form CA 20 70 10 01 (or a substitute form providing equivalent coverage) for the job site.

**EXHIBIT C TO
CONTRACTOR'S
RIGHT OF ENTRY AGREEMENT**

**Union Pacific Railroad Company
Insurance Provisions For
Contractor's Right of Entry Agreement**

Contractor shall, at its sole cost and expense, procure and maintain during the course of the Project and until all Project work on Railroad's property has been completed and the Contractor has removed all equipment and materials from Railroad's property and has cleaned and restored Railroad's property to Railroad's satisfaction, the following insurance coverage:

- A. Commercial General Liability** insurance. Commercial general liability (CGL) with a limit of not less than \$5,000,000 each occurrence and an aggregate limit of not less than \$10,000,000. CGL insurance must be written on ISO occurrence form CG 00 01 12 04 (or a substitute form providing equivalent coverage).

The policy must also contain the following endorsement, which must be stated on the certificate of insurance:

- Contractual Liability Railroads ISO form CG 24 17 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site.
- Designated Construction Project(s) General Aggregate Limit ISO Form CG 25 03 03 97 (or a substitute form providing equivalent coverage) showing the project on the form schedule.

- B. Business Automobile Coverage** insurance. Business auto coverage written on ISO form CA 00 01 10 01 (or a substitute form providing equivalent liability coverage) with a combined single limit of not less \$5,000,000 for each accident and coverage must include liability arising out of any auto (including owned, hired and non-owned autos).

The policy must contain the following endorsements, which must be stated on the certificate of insurance:

- Coverage For Certain Operations In Connection With Railroads ISO form CA 20 70 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Property" as the Designated Job Site.
- Motor Carrier Act Endorsement - Hazardous materials clean up (MCS-90) if required by law.

- C. Workers' Compensation and Employers' Liability** insurance. Coverage must include but not be limited to:

- Contractor's statutory liability under the workers' compensation laws of the state where the work is being performed.
- Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 disease policy limit \$500,000 each employee.

If Contractor is self-insured, evidence of state approval and excess workers compensation coverage must be provided. Coverage must include liability arising out of the U. S. Longshoremen's and Harbor Workers' Act, the Jones Act, and the Outer Continental Shelf Land Act, if applicable.

The policy must contain the following endorsement, which must be stated on the certificate of insurance.

- Alternate Employer endorsement ISO form WC 00 03 01 A (or a substitute form providing equivalent coverage) showing Railroad in the schedule as the alternate employer (or a substitute form providing equivalent coverage).

- D. **Railroad Protective Liability** insurance. Contractor must maintain "Railroad Protective Liability" (RPL) insurance written on ISO occurrence form CG 00 35 12 04 (or a substitute form providing equivalent coverage) on behalf of Railroad as named insured, with a limit of not less than \$2,000,000 per occurrence and an aggregate of \$6,000,000. The definition of "JOB LOCATION" and "WORK" on the declaration page of the policy shall refer to this Agreement and shall describe all WORK or OPERATIONS performed under this agreement." Contractor shall provide this Agreement to Contractor's insurance agent(s) and/or broker(s) and Contractor shall instruct such agent(s) and/or broker(s) to procure the insurance coverage required by this Agreement. A BINDER STATING THE POLICY IS IN PLACE MUST BE SUBMITTED TO RAILROAD BEFORE THE WORK MAY COMMENCE AND UNTIL THE ORIGINAL POLICY IS FORWARDED TO UNION PACIFIC RAILROAD. **[Ken - there is a closed quote in this paragraph but no open quote.]**
- E. **Umbrella or Excess** insurance. If Contractor utilizes umbrella or excess policies, these policies must "follow form" and afford no less coverage than the primary policy.
- F. **Pollution Liability** insurance. Pollution liability coverage must be included when the scope of the work as defined in the Agreement includes installation, temporary storage, or disposal of any "hazardous" material that is injurious in or upon land, the atmosphere, or any watercourses; or may cause bodily injury at any time.

If required, coverage may be provided in separate policy form or by endorsement to Contractors CGL or RPL. In any form coverage must be equivalent to that provided in ISO form CG 24 15 "Limited Pollution Liability Extension Endorsement" or CG 28 31 "Pollution Exclusion Amendment" with limits of at least \$5,000,000 per occurrence and an aggregate limit of \$10,000,000.

If the scope of work as defined in this Agreement includes the disposal of any hazardous or non-hazardous materials from the job site, Contractor must furnish to Railroad evidence of pollution legal liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting the materials, with coverage in minimum amounts of \$1,000,000 per loss, and an annual aggregate of \$2,000,000.

Other Requirements

- G. All policy(ies) required above (except worker's compensation and employers liability) must include Railroad as "Additional Insured" using ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage). The coverage provided to Railroad as additional insured shall, to the extent provided under ISO Additional Insured Endorsement CG 20 26, and CA 20 48 provide coverage for Railroad's negligence whether sole or partial, active or passive, and shall not be limited by Contractor's liability under the indemnity provisions of this Agreement.
- H. Punitive damages exclusion, if any, must be deleted (and the deletion indicated on the certificate of insurance), unless the law governing this Agreement prohibits all punitive damages that might arise under this Agreement.

- I. Contractor waives all rights of recovery, and its insurers also waive all rights of subrogation of damages against Railroad and its agents, officers, directors and employees. This waiver must be stated on the certificate of insurance.
- J. Prior to commencing the work, Contractor shall furnish Railroad with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements in this Agreement.
- K. All insurance policies must be written by a reputable insurance company acceptable to Railroad or with a current Best's Insurance Guide Rating of A- and Class VII or better, and authorized to do business in the state where the work is being performed.
- L. The fact that insurance is obtained by Contractor or by Railroad on behalf of Contractor will not be deemed to release or diminish the liability of Contractor, including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Railroad from Contractor or any third party will not be limited by the amount of the required insurance coverage.

EXHIBIT D
TO
CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

MINIMUM SAFETY REQUIREMENTS

The term "employees" as used herein refer to all employees of Contractor as well as all employees of any subcontractor or agent of Contractor.

I. Clothing

- A. All employees of Contractor will be suitably dressed to perform their duties safely and in a manner that will not interfere with their vision, hearing, or free use of their hands or feet.

Specifically, Contractor's employees must wear:

- (i) Waist-length shirts with sleeves.
- (ii) Trousers that cover the entire leg. If flare-legged trousers are worn, the trouser bottoms must be tied to prevent catching.
- (iii) Footwear that covers their ankles and has a defined heel. Employees working on bridges are required to wear safety-toed footwear that conforms to the American National Standards Institute (ANSI) and FRA footwear requirements.

- B. Employees shall not wear boots (other than work boots), sandals, canvas-type shoes, or other shoes that have thin soles or heels that are higher than normal.

- C. Employees must not wear loose or ragged clothing, neckties, finger rings, or other loose jewelry while operating or working on machinery.

II. Personal Protective Equipment

Contractor shall require its employees to wear personal protective equipment as specified by Railroad rules, regulations, or recommended or requested by the Railroad Representative.

- (i) Hard hat that meets the American National Standard (ANSI) Z89.1 – latest revision. Hard hats should be affixed with Contractor's company logo or name.
- (ii) Eye protection that meets American National Standard (ANSI) for occupational and educational eye and face protection, Z87.1 – latest revision. Additional eye protection must be provided to meet specific job situations such as welding, grinding, etc.

- (iii) Hearing protection, which affords enough attenuation to give protection from noise levels that will be occurring on the job site. Hearing protection, in the form of plugs or muffs, must be worn when employees are within:
 - 100 feet of a locomotive or roadway/work equipment
 - 15 feet of power operated tools
 - 150 feet of jet blowers or pile drivers
 - 150 feet of retarders in use (when within 10 feet, employees must wear dual ear protection – plugs and muffs)
 -
- (iv) Other types of personal protective equipment, such as respirators, fall protection equipment, and face shields, must be worn as recommended or requested by the Railroad Representative.

III. On Track Safety

Contractor is responsible for compliance with the Federal Railroad Administration's Roadway Worker Protection regulations – 49CFR214, Subpart C and Railroad's On-Track Safety rules. Under 49CFR214, Subpart C, railroad contractors are responsible for the training of their employees on such regulations. In addition to the instructions contained in Roadway Worker Protection regulations, all employees must:

- (i) Maintain a distance of twenty-five (25) feet to any track unless the Railroad Representative is present to authorize movements.
- (ii) Wear an orange, reflectorized workwear approved by the Railroad Representative.
- (iii) Participate in a job briefing that will specify the type of On-Track Safety for the type of work being performed. Contractor must take special note of limits of track authority, which tracks may or may not be fouled, and clearing the track. Contractor will also receive special instructions relating to the work zone around machines and minimum distances between machines while working or traveling.

IV. Equipment

- A. It is the responsibility of Contractor to ensure that all equipment is in a safe condition to operate. If, in the opinion of the Railroad Representative, any of Contractor's equipment is unsafe for use, Contractor shall remove such equipment from Railroad's property. In addition, Contractor must ensure that the operators of all equipment are properly trained and competent in the safe operation of the equipment. In addition, operators must be:
 - Familiar and comply with Railroad's rules on lockout/tagout of equipment.
 - Trained in and comply with the applicable operating rules if operating any hy-rail equipment on-track.
 - Trained in and comply with the applicable air brake rules if operating any equipment that moves rail cars or any other railbound equipment.

- B. All self-propelled equipment must be equipped with a first-aid kit, fire extinguisher, and audible back-up warning device.
- C. Unless otherwise authorized by the Railroad Representative, all equipment must be parked a minimum of twenty-five (25) feet from any track. Before leaving any equipment unattended, the operator must stop the engine and properly secure the equipment against movement.
- D. Cranes must be equipped with three orange cones that will be used to mark the working area of the crane and the minimum clearances to overhead power lines.

V. General Safety Requirements

- A. Contractor shall ensure that all waste is properly disposed of in accordance with applicable federal and state regulations.
- B. Contractor shall ensure that all employees participate in and comply with a job briefing conducted by the Railroad Representative, if applicable. During this briefing, the Railroad Representative will specify safe work procedures, (including On-Track Safety) and the potential hazards of the job. If any employee has any questions or concerns about the work, the employee must voice them during the job briefing. Additional job briefings will be conducted during the work as conditions, work procedures, or personnel change.
- C. All track work performed by Contractor meets the minimum safety requirements established by the Federal Railroad Administration's Track Safety Standards 49CFR213.
- D. All employees comply with the following safety procedures when working around any railroad track:
 - (i) Always be on the alert for moving equipment. Employees must always expect movement on any track, at any time, in either direction.
 - (ii) Do not step or walk on the top of the rail, frog, switches, guard rails, or other track components.
 - (iii) In passing around the ends of standing cars, engines, roadway machines or work equipment, leave at least 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment if the opening is less than one car length (50 feet).
 - (iv) Avoid walking or standing on a track unless so authorized by the employee in charge.
 - (v) Before stepping over or crossing tracks, look in both directions first.
 - (vi) Do not sit on, lie under, or cross between cars except as required in the performance of your duties and only when track and equipment have been protected against movement.

- E. All employees must comply with all federal and state regulations concerning workplace safety.

SWPPP



Storm Water Pollution Prevention Plan



Route FAP 346 and FAU 1218	Marked Route US 41 and IL 132	Section 125X-N
Project Number C-91-07-00	County Lake	Contract Number 60K80

This plan has been prepared to comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) Permit No. ILR10 (Permit ILR10), issues by the Illinois Environmental Protection Agency (IEPA) for storm water discharges from construction site activities.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name John Fortmann, PE	Title Dep. Dir. of Highways, Reg. 1 Eng	Agency Illinois Dept. of Transportation
Signature 	Date 12-17-15	

I. Site Description

A. Provide a description of the project location (include latitude and longitude):

The project is situated in Warren Township, IL at US Rte 41 & IL Rte 132. The design, installation, and maintenance of BMP's at these locations are within an area where annual erosivity (R value) is less than or equal to 160. Erosivity is less than 5 in all two-week periods between October 12 and April 15, which would qualify for a construction rainfall erosivity waiver under the US Construction General Permit requirements. At these locations, erosivity is highest in spring to autumn, April 16-October 11. The latitude is 42N 22' 15.10" and the longitude is 87W 53' 46.32". The project is situated in County-Lake, Town-45N, & Section-24.

B. Provide a description of the construction activity which is subject of this plan:

The project includes the complete removal and replacement of UPRR Bridge (including pilings) over IL Rte 132 & IL Rte 132 Roadway Widening & Reconstruction. In addition, the bridge structure shall be widened and lengthened. The UPRR Bridge project includes construction of the new UPRR Bridge, construction of a temporary shoofly bridge, reconstruction of the modified main line track and shoofly track, reconstruction of IL 132 east of the intersection with US 41, reconstruction of the US 41/IL132 intersection, and reconstruction of retaining walls on the north side of IL 132 and the south side of IL 132 East of the new railroad bridge. This project will be completed in 4 stages. Drainage Improvements including regrading the roadside swales and installing a temporary culvert under the temporary Shoofly Track embankment. The project will be permanently stabilized by stage with class 2A, 4, 4A, and 4B seed. The project also includes the installation, maintenance, and removal of ESC measures as depicted in the plans.

C. Provide the estimated duration of this project:

24 Months

D. The total area of the construction site is estimated to be 15 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 12 acres.

- E. The following is a weighted average of the runoff coefficient for this project after construction activities are completed:

Existing Runoff Coefficient: C=0.54, Proposed Runoff Coefficient: C=0.60.

- F. List all soils found within project boundaries. Include map unit name, slope information and erosivity:

Soils on the project site consist of Silty Loam, Dark Gray to Black Silty Clay Loam, Brown & Gray Silty Loam. Map Unit-Lake County, Illinois (ILo97). Slope varies from 0 to 4 percent. K Factor = 0.37.

- G. Provide an aerial extent of wetland acreage at the site:

An aerial extent of wetland has been attached.

- H. Provide a description of potentially erosive areas associated with this project:

Sediment Tracking on Adjacent Streets, Wind/Dust Erosion. All areas outside of the construction limits of this project will remain undisturbed throughout the duration of the construction process.

- I. The following is a description of soil disturbing activities by stages, their locations, and their erosive factors (e.g. steepness of slopes, length of scopes, etc.):

Install perimeter silt fence, construction entrance. Temporary erosion control structures will be installed when appropriate during the construction process. Tree and brush clearing. Strip and stockpile topsoil. Complete necessary grading. Construction of roadway, bridge construction. Respread topsoil on completed sections and all open areas. Restore remaining disturbed areas.

- J. See the erosion control plans and/or drainage plans for this contract for information regarding drainage patterns, approximate slopes anticipated before and after major grading activities, locations where vehicles enter or exit the site and controls to prevent off site sediment tracking (to be added after contractor identifies locations), areas of soil disturbance, the location of major structural and non-structural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands) and locations where storm water is discharged to surface water including wetlands.

- K. Identify who owns the drainage system (municipality or agency) this project will drain into:

IDOT, Lake County, Village of Gurnee.

- L. The following is a list of General NPDES ILR40 permittees within whose reporting jurisdiction this project is located.

IDOT, Lake County, Village of Gurnee.

- M. The following is a list of receiving water(s) and the ultimate receiving water(s) for this site. The location of the receiving waters can be found on the erosion and sediment control plans:

Bull Creek and the Des Plaines River south of IL Rte 132 and north of O'Plaine Rd. They are not listed by IDNR as Biologically Significant Streams.

- N. Describe areas of the site that are to be protected or remain undisturbed. These areas may include steep slopes, highly erodible soils, streams, stream buffers, specimen trees, natural vegetation, nature preserves, etc.

Areas outside of the construction limits will remain undisturbed throughout the duration of the construction process.

O. The following sensitive environmental resources are associated with this project, and may have the potential to be impacted by the proposed development:

- Floodplain
- Wetland Riparian
- Threatened and Endangered Species
- Historic Preservation
- 303(d) Listed receiving waters for suspended solids, turbidity, or siltation
- Receiving waters with Total Maximum Daily Load (TMDL) for sediment, total suspended solids, turbidity, or siltation
- Applicable Federal, Tribal, State or Local Programs
- Other

1. 303(d) Listed receiving waters (fill out this section if checked above):

DesPlaines River.

a. The name(s) of the listed water body, and identification of all pollutants causing impairment:

DesPlaines R., Arsenic, Chloride, Phosphorus, Mercury, PCBs, Fecal Coliform.

b. Provide a description of how erosion and sediment control practices will prevent a discharge of sediment resulting from a storm event equal to or greater than a twenty-five (25) year, twenty-four (24) hour rainfall event:

The vegetated swales will be installed along the northern and south east perimeter of IL Rte 132 to capture stormwater run-on from the adjacent property. The swales will convey stormwater to storm drain inlets in the northwest, northeast and south east corners of the site. Inlet Protection will be installed around all storm drain inlets to allow for infiltration of the run-on. The vegetated swales will have a trapezoidal shape with a slope ratio of 2:1. The bottom of the swale will be at least 2 feet above the seasonal high water table and bedrock. The vegetated swales will remain as a permanent stormwater structure after construction is complete. The vegetated swales will be installed before site grading operations begin at the construction site. Stormwater runoff entering these vegetated swales will be discharged to a outlet structures connected to the IL Rte 132 storm sewer system. Drainage Improvements also including swales and installing a temporary culvert under the temporary Shoofly Track embankment on north & south of IL Rte 132. Stormwater runoff entering between the existing tracks and the temporary Shoofly tracks will be discharged to a temporary culvert under the temporary Shoofly Track. Run-off captured by the vegetated swale on the east side of the temporary Shoofly Track embankment will be discharged to the existing detention pond on south of IL 132. See attached Erosion Control Plans.

c. Provide a description of the location(s) of direct discharge from the project site to the 303(d) water body:

Stormwater runoff captured by the vegetated swales will be discharged to a outlet structures connected to the IL Rte 132 storm sewer system.

d. Provide a description of the location(s) of any dewatering discharges to the MS4 and/or water body:

The locations of dewatering will be discharged to the IL Rte 132 storm sewer system.

2. TMDL (fill out this section if checked above)

a. The name(s) of the listed water body:

N/A

b. Provide a description of the erosion and sediment control strategy that will be incorporated into the site design that is consistent with the assumptions and requirements of the TMDL:

N/A

c. If a specific numeric waste load allocation has been established that would apply to the project's discharges, provide a description of the necessary steps to meet the allocation:

N/A

P. The following pollutants of concern will be associated with this construction project:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Soil Sediment | <input checked="" type="checkbox"/> Petroleum (gas, diesel, oil, kerosene, hydraulic oil / fluids) |
| <input checked="" type="checkbox"/> Concrete | <input checked="" type="checkbox"/> Antifreeze / Coolants |
| <input checked="" type="checkbox"/> Concrete Truck waste | <input checked="" type="checkbox"/> Waste water from cleaning construction equipment |
| <input checked="" type="checkbox"/> Concrete Curing Compounds | <input type="checkbox"/> Other (specify) _____ |
| <input checked="" type="checkbox"/> Solid waste Debris | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Paints | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Solvents | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Fertilizers / Pesticides | <input type="checkbox"/> Other (specify) _____ |

II. Controls

This section of the plan addresses the controls that will be implemented for each of the major construction activities described in I.C. above and for all use areas, borrow sites, and waste sites. For each measure discussed, the Contractor will be responsible for its implementation as indicated. The Contractor shall provide to the Resident Engineer a plan for the implementation of the measures indicated. The Contractor and subcontractors, will notify the Resident Engineer of any proposed changes, maintenance, or modifications to keep construction activities compliant with the Permit ILR10. Each such Contractor has signed the required certification on forms which are attached to, and are a part of, this plan:

- A. **Erosion and Sediment Controls:** At a minimum, controls must be coordinated, installed, and maintained to:
1. Minimize the amount of soil exposed during construction activity;
 2. Minimize the disturbance of steep slopes;
 3. Maintain natural buffers around surface waters, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration, unless infeasible;
 4. Minimize soil compaction and, unless infeasible, preserve topsoil.
- B. **Stabilization Practices:** Provided below is a description of interim and permanent stabilization practices, including site- specific scheduling of the implementation of the practices. Site plans will ensure that existing vegetation is preserved where attainable and disturbed portions of the site will be stabilized. Stabilization practices may include but are not limited to: temporary seeding, permanent seeding, mulching, geotextiles, sodding, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Except as provided below in II(B)(1) and II(B)(2), stabilization measures shall be initiated **immediately** where construction activities have temporarily or permanently ceased, but in no case more than **one (1) day** after the construction activity in that portion of the site has temporarily or permanently ceases on all disturbed portions of the site where construction will not occur for a period of fourteen (14) or more calendar days.
1. Where the initiation of stabilization measures is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
 2. On areas where construction activity has temporarily ceased and will resume after fourteen (14) days, a temporary stabilization method can be used.

The following stabilization practices will be used for this project:

- | | |
|---|---|
| <input type="checkbox"/> Preservation of Mature Vegetation | <input checked="" type="checkbox"/> Erosion Control Blanket / Mulching |
| <input checked="" type="checkbox"/> Vegetated Buffer Strips | <input checked="" type="checkbox"/> Sodding |
| <input checked="" type="checkbox"/> Protection of Trees | <input type="checkbox"/> Geotextiles |
| <input checked="" type="checkbox"/> Temporary Erosion Control Seeding | <input checked="" type="checkbox"/> Other (specify) <u>Mulch Method 2</u> |
| <input type="checkbox"/> Temporary Turf (Seeding, Class 7) | <input type="checkbox"/> Other (specify) _____ |
| <input checked="" type="checkbox"/> Temporary Mulching | <input type="checkbox"/> Other (specify) _____ |
| <input checked="" type="checkbox"/> Permanent Seeding | <input type="checkbox"/> Other (specify) _____ |

Describe how the stabilization practices listed above will be utilized during construction:

PVB is used as an alternative to PEB where there is sufficient space. PVB applies where vegetation can be temporarily preserved or established and utilized for sediment control and in areas where surface runoff is discharged as sheet-flow. VBs are used to filter sediment from sheet-flow. Temporary erosion control seeding is used to establish quick growing plants to stabilize disturbed areas, it applies on cleared, barren or sparsely vegetated soil surfaces where vegetative cover is needed for less than one year. Seeding shall conform to Section 280 of the Standard Specifications. Stabilization of fine graded disturbed areas using a continuous cover of grass sod. It applies at disturbed areas, requiring immediate cover for erosion protection or sediment control. Irrigate sod according to Article 252.08. ECBs are designed to protect soil surfaces from raindrop impacts and overland flow during establishment of grass/vegetation and to reduce soil moisture loss due to evaporation. This practice used for permanent seeding, winter shutdown, temporary stockpiles, or erodible areas where temporary stabilization may be required (e.g., steep slopes, ditches). Loose applied straw mulch, hydraulic mulch, gravel mulch, compost or organic waste originating in the right-of way can reduce erosion by absorbing raindrop energy, provide stabilization during establishment of grass/vegetation and reduce soil moisture loss due to evaporation. It applies at the base of trees or shrubs and on temporary or final seeded areas away from traffic where it would be blown away. Mulch placement on steep slopes is limited to hydraulic mulch or ECBs and TRMs.

Stabilization controls runoff volume and velocity, peak runoff rates and volumes of discharge to minimize exposed soil, disturbed slopes, sediment discharges from construction, and provides for natural buffers and minimization of soil compaction. Existing vegetated areas where disturbance can be avoided will not require stabilization.

Where possible, temporary stabilization of the initial stage should be completed before work is moved to subsequent stages.

Mulch Method 2 should be applied to slopes for temporary stabilization prior to seasons when Temporary seed will not generate, for example in mid-July or in winter.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

All temporary erosion control systems shall be removed at the direction of the Engineer and be disposed of according to Article 202.03.

Permanent stabilization shall be done within 7 days after completion of final grading of the soil.

- C. **Structural Practices:** Provided below is a description of structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include but are not limited to: perimeter erosion barrier, earth dikes, drainage swales, sediment traps, ditch checks, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. The installation of these devices may be subject to Section 404 of the Clean Water Act.

The following stabilization practices will be used for this project:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Perimeter Erosion Barrier | <input type="checkbox"/> Rock Outlet Protection |
| <input checked="" type="checkbox"/> Temporary Ditch Check | <input checked="" type="checkbox"/> Riprap |
| <input checked="" type="checkbox"/> Storm Drain Inlet Protection | <input type="checkbox"/> Gabions |
| <input type="checkbox"/> Sediment Trap | <input type="checkbox"/> Slope Mattress |
| <input type="checkbox"/> Temporary Pipe Slope Drain | <input checked="" type="checkbox"/> Retaining Walls |
| <input type="checkbox"/> Temporary Sediment Basin | <input type="checkbox"/> Slope Walls |
| <input type="checkbox"/> Temporary Stream Crossing | <input type="checkbox"/> Concrete Revetment Mats |

- | | |
|--|--|
| <input type="checkbox"/> Stabilized Construction Exits | <input type="checkbox"/> Level Spreaders |
| <input type="checkbox"/> Turf Reinforcement Mats | <input checked="" type="checkbox"/> Other (specify) <u>Stabilized Flow Line</u> |
| <input type="checkbox"/> Permanent Check Dams | <input checked="" type="checkbox"/> Other (specify) <u>Temporary Seeding</u> |
| <input type="checkbox"/> Permanent Sediment Basin | <input checked="" type="checkbox"/> Other (specify) <u>Temporary Erosion Control Blanket</u> |
| <input type="checkbox"/> Aggregate Ditch | <input type="checkbox"/> Other (specify) _____ |
| <input type="checkbox"/> Paved Ditch | <input type="checkbox"/> Other (specify) _____ |

Describe how the structural practices listed above will be utilized during construction:

Structural measures will limit runoff and the discharge of pollutants from leaving the site.

All temporary synthetic and structural erosion prevention and sediment control BMPs must be removed after completion. Silt fence should only be used as PEB in areas where the work area is higher than the perimeter. The use of silt fence at the top of the slope/elevations higher than the work area should always be avoided. If necessary, temporary fence should be utilized in these locations (where the top of slope/elevation is higher than the work area) in lieu of silt fence.

All work associated with installation and maintenance of Stabilized Construction Entrances and concrete washouts are incidental to the contract.

The contractor should provide to the RE a plan to ensure that a stabilized flow line will be provided during storm sewer construction. The use of a stabilized flow line between installed storm sewer and open disturbance will reduce the potential for the offsite discharge of sediment bearing waters, particularly when rain is forecasted so that flow will not erode. Lack of an approved plan or failure to comply will result in an ESC Deficiency Deduction.

Inlet and Pipe protection shown on Highway Standard Sheet 280001 should be avoided. Storm Drain Inlet Protection should be comprised of ditch checks, temporary seeding and temporary erosion control blanket for pipe inlets.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

All temporary synthetic and structural erosion prevention and sediment control BMP's must be removed after completion. PEB, TDC, and Inlet Protection will be removed once the site is stabilized. Permanent measures, ripraps, retaining walls etc, shall remain in place.

D. Treatment Chemicals

Will polymer flocculents or treatment chemicals be utilized on this project: Yes No

If yes above, identify where and how polymer flocculents or treatment chemicals will be utilized on this project.

N/A

E. Permanent Storm Water Management Controls: Provided below is a description of measures that will be installed during the construction process to control volume and pollutants in storm water discharges that will occur after construction operations have been completed. The installation of these devices may be subject to Section 404 of the Clean Water act.

1. Such practices may include but are not limited to: storm water detention structures (including wet ponds), storm water retention structures, flow attenuation by use of open vegetated swales and natural depressions, infiltration of runoff on site, and sequential systems (which combine several practices).

The practices selected for implementation were determined on the basis of the technical guidance in Chapter 41 (Construction Site Storm Water Pollution Control) of the IDOT Bureau of Design & Environment Manual. If practices other than those discussed in Chapter 41 are selected for implementation or if practices are applied to situations different from those covered in Chapter 41, the technical basis for such decisions will be explained below.

2. Velocity dissipation devices will be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. maintenance of hydrologic conditions such as the hydroperiod and hydrodynamics present prior to the initiation of construction activities).

Description of permanent storm water management controls:

Due to nature of the project development on site, the creation of impervious surface is inherent in the design. Attempts have been made to minimize the percent of impervious surfaces. The total proposed impervious acreage is 6.09 out of 12 acres of the total property. The project site is surrounded by public right-of-way, and residential lots. No wetland impacts are anticipated.

Best Management Practices (BMPs) will be employed to prevent water quality impacts.

- F. **Approved State or Local Laws:** The management practices, controls, and provisions contained in this plan will be in accordance with IDOT specifications, which are at least as protective as the requirements contained in the Illinois Environmental Protection Agency's Illinois Urban Manual. Procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials shall be described or incorporated by reference in the space provided below. Requirements specified in sediment and erosion site plans, site permits, storm water management site plans or site permits approved by local officials that are applicable to protecting surface water resources are, upon submittal of an NOI, to be authorized to discharge under the Permit ILR10 incorporated by reference and are enforceable under this permit even if they are not specifically included in the plan.

Description of procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials:

TBD

- G. **Contractor Required Submittals:** Prior to conducting any professional services at the site covered by this plan, the Contractor and each subcontractor responsible for compliance with the permit shall submit to the Resident Engineer a Contractor Certification Statement, BDE 2342a.

1. The Contractor shall provide a construction schedule containing an adequate level of detail to show major activities with implementation of pollution prevention BMPs, including the following items:
 - Approximate duration of the project, including each stage of the project
 - Rainy season, dry season, and winter shutdown dates
 - Temporary stabilization measures to be employed by contract phases
 - Mobilization time frame
 - Mass clearing and grubbing/roadside clearing dates
 - Deployment of Erosion Control Practices
 - Deployment of Sediment Control Practices (including stabilized construction entrances/exits)
 - Deployment of Construction Site Management Practices (including concrete washout facilities, chemical storage, refueling locations, etc.)
 - Paving, saw-cutting, and any other pavement related operations
 - Major planned stockpiling operations
 - Time frame for other significant long-term operations or activities that may plan non-storm water discharges such as dewatering, grinding, etc.
 - Permanent stabilization activities for each area of the project
2. The Contractor and each subcontractor shall provide, as an attachment to their signed Contractor Certification Statement, a discussion of how they will comply with the requirements of the permit in regard to the following items and provide a graphical representation showing location and type of BMPs to be used when applicable:

- Vehicle Entrances and Exits - Identify type and location of stabilized construction entrances and exits to be used and how they will be maintained.
- Material delivery, Storage, and Use - Discuss where and how materials including chemicals, concrete curing compounds, petroleum products, etc. will be stored for this project.
- Stockpile Management - Identify the location of both on-site and off-site stockpiles. Discuss what BMPs will be used to prevent pollution of storm water from stockpiles.
- Waste Disposal - Discuss methods of waste disposal that will be used for this project.
- Spill Prevention and Control - Discuss steps that will be taken in the event of a material spill (chemicals, concrete curing compounds, petroleum, etc.).
- Concrete Residuals and Washout Wastes - Discuss the location and type of concrete washout facilities to be used on this project and how they will be signed and maintained.
- Litter Management - Discuss how litter will be maintained for this project (education of employees, number of dumpsters, frequency of dumpster pick-up, etc.).
- Vehicle and Equipment Cleaning and Maintenance - Identify where equipment cleaning and maintenance locations for this project and what BMPs will be used to ensure containment and spill prevention.
- Dewatering Activities - Identify the controls which will be used during dewatering operations to ensure sediments will not leave the construction site.
- Polymer Flocculants and Treatment Chemicals - Identify the use and dosage of treatment chemicals and provide the Resident Engineer with Material Safety Data Sheets. Describe procedures on how the chemicals will be used and identify who will be responsible for the use and application of these chemicals. The selected individual must be trained on the established procedures.
- Additional measures indicated in the plan.

III. Maintenance

When requested by the Contractor, the Resident Engineer will provide general maintenance guides to the Contractor for the practices associated with this project. The following additional procedures will be used to maintain, in good and effective operating conditions, the vegetation, erosion and sediment control measures and other protective measures identified in this plan. It will be Contractor's responsibility to attain maintenance guidelines for any manufactured BMPs which are to be installed and maintained per manufacture's specifications.

During construction activity, the maintenance of all BMPs will be required as set forth in the SWPPP. See Maintenance Guide per new website at: <http://www.idot.illinois.gov/transportation-system/emiroment/erosion-and-sediment-control>.

Temporary Riprap Maintenance: Riprap at temporary culvert should be checked for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap has been damaged, it should be repaired immediately before further damage can take place.

Temporary Erosion Control Seeding Maintenance: Restore rills, greater than 4 inches deep, as quickly as possible on slopes steeper than 1V:4H to prevent sheetflow from becoming concentrated flow patterns. Mow, if necessary, to promote seed soil contact when excessive weed development occurs, a common indication of ineffective temporary seeding. Supplement BMP if weather conditions (extreme heat or cold) are not conducive for germination.

Temporary Mulching Maintenance: Repair straw if blown or washed away, or if hydraulic mulch washes away. Place tackifier or an ECB if mulch does not control erosion.

Erosion Control Blanket (ECB) Maintenance: Repair damage due to water running beneath the blanket and restore ECBs when displacement occurs. Reseeding may be necessary. Replace all displaced ECBs and restaple.

Perimeter Erosion Barrier (PEB) Maintenance: Repair tears, gaps or undermining. Restore leaning PEB and ensure taut. Repair or replace any missing or broken stakes immediately. Clean PEB if sediment reaches one-third height of barrier.

Remove PEB once final stabilization establishes since PEB is no longer necessary and should be removed. Repair PEB if undermining occurs anywhere along its entire length.

Temporary Ditch Checks (TDC) Maintenance: Remove sediment from upstream side of ditch check when sediment has reached 50% of height of structure. Remove ditch checks once all upslope areas are stabilized, seed or otherwise stabilize TDC, riprap at temporary culvert area(s). All temporary erosion control systems shall be removed at the direction of the Engineer and be disposed of according to Article 202.03.

Storm Drain Inlet Protection Maintenance: Remove sediment from inlet filter basket when basket is 25% full or 50% of the fabric pores are covered with silt. When filter is removed for cleaning, replace filter if any tear is present.

Stabilized Construction Entrance Maintenance: Replenish stone or replace exit if vehicles continue to track sediment onto the roadway from the construction site. Use street sweeping in conjunction with this BMP to remove sediment not removed by the stabilized construction exit.

IV. Inspections

Qualified personnel shall inspect disturbed areas of the construction site which have not yet been finally stabilized, structural control measures, and locations where vehicles and equipment enter and exit the site using IDOT Storm Water Pollution Prevention Plan Erosion Control Inspection Report (BC 2259). Such inspections shall be conducted at least once every seven (7) calendar days and within twenty-four (24) hours of the end of a storm or by the end of the following business or work day that is 0.5 inch or greater or equivalent snowfall.

Inspections may be reduced to once per month when construction activities have ceased due to frozen conditions. Weekly inspections will recommence when construction activities are conducted, or if there is 0.5" or greater rain event, or a discharge due to snowmelt occurs.

If any violation of the provisions of this plan is identified during the conduct of the construction work covered by this plan, the Resident Engineer shall notify the appropriate IEPA Field Operations Section office by e-mail at: epa.swnoncomp@illinois.gov, telephone or fax within twenty-four (24) hours of the incident. The Resident Engineer shall then complete and submit an "Incidence of Non-Compliance" (ION) report for the identified violation within five (5) days of the incident. The Resident Engineer shall use forms provided by IEPA and shall include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance. All reports of non-compliance shall be signed by a responsible authority in accordance with Part VI. G of the Permit ILR10.

The Incidence of Non-Compliance shall be mailed to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Attn: Compliance Assurance Section
1021 North Grand East
Post Office Box 19276
Springfield, Illinois 62794-9276

Additional Inspections Required:

The ESC Technician will inspect the site on a weekly basis and within 24 hours of every 0.5-inch storm event. All temporary erosion control systems shall be removed at the direction of the Engineer and be disposed of according to Article 202.03.dence of Noncompliance" report should be completed for any SWPPP violations and submitted the Enforcement Officer.

All offset Borrow, Waste and Use areas are part of the construction site and are to be inspected according to the language in this section.

V. Failure to Comply

Failure to comply with any provisions of this Storm Water Pollution Prevention Plan will result in the implementation of a National Pollutant Discharge Elimination System/Erosion and Sediment Control Deficiency Deduction against the Contractor and/or penalties under the Permit ILR10 which could be passed on to the Contractor.



Contractor Certification Statement



Prior to conducting any professional services at the site covered by this contract, the Contractor and every subcontractor must complete and return to the Resident Engineer the following certification. A separate certification must be submitted by each firm. Attach to this certification all items required by Section II.G of the Storm Water Pollution Prevention Plan (SWPPP) which will be handled by the Contractors/subcontractor completing this form.

Route FAP 346 and FAU 1218	Marked Route US 41 and IL 132	Section 125X-N
Project Number C-91-07-00	County Lake	Contract Number 60K80

This certification statement is a part of SWPPP for the project described above, in accordance with the General NPDES Permit No. ILR10 issued by the Illinois Environmental Protection Agency.

I certify under penalty of law that I understand the terms of the Permit No. ILR10 that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

In addition, I have read and understand all of the information and requirements stated in SWPPP for the above mentioned project; I have received copies of all appropriate maintenance procedures; and, I have provided all documentation required to be in compliance with the Permit ILR10 and SWPPP and will provide timely updates to these documents as necessary.

- Contractor
- Sub-Contractor

Print Name <input type="text"/>	Signature <input type="text"/>
Title <input type="text"/>	Date <input type="text"/>
Name of Firm <input type="text"/>	Telephone <input type="text"/>
Street Address <input type="text"/>	City/State/Zip <input type="text"/>

Items which the Contractor/subcontractor will be responsible for as required in Section II.G. of SWPPP:

404 PERMIT



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS
231 SOUTH LA SALLE STREET
CHICAGO, ILLINOIS 60604-1437

August 2, 2016

Technical Services Division
Regulatory Branch
LRC-2015-00644

SUBJECT: Authorization to Discharge 0.04 Acres of Fill in Waters of the U.S. for the UPRR Bridge Replacement over IL-132, Gurnee, Lake County, Illinois

John Fortmann
Illinois Department of Transportation
201 West Center Court
Schaumburg, Illinois 60196-1096

Dear Mr. Fortmann:

This office has verified that your proposed activity complies with the terms and conditions of Regional Permit 3 (Transportation Projects) and the General Conditions for all activities authorized under the Regional Permit Program.

This verification expires three (3) years from the date of this letter and covers only your activity as described in your notification and as shown on the plans entitled "FAP Route 346 (US 41) – at IL Route 132 (Under UPRR) – Section: 125X-N&J-SB-B – Bridge Replacement and Interchange Improvement – Lake County – C-91-603-10" dated July 29, 2015, prepared by IDOT. Caution must be taken to prevent construction materials and activities from impacting waters of the United States beyond the scope of this authorization. If you anticipate changing the design or location of the activity, you should contact this office to determine the need for further authorization.

The activity may be completed without further authorization from this office provided the activity is conducted in compliance with the terms and conditions of the RPP, including conditions of water quality certification issued under Section 401 of the Clean Water Act by the Illinois Environmental Protection Agency (IEPA). If the design, location, or purpose of the project is changed, you should contact this office to determine the need for further authorization.

The following special conditions are a requirement of your authorization:

1. You are required to retain a qualified Independent SESC Inspector (ISI). The following requirements apply:
 - a. You shall contact this office and the ISI at least 10 calendar days prior to the preconstruction meeting so that a representative of this office may attend. The

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- meeting agenda will include a discussion of the SESC plan and the installation and maintenance requirements of the SESC practices on the site;
- b. Prior to commencement of any in-stream work, you shall submit construction plans and a detailed narrative to this office that disclose the contractor's preferred method of cofferdam and dewatering method;
 - c. The ISI will perform weekly inspections of the implemented SESC measures to ensure proper installation and regular maintenance of the approved methods. The ISI contact information form shall be submitted to this office via e-mail and/or hard copy prior to commencement of the permitted work;
 - d. The ISI shall submit to the Corps an inspection report with digital photographs of the SESC measures on a weekly basis during the active and non-active phases of construction. An inspection report shall also be submitted at the completion of the project once the SESC measures have been removed and final stabilization has been completed; and
 - e. Field conditions during project construction may require the implementation of additional SESC measures not included in the SESC plans for further protection of aquatic resources. You shall contact this office immediately in the event of any changes or modifications to the approved plan set or non-compliance of an existing SESC method. Upon direction of the Corps, corrective measure shall be instituted at the site to resolve the problem along with a plan to protect and/or restore the impacted jurisdictional area(s). If you fail to implement corrective measures, this office may require more frequent site inspections to ensure the installed SESC measures are acceptable.
2. This site is within the aboriginal homelands of several American Indian Tribes. If any human remains, Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA), or archaeological evidence are discovered during any phase of this project, interested Tribes request immediate consultation with the entity of jurisdiction for the location of discovery. In such case, please contact Mr. Soren Hall by telephone at 312-846-5532, or email at Soren.G.Hall@usace.army.mil.
 3. You are responsible for all work authorized herein and for ensuring that all contractors are aware of the terms and conditions of this authorization.
 4. A copy of this authorization must be present at the project site during all phases of construction.
 5. You shall notify this office of any proposed modifications to the project, including revisions to any of the plans or documents cited in this authorization. You must receive approval from this office before work affected by the proposed modification is performed.
 6. You shall notify this office prior to the transfer of this authorization and liabilities associated with compliance with its terms and conditions.
The authorization is without force and effect until all other permits or authorizations from

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local, state, or other Federal agencies are secured. Please note that IEPA has issued Section 401 Water Quality Certification for this RP. These conditions are included in the enclosed fact sheet. If you have any questions regarding Section 401 certification, please contact Mr. Dan Heacock at IEPA's Division of Water Pollution Control, Permit Section #15, by telephone at (217) 782-3362.

Once you have completed the authorized activity, please sign and return the enclosed compliance certification. If you have any questions, please contact Mr. Soren Hall of my staff by telephone at 312-846-5532, or email at Soren.G.Hall@usace.army.mil.

Sincerely,

Kathleen G. Chernich
Chief, East Section
Regulatory Branch

Enclosures

Copy Furnished:
Huff & Huff (Alycia Klauenberg)



PERMIT COMPLIANCE

CERTIFICATION

Permit Number: LRC-2015-00644
Permittee: John Fortman
Illinois Department of Transportation
Date: August 2, 2016

I hereby certify that the work authorized by the above-referenced permit has been completed in accordance with the terms and conditions of said permit and if applicable, compensatory wetland mitigation was completed in accordance with the approved mitigation plan.¹

PERMITTEE

DATE

Upon completion of the activity authorized by this permit and any mitigation required by the permit, this certification must be signed and returned to the following address:

U.S. Army Corps of Engineers
Chicago District, Regulatory Branch
231 South LaSalle Street, Suite 1500
Chicago, Illinois 60604-1437

Please note that your permitted activity is subject to compliance inspections by Corps of Engineers representatives. If you fail to comply with this permit, you may be subject to permit suspension, modification, or revocation.

¹If compensatory mitigation was required as part of your authorization, you are certifying that the mitigation area has been graded and planted in accordance with the approved plan. You are acknowledging that the maintenance and monitoring period will begin after a site inspection by a Corps of Engineers representative or after thirty days of the Corps' receipt of this certification. You agree to comply with all permit terms and conditions, including additional reporting requirements, for the duration of the maintenance and monitoring period.



US Army Corps of Engineers®
Chicago District

**GENERAL CONDITIONS
APPLICABLE TO THE 2012
REGIONAL PERMIT PROGRAM**

The permittee shall comply with the terms and conditions of the Regional Permits and the following general conditions for all activities authorized under the RPP:

1. State 401 Water Quality Certification - Water quality certification under Section 401 of the Clean Water Act may be required from the Illinois Environmental Protection Agency (IEPA). The District may consider water quality, among other factors, in determining whether to exercise discretionary authority and require an Individual Permit. Please note that Section 401 Water Quality Certification is a requirement for projects carried out in accordance with Section 404 of the Clean Water Act. Projects carried out in accordance with Section 10 of the Rivers and Harbors Act of 1899 do not require Section 401 Water Quality Certification

On March 2, 2012, the IEPA granted Section 401 certification, with conditions, for all Regional Permits, except for activities in certain waterways noted under RPs 4 and 8. The following conditions of the certification are hereby made conditions of the RPP:

1. The applicant shall not cause:
 - a) a violation of applicable water quality standards of the Illinois Pollution Control Board Title 35, Subtitle C: Water Pollution Rules and Regulations;
 - b) water pollution defined and prohibited by the Illinois Environmental Protection Act;
 - c) interference with water use practices near public recreation areas or water supply intakes;
 - d) a violation of applicable provisions of the Illinois Environmental Protection Act.
2. The applicant shall provide adequate planning and supervision during the project construction period for implementing construction methods, processes and cleanup procedures necessary to prevent water pollution and control erosion.
3. Except as allowed under condition 9, any spoil material excavated, dredged or otherwise produced must not be returned to the waterway but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to waters of the State unless a permit has been issued by the Illinois EPA. Any backfilling must be done with clean material placed in a manner to prevent violation of applicable water quality standards.
4. All areas affected by construction shall be mulched and seeded as soon after construction as possible. The applicant shall undertake necessary measures and procedures to reduce erosion during construction. Interim measures to prevent soil erosion during construction shall be taken and may include the installation of sedimentation basins and temporary mulching. All construction within the waterway shall be conducted during zero or low flow conditions. The applicant shall be responsible for obtaining a NPDES Stormwater Permit prior to initiating construction if the construction activity associated with the project will result in the disturbance of (1) one or more acres, total land area. A NPDES Stormwater Permit may be obtained by submitting a properly completed Notice of Intent (NOI) form by certified mail to the Illinois EPA's Division of Water Pollution Control, Permit Section.
5. The applicant shall implement erosion control measures consistent with the Illinois Urban Manual (IEPA/USDA, NRCS; 2011, <http://aiswcd.org/IUM/index.html>).
6. The applicant is advised that the following permits(s) must be obtained from the Illinois EPA: The applicant must obtain permits to construct sanitary sewers, water mains, and related facilities prior to construction.
7. Backfill used in the stream-crossing trench shall be predominantly sand or larger size material, with less than 20% passing a #230 U.S. sieve.
8. Any channel relocation shall be constructed under dry conditions and stabilized to prevent erosion prior to the diversion of flow.
9. Backfill used within trenches passing through surface waters of the State, except wetland areas, shall be clean course aggregate, gravel or other material which will not cause siltation, pipe damage during placement, or chemical corrosion in place. Excavated material may be used only if:
 - a) particle size analysis is conducted and demonstrates the material to be at least 80% sand or larger size material, using #230 U.S. sieve; or
 - b) excavation and backfilling are done under dry conditions.
10. Backfill used within trenches passing through wetland areas shall consist of clean material which will not cause siltation, pipe damage during placement, or chemical corrosion in place. Excavated material shall be used to the extent practicable, with the upper six (6) to twelve (12) inches backfilled with the topsoil obtained during trench excavation.
11. Any applicant proposing activities in a mined area or previously mined area shall provide to the IEPA a written determination regarding the sediment and materials used which are considered "acid-producing material" as defined in 35 Il. Adm. Code,

Subtitle D. If considered "acid-producing material," the applicant shall obtain a permit to construct pursuant to 35 Il. Adm. Code 404.101.

12. Asphalt, bituminous material and concrete with protruding material such as reinforcing bar or mesh shall not be 1) used for backfill, 2) placed on shorelines/stream banks, or 3) placed in waters of the State.
 13. Applicants that use site dewatering techniques in order to perform work in waterways for construction activities approved under Regional Permits 1 (Residential, Commercial and Institutional Developments), 2 (Recreation Projects), 3 (Transportation Projects), 7 (Temporary Construction Activities), 9 (Maintenance) or 12 (Bridge Scour Protection) shall maintain flow in the stream during such construction activity by utilizing dam and pumping, fluming, culverts or other such techniques.
 14. In addition to any action required of the Regional Permit 13 (Cleanup of Toxic and Hazardous Materials Projects) applicant with respect to the "Notification" General Condition 22, the applicant shall notify the Illinois EPA Bureau of Water, of the specific activity. This notification shall include information concerning the orders and approvals that have been or will be obtained from the Illinois EPA Bureau of Land (BOL) for all cleanup activities under BOL jurisdiction, or for which authorization or approval is sought from BOL for no further remediation. This Regional Permit is not valid for activities that do not require or will not receive authorization or approval from the BOL.
2. Threatened and Endangered Species - If the District determines that the activity may affect Federally listed species or critical habitat, the District will initiate section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) in accordance with the Endangered Species Act of 1973, as amended (Act). Applicants shall provide additional information that would enable the District to conclude that the proposed action will have no effect on federally listed species.

The application packet shall indicate whether resources (species, their suitable habitats, or critical habitat) listed or designated under the Act, may be present within areas affected (directly or indirectly) by the proposed project. Applicants shall provide a section 7 species list for the action area using the on-line process at the USFWS website. You can access "U.S. Fish and Wildlife Service Endangered Species Program of the Upper Midwest" website at www.fws.gov/midwest/Endangered. Click on the section 7 Technical Assistance green shaded box in the lower right portion of the screen and follow the instructions to completion. Review all documentation pertaining to the species list, provide the rationale for your effects determination for each species, and send the information to this office for review.

If no species, their suitable habitats, or critical habitat are listed, then a "no effect" determination can be made, and section 7 consultation is not warranted. If species or critical habitat appear on the list or suitable habitat is present within the action area, then a biological assessment or biological evaluation will need to be completed to determine if the proposed action will have "no effect" or "may effect" the species or suitable habitat. The District will request initiation of section 7 consultation with the USFWS upon agreement with the applicant on the effect determinations in the biological assessment or biological evaluation. If the issues are not resolved, the analysis of the situation is complicated, or impacts to listed species or critical habitat are found to be greater than minimal, the District will consider reviewing the project under the Individual Permit process.

Projects in Will, DuPage, or Cook Counties that are located in the recharge zones for Hine's emerald dragonfly critical habitat units may be reviewed under the RPP, with careful consideration due to the potential impacts to the species. All projects reviewed that are located within 3.25 miles of a critical habitat unit will be reviewed under Category II of the RPP. Please visit the following website for the locations of the Hine's emerald dragonfly critical habitat units in Illinois.
<http://www.fws.gov/midwest/endangered/insects/hed/FRHinesFinalRevisedCH.html>

3. Historic Properties - In cases where the District determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity may require an Individual Permit. A determination of whether the activity may be authorized under the RPP instead of an Individual Permit will not be made until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the District with the appropriate documentation to demonstrate compliance with those requirements.

Non-Federal permittees must include notification to the District if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the permit application must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing permit submittals, the District will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. Based on the information submitted and these efforts, the District shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the District, the non-Federal applicant shall not begin the activity until notified by the District either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

The District will take into account the effects on such properties in accordance with 33 CFR Part 325, Appendix C, and 36 CFR 800. If all issues pertaining to historic properties have been resolved through the consultation process to the satisfaction of the District, Illinois Historic Preservation Agency (IHPA) and Advisory Council on Historic Preservation, the District may, at its discretion, authorize the activity under the RPP instead of an Individual Permit.

Applicants are encouraged to obtain information on historic properties from the IHPA and the National Register of Historic Places at the earliest stages of project planning. For information, contact:

Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1507
(217) 782-4836
www.illinoishistory.gov

If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity, you must immediately notify this office of what you have found, and to the maximum extent practicable, stop activities that would adversely affect those remains and artifacts until the required coordination has been completed. We will initiate the Federal, Tribal and State coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. Soil Erosion and Sediment Control - Measures shall be taken to control soil erosion and sedimentation at the project site to ensure that sediment is not transported to waters of the U.S. during construction. Soil erosion and sediment control measures shall be implemented before initiating any clearing, grading, excavating or filling activities. All temporary and permanent soil erosion and sediment control measures shall be maintained throughout the construction period and until the site is stabilized. All exposed soil and other fills, and any work below the ordinary high water mark shall be permanently stabilized at the earliest practicable date.

Applicants are required to prepare a soil erosion and sediment control (SESC) plan including temporary BMPs. The plan shall be designed in accordance with the Illinois Urban Manual, 2011 (<http://aiswcd.org/IUM/index.html>). Practice standards and specifications for measures outlined in the soil erosion and sediment control plans will follow the latest edition of the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement." Additional Soil Erosion and Sediment Control (SESC) measures not identified in the Illinois Urban Manual may also be utilized upon District approval.

At the District's discretion, an applicant may be required to submit the SESC plan to the local Soil and Water Conservation District (SWCD), or the Lake County Stormwater Management Commission (SMC) for review. When the District requires submission of an SESC plan, the following applies: An activity may not commence until the SESC plan for the project site has been approved; The SWCD/SMC will review the plan and provide a written evaluation of its adequacy; A SESC plan is considered acceptable when the SWCD/SMC has found that it meets technical standards. Once a determination has been made, the authorized work may commence unless the SWCD/SMC has requested that they be notified prior to commencement of the approved plans. The SWCD/SMC may attend pre-construction meetings with the permittee and conduct inspections during construction to determine compliance with the plans. Applicants are encouraged to begin coordinating with the appropriate SWCD/SMC office at the earliest stages of project planning. For information, contact:

Kane-DuPage SWCD
2315 Dean Street, Suite 100
St. Charles, IL 60174
(630) 584-7961 ext.3
www.kanedupageswcd.org

McHenry-Lake County SWCD
1648 South Eastwood Dr.
Woodstock, IL 60098
(815) 338-0099 ext.3
www.mchenryswcd.org

North Cook SWCD
899 Jay Street
Elgin, IL 60120
(847) 468-0071
www.northcookswcd.org

Lake County SMC
500 W. Winchester Rd, Suite 201
Libertyville, IL 60048
(847) 377-7700
www.lakecountyil.gov/stormwater

5. Total Maximum Daily Load - For projects that include a discharge of pollutant(s) to waters for which there is an approved Total Maximum Daily Load (TMDL) allocation for any parameter, the applicant shall develop plans and BMPs that are consistent with the assumptions and requirements in the approved TMDL. The applicant must incorporate into their plans and BMPs any conditions applicable to their discharges necessary for consistency with the assumptions and requirements of the TMDL within any timeframes established in the TMDL. The applicant must carefully document the justifications for all BMPs and plans, and install, implement and maintain practices and BMPs that are consistent with all relevant TMDL allocations and with all relevant conditions in an implementation plan. Information regarding the TMDL program, including approved TMDL allocations, can be found at the following website: www.epa.state.il.us/water/tmdl/

6. Floodplain - Discharges of dredged or fill material into waters of the United States within the 100-year floodplain (as defined by the Federal Emergency Management Agency) resulting in permanent above-grade fills shall be avoided and minimized to the maximum extent practicable. When such an above-grade fill would occur, the applicant may need to obtain approval from the Illinois

Department of Natural Resources, Office of Water Resources, (IDNR-OWR) which regulates activities affecting the floodway and the local governing agency (e.g., Village or County) with jurisdiction over activities in the floodplain. Compensatory storage may be required for fill within the floodplain. Applicants are encouraged to obtain information from the IDNR-OWR and the local governing agency with jurisdiction at the earliest stages of project planning. For information on floodway construction, contact:

IDNR/OWR
2050 Stearns Road
Bartlett, IL 60103
(847) 608-3100
<http://dnr.state.il.us/owr/>

For information on floodplain construction, please contact the local government and/or the Federal Emergency Management Agency. Pursuant to 33 CFR 320.4(j), the District will consider the likelihood of the applicant obtaining approval for above-ground permanent fills in floodplains in determining whether to issue authorization under the RPP.

7. Navigation - No activity may cause more than a minimal adverse effect on navigation. Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
8. Proper Maintenance - Any authorized structure or fill shall be properly maintained, including that necessary to ensure public safety.
9. Aquatic Life Movements - No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including species that normally migrate through the area, unless the activity's primary purpose is to impound water.
10. Equipment - Soil disturbance and compaction shall be minimized through the use of matting for heavy equipment, low ground pressure equipment, or other measures as approved by the District.
11. Wild and Scenic Rivers - No activity may occur in a component of the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status. Information on Wild and Scenic Rivers may be obtained from the appropriate land management agency in the area, such as the National Park Service and the U.S. Forest Service.
12. Tribal Rights - No activity or its operation may impair reserved tribal rights, such as reserved water rights, treaty fishing and hunting rights.
13. Water Supply Intakes - No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.
14. Shellfish Production - No discharge of dredged or fill material may occur in areas of concentrated shellfish production.
15. Suitable Material - No discharge of dredged or fill material may consist of unsuitable material and material discharged shall be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act). Unsuitable material includes trash, debris, car bodies, asphalt, and creosote treated wood.
16. Spawning Areas - Discharges in spawning areas during spawning seasons shall be avoided to the maximum extent practicable.
17. Obstruction of High Flows - Discharges shall not permanently restrict or impede the passage of normal or expected high flows. All crossings shall be culverted, bridged or otherwise designed to prevent the restriction of expected high water flows, and shall be designed so as not to impede low water flows or the movement of aquatic organisms.
18. Impacts From Impoundments - If the discharge creates an impoundment of water, adverse impacts on aquatic resources caused by the accelerated passage of water and/or the restriction of its flow shall be avoided to the maximum extent practicable.
19. Waterfowl Breeding Areas - Discharges into breeding areas for migratory waterfowl shall be avoided to the maximum extent practicable.
20. Removal of Temporary Fills - Any temporary fill material shall be removed in its entirety and the affected area returned to its pre-existing condition.
21. Mitigation - All appropriate and practicable steps must first be taken to avoid and minimize impacts to aquatic resources. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, and/or other aquatic resource functions (33 CFR 332). The proposed compensatory mitigation shall utilize a watershed approach and fully consider the ecological needs of the watershed. Where an appropriate watershed plan is available, mitigation site selection should consider recommendations in the plan. The applicant shall describe in detail how the mitigation site was chosen and will be developed, based on the specific

resource need of the impacted watershed. Permit applicants are responsible for proposing an appropriate compensatory mitigation option to offset unavoidable impacts. However, the District is responsible for determining the appropriate form and amount of compensatory mitigation required when evaluating compensatory mitigation options, and determining the type of mitigation that would be environmentally preferable. In making this determination, the District will assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed. Methods of providing compensatory mitigation include aquatic resource restoration, establishment, enhancement, and in certain circumstances, preservation. Compensatory mitigation will be accomplished by establishing a minimum ratio of 1.5 acres of mitigation for every 1.0 acre of impact to waters of the U.S. Furthermore, the District has the discretion to require additional mitigation to ensure that the impacts are no more than minimal. Further information is available at www.lrc.usace.army.mil/Missions/Regulatory/Illinois/Mitigation.aspx

22. **Notification** - The applicant shall provide written notification (i.e., a complete application) for a proposed activity to be authorized under the RPP prior to commencing a proposed activity. The District's receipt of the complete application is the date when the District receives all required notification information from the applicant (see below). If the District informs the applicant within 60 calendar days that the notification is incomplete (i.e., not a complete application), the applicant shall submit to the District, in writing, the requested information to be considered for review under the Regional Permit Program. A new 60 day review period will commence when the District receives the requested information. Applications that involve unauthorized activities that are completed or partially completed by the applicant are not subject to the 60-day review period.

For all activities, notification shall include:

- a. A cover letter providing a detailed narrative of the proposed activity describing all work to be performed, a clear project purpose and need statement, the Regional Permit(s) to be used for the activity, the area (in acres) of waters of the U.S. to be impacted (be sure to specify if the impact is permanent or temporary, and identify which area it affects), and a statement that the terms and conditions of the RPP will be followed.
- b. A completed joint application form for Illinois signed by the applicant or agent. The application form is available at www.lrc.usace.army.mil/Portals/36/docs/regulatory/forms/appform.pdf. If the applicant does not sign the joint application form, notification shall include a signed, written statement from the applicant designating the agent as their representative.
- c. A delineation of waters of the U.S., including wetlands, for the project area, and for areas adjacent to the project site (off-site wetlands shall be identified through the use of reference materials including review of local wetland inventories, soil surveys and the most recent available aerial photography), shall be prepared in accordance with the current U.S. Army Corps of Engineers methodology (www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/reg_supp.aspx) and generally conducted during the growing season.* Our wetland delineation standards are available at www.lrc.usace.army.mil/Portals/36/docs/regulatory/pdf/Delineations.pdf. For sites supporting wetlands, the delineation shall include a Floristic Quality Assessment (Swink and Wilhelm. 1994, latest edition, Plants of the Chicago Region). The delineation shall also include information on the occurrence of any high-quality aquatic resources (see Appendix A), and a listing of waterfowl, reptile and amphibian species observed while at the project area. The District reserves the right to exercise judgment when reviewing submitted wetland delineations. Flexibility of the requirements may be determined by the District on a case-by-case basis only.
- d. A street map showing the location of the project area.
- e. Latitude and longitude for the project in decimal degrees format (i.e. 41.88377N, -87.63960W).
- f. Preliminary engineering drawings sized 11" by 17" (full-sized may be requested by the project manager and you may also submit plans in PDF format on a disc) showing all aspects of the proposed activity and the location of waters of the U.S. to be impacted and not impacted. The plans shall include grading contours, proposed and existing structures such as buildings footprints, roadways, road crossings, stormwater management facilities, utilities, construction access areas and details of water conveyance structures. The plans shall also depict buffer areas, outlots or open space designations, best management practices, deed restricted areas and restoration areas, if required under the specific RP.
- g. Submittal of soil erosion and sediment control (SESC) plans that identify all SESC measures to be utilized during construction of the project.
- h. The application packet shall indicate whether resources (species, their suitable habitats, or critical habitat) listed or designated under the Endangered Species Act of 1973, as amended, may be present within areas affected (directly or indirectly) by the proposed project. Applicants shall provide a section 7 species list for the action area using the on-line process at the USFWS website. You can access "U.S. Fish and Wildlife Service Endangered Species Program of the Upper Midwest" website at www.fws.gov/midwest/Endangered. Click on the section 7 Technical Assistance green shaded box in the lower right portion of the screen and follow the instructions to completion. Print all documentation pertaining to the species list, include the rationale for your effects determination for each species, and forward the information to this office for review.

* If a wetland delineation is conducted outside of the growing season, the District will determine on a case-by-case basis whether sufficient evidence is available to make an accurate determination. If the District finds that the delineation lacks sufficient evidence, the application will not be considered complete until the information is provided. This may involve re-delineating the project site during the growing season.

In the event there are no species, their suitable habitats, or critical habitat, then a “no effect” determination can be made and section 7 consultation is not warranted. If species or critical habitat appear on the list, or suitable habitat is present within the action area, then a biological assessment or biological evaluation will need to be completed to determine if the proposed action will have “no effect” or “may effect” on the species or suitable habitat. The District will request initiation of section 7 consultation with the USFWS upon agreement with the applicant on the effect determinations in the biological assessment or biological evaluation. If the issues are not resolved, the analysis of the situation is complicated, or impacts to listed species or critical habitat are found to be greater than minimal, the District will consider reviewing the project under the Individual Permit process.

- i. A determination of the presence or absence of any State threatened or endangered species. Please contact the Illinois Department of Natural Resources (IDNR) to determine if any State threatened and endangered species could be in the project area. You can access the IDNR’s Ecological Compliance Assessment Tool (EcoCAT) at the following website: <http://dnrecocat.state.il.us/ecopublic/>. Once you complete the EcoCAT and consultation process, forward all resulting information to this office for consideration. The report shall also include recommended methods as required by the IDNR for minimizing potential adverse effects of the project.
- j. A statement about the knowledge of the presence or absence of Historic Properties, which includes properties listed, or properties eligible to be listed in the National Register of Historic Places. A letter from the Illinois Historic Preservation Agency (IHPA) can be obtained indicating whether your project is in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. The permittee shall provide all pertinent correspondence with the IHPA documenting compliance. The IHPA has a checklist of documentation required for their review located here: www.illinoishistory.gov/PS/rcdocument.htm.
- k. Where an appropriate watershed plan is available, the applicant shall address in writing how the proposed activity is aligned with the relevant water quality, hydrologic, and aquatic resource protection recommendations in the watershed plan.
- l. A discussion of measures taken to avoid and/or minimize impacts to aquatic resources on the project site.
- m. A compensatory mitigation plan for all impacts to waters of the U.S. (if compensatory mitigation is required under the specific RP).
- n. A written narrative addressing all items listed under the specific RP.

For Category II activities, the District will provide an Agency Request for Comments (ARC) which describes the proposed activity. The ARC will be sent to the following agencies: United States Fish & Wildlife Service (USFWS), United States Environmental Protection Agency (USEPA), Illinois Department of Natural Resources (IDNR), Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR), Illinois Environmental Protection Agency (IEPA), Illinois Historic Preservation Agency (IHPA), Illinois Nature Preserves Commission (INPC) and U.S. Coast Guard (Section 10 activities only). Additional entities may also be notified as needed. These agencies have ten (10) calendar days from the date of the ARC to contact the District and either provide comments or request an extension not to exceed fifteen (15) calendar days. The District will fully consider agency comments received within the specified time frame. If the District determines the activity complies with the terms and conditions of the RPP and impacts on aquatic resources are minimal, the District will notify the applicant in writing and include special conditions if deemed necessary. If the District determines that the impacts of the proposed activity are more than minimal, the District will notify the applicant that the project does not qualify for authorization under the RPP and instruct the applicant on the procedures to seek authorization under an Individual Permit.

23. Compliance Certification - Any permittee who has received authorization under the RPP from the District shall submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the District with the authorization letter and will include: a) a statement that the authorized work was done in accordance with the District’s authorization, including any general or specific conditions; b) a statement that any required mitigation was completed in accordance with the permit conditions and; c) the signature of the permittee certifying the completion of the work and mitigation.

24. Multiple use of Regional Permits - In any case where a Regional Permit is combined with any other Regional Permit to cover a single and complete project (except where prohibited under specific Regional Permits), the applicant shall notify the District in accordance with General Condition 22. If multiple Regional Permits are used, the total impact may not exceed the maximum allowed by the Regional Permit with the greatest impact threshold.

25. Other Restrictions - Authorization under the RPP does not obviate the need to obtain other Federal, State or local permits, approvals, or authorizations required by law nor does it grant any property rights or exclusive privileges, authorize any injury to the property or rights of others or authorize interference with any existing or proposed Federal project.

Approved by:

//ORIGINAL SIGNED//

Frederic A. Drummond, Jr.
Colonel, U.S. Army
District Commander

February 24, 2012

Date

FAP Route 346 (US 41)
Project ACNHPP-0346(019)
Section 125X-N&J-SB-B
Lake County
Contract No. 60K80

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K801

SPECIAL PROVISIONS

SECTION B

UPRR BRIDGE & TRACKWORK

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
 SECTION 125X-N LAKE COUNTY
 CONTRACT NO. 60K802

UPRR
SPECIFICATIONS FOR UPRR OVER ROUTE 132 IN LAKE COUNTY

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SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K804

DIVISION 1 – GENERAL CONDITIONS

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SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K805

SECTION 01572
WORKING AND FLAGGING NEAR THE TRACKS

PART 1 - GENERAL

A. SUMMARY

1. Except as authorized by the Agreement and the Engineer, the Contractor will not work within 25 feet of the centerline of any track in service, and will locate all equipment, devices and materials at a sufficient distance from any track to ensure that no apparatus or part of any piece of equipment, device or material, such as the boom of a crane or a dragline, could under any circumstances reach closer than 25 feet to the centerline of any track. When the Contractor is required to work within 25 feet of the centerline of any track in service, a flagman will be required. The Contractor will shut down or clear equipment within 25 ft. of track when trains are approaching, as advised by railroad flagman. The Railroad will bear the cost of such Railroad flagmen required for on track safety.
 2. Railroad flagmen are for the protection of train movements only. The Contractor is responsible for all equipment movements across public and private road crossings. The Contractor's equipment shall be equipped with two-way radios for better communications with railroad flagmen and the railroad engineer. Contractor shall provide Flagger(s) with a working radio(s). All other flagging charges not involving the safety of Railroad operations will be at the Contractor's expense.
- 1.2 The Contractor must notify the Engineer at least seven (7) days in advance of the date the Contractor wishes to have a railroad flagman.

A. CONTRACTOR SAFETY

1. The Contractor shall abide by the rules set forth in the "Minimum Safety Requirements" for UPRR Contractors.(separate document)
2. General Contractor and all Subcontractors shall attend all safety meetings. Contractor shall adequately maintain their company "Safety Plan" throughout the duration of the project. Contractor will conduct FRA required "On Track Safety Training" for all contractor and subcontractor workers.
3. Emergency phone numbers shall be posted in a conspicuous place in all field offices or on the project property.
4. Cell phone use is not allowed while operating equipment or walking on UPRR property.

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SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K806

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

- 1.1 SUMMARY: The Contractor shall provide a Project Closeout CD to Engineer prior to final invoice. CD shall contain (if project applicable):
- A. All as-built drawings for the project: one electronic file copy, in both CAD format and pdf format, of "as-constructed" drawings upon completion of the work. The drawings shall reflect all modifications made during construction and note the exact location of all utilities and equipment. Each sheet shall be stamped "As-Built," signed and dated.
 - B. All density tests and soil proctor data.
 - C. All concrete break tests.
 - D. All welding data.
 - E. All pile driving data.
 - F. All reviewed submittals sent to engineer during project duration.
 - G. Any DWR forms for equipment rental used on the project.
 - H. Per Section 01300, the Contractor will supply the instructions, operating and maintenance instruction bulletins, complete parts lists and wiring diagrams for all panels.
 - I. Per Section 01551, supply any agreements made between the Contractor and private landowners.

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CONTRACT NO. 60K807

GUARANTEES, WARRANTIES AND BONDS
Section 01750

SECTION 01750

GUARANTEES, WARRANTIES AND BONDS

PART 1 - GENERAL

- 1.1 SUMMARY: The Contractor shall guarantee all Work under this Agreement for a period of one year from the date of acceptance by the Railroad, unless otherwise indicated. Contractor shall leave the Work in perfect order at completion, and the final certificate of payment shall not relieve him of the responsibility for negligence, faulty materials, or workmanship; upon written notice, he shall remedy any defects or workmanship that may appear during the time hereinbefore mentioned and pay all expenses due therefrom to the entire satisfaction of the Engineer.

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DIVISION 2 – SITE WORK SPECIFICATIONS

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K809

SECTION 02050
REMOVAL OF EXISTING STRUCTURES

PART 1: DESCRIPTION

1.01 General

A. This work shall consist of the removal of the railroad bridge structures. Removal shall be in accordance with the Union Pacific Railroad Guidelines for Bridge Demolition as well as any requirements for IDOT and Lake County for the respective bridges. The bridges to be removed shall include the following:

1. The existing Union Pacific Railroad Bridge over IL 132 / Grand Avenue
2. The temporary Shoo-fly Bridge over IL 132 / Grand Avenue

B. Submittals

The Contractor shall submit three complete sets of the demolition plan to the Engineer and the Union Pacific Railroad for approval, detailing the proposed methods of demolition and the amount, location(s) and type(s) of equipment to be used. For work adjacent to or over an active roadway, the demolition plan shall include an assessment of the structure's condition and an evaluation of the structure's strength and stability during demolition and shall be sealed by an Illinois Licensed Structural Engineer. Review and comment of the demolition plan by the Railroad or Engineer will not relieve the Contractor of the ultimate responsibility and liability for the demolition of the structure. A minimum of three weeks shall be allowed for the Railroad's review after the complete submittal is received. No removal operations will be permitted until the submitted material has been reviewed and comments provided. The removal plan shall include the following:

1. Plan, elevation and location of the bridge, and the locations of any access roads needed for the movement of the equipment.

The as-built drawings may be used for the submittal provided the removal steps are clearly marked and legible.

2. Bridge removal sequences and procedures for the entire bridge including the staging for the removal of the superstructure and substructure.
3. List type and number of equipment required and their locations during demolition operations.
4. Location and types of temporary supports, shoring or bracing required. These members shall be designed to meet Union Pacific Railroad current standard drawing 710000 (formerly UPRR C.E. 106613) "General Shoring Requirements", "Guidelines for Design and Construction of Falsework for Structure Over Union Pacific Railroad", Guidelines for Design and Construction

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SECTION 125X-N LAKE COUNTY
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of Shoring Adjacent to Active Railroad Tracks", and the appropriate local and national building and design code requirements.

5. The proposed vertical and horizontal clearance from all tracks to the temporary and permanent supports.
6. If any temporary supports interfere with the natural drainage along the Railroad right-of-way, a temporary drainage plan shall be submitted for review and comment prior to constructing temporary supports. The proposed drainage plan shall route all drainage away from the railroad tracks.
7. Details, limits, and locations of protective covers or other measures proposed to be used to protect the tracks.
8. All procedures necessary to remove the bridge in a safe and controlled manner. The estimated time for complete removal shall be noted.
9. All overhead and underground utilities in the area affected by removal of the bridge shall be located on the drawings, including any fiber optic, electric, railroad signal, and communication lines.
10. The location and details of track crossings required for moving of the equipment across the railroad tracks.
11. Limits of demolition of substructures.
12. Details of on-site fire suppression.

1.02 Special Requirements

1. Reference Standards - The work is subject to requirements of applicable portions of Section 501 and any other articles or sections that are referenced within Section 501 or other Sections or articles cited elsewhere in this Specification, of the following:
 1. "Standard Specifications for Road and Bridge Construction" prepared by the Illinois Department of Transportation, latest edition; and any of its Supplemental Specifications and Recurring Special Provisions. The "Standard Specifications for Road and Bridge Construction" is referred to in the following Articles as the "Standard Specifications" and except as may be otherwise stated, the work to be done under this section must conform to the requirements of said "Standard Specifications".
 2. Where the "Standard Specifications" refer to the "Engineer" it is understood to mean "Engineer." Except where the "Standard Specification" refers to the "Engineer" for required tests/inspections, it will be understood to mean "Contractor".
 3. Standard Specifications articles referring to "Protective Shield System", "Method of Measurement" and "Basis of Payment" are not applicable and are replaced by the articles included in this Specification.

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SECTION 125X-N LAKE COUNTY
CONTRACT NO. 60K8011

1.03 References

- A. BNSF Railway – Union Pacific Railroad "Guidelines for Railroad Grade Separation Projects"
- B. UPRR-"Guidelines for Temporary Shoring"
- C. UPRR – "Guidelines for Preparation of a Bridge Demolition and Removal Plan for Structures Over Railroad"

1.04 Related Work

- A. VINYL FENCE, 4' Section 02800

PART 2: MATERIALS

2.01 (Not Used)

PART 3: EXECUTION

3.01 General

- A. Existing structures shall be removed to at least 3 ft (300 mm) below the proposed elevation of subgrade or ground surface. Portions of existing structures below this elevation that interfere with the proposed construction shall also be removed.
- B. Structural Steel material from the existing structure and the temporary shoo-fly structure will be considered property of the Contractor for recycling or legal disposal.
- C. The Contractor shall comply with the requirements of this specification and all applicable Federal, State and Local laws, codes and regulations pertaining to the removal and disposal of the structural steel from the existing structure; including but not limited to the regulations of the United States Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), and the Illinois Environmental Protection Agency (IEPA). The Contractor shall comply with all applicable regulations even if the regulation is not specifically referenced herein. If a Federal, State or Local regulation is more restrictive than the requirements of this Specification, the more restrictive requirements shall prevail.
- D. The Contractor is solely responsible for the payment of any fines and undertaking of any clean-up activities mandated by Federal or State environmental agencies for improper waste handling, storage, transportation or disposal.
- E. Contractor shall furnish, install and remove Silt Fence around the bridge demolition area.
- F. Site restoration must be performed on disturbed areas due to work required in this Specification immediately after removal of the existing structure is complete to the approval of the Engineer. Site restoration measures include installing topsoil and permanent seeding.

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- G. Disposal of the removed structures off-site shall be included in the cost to Remove Existing Structure. No separate payment will be made for the Disposal of removed structures.
- H. The work shall in no way impede train operations.
- I. The Contractor shall be responsible for planning and executing all procedures necessary to remove structures in a safe and controlled manner.
- J. The Railroad's tracks and property shall be protected at all times.
- K. The Contractor shall ensure that the area immediately adjacent to operational tracks shall remain free from stumble or like hazards to the ground railroad personnel to prevent injuries. Open excavations shall be in accordance with all applicable local, state, and OSHA regulations and shall be protected by appropriate fencing.
- L. No work shall be performed within 50 feet of the nearest rail when trains pass the work site.
- M. Staged demolition of the portions of the structure immediately adjacent to operational tracks shall not jeopardize the integrity of the structure over said tracks until actual removal of the portion of the structure over the tracks is being completed.
- N. A flagman is required when any work is performed within 25 feet of the nearest rail.
- O. No blasting or burning will be permitted on Railroad's right-of-way.

3.02 Procedure

- A. During removal operations the remaining structure shall be stable during all stages of the removal operation.
- B. The Contractor Shall Coordinate the removal schedule with the Railroad. All of the removal work within the vicinity of an active track area shall be performed during the time windows when trains are not passing the site.
- C. All debris and refuse resulting from the work shall be removed from the right-of-way by the Contractor and the premises left in a neat and presentable condition.
- D. The work progress shall be reviewed and logged by the Contractor's Engineer. Should an unplanned event occur, the Contractor shall inform the Railroad and submit procedure to correct or remedy the occurrence.

3.03 Track Protection

- A. Construction equipment shall not be placed on the tracks unless tracks are protected.

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- B. Temporary haul road crossings shall be timbers. The type of crossing shall be approved by the Railroad. Solid timbers or ballast with timber headers shall be used between multiple tracks. If temporary crossing is accessible to the public crossing shall be protected with barricades or locked gates when the Contractor is not actively working at the site or weekends.
- C. Track protection is required for all equipment including rubber tired equipment operating within 25 ft. of the tracks.

3.04 Cranes

- A. When cranes are operated near the tracks the following is required:
 - 1. Only cranes with the capacity to handle the loads may be used. Front end loaders and backhoes cannot be used to lift over the tracks.
 - 2. The Contractor shall verify that the foundations under the crane can support the loads.
 - 3. The size and material type of crane mats shall be submitted to the Railroad for review and comment. No mat substitution will be allowed. The mats shall be rigid and of sufficient capacity to distribute the crane load and prevent tipping of the crane.
 - 4. Installation of temporary track crossings for equipment shall be scheduled with the Railroad.
 - 5. Additional track protection is required when crossing with a crane. The protection methods shall be submitted to the Railroad for review and comment.
 - 6. Equipment shall not place outriggers on the tracks or ballast.
 - 7. Cranes shall not be placed within the track clearance envelope without flagman protection.

3.05 Cutting Torches

- A. When a cutting torch is used near the tracks or any timber, the following steps shall be taken:
 - 1. Fire suppression equipment is required on-site.
 - 2. Do not use a torch over, between, or adjacent to the tracks unless a steel plate protective cover is used. Care shall be taken to make certain the steel plate does not come in contact with the rails. Details of the shield shall be submitted to the Railroad for approval.
 - 3. Wet ties and other timber below the cutting area
 - 4. Monitor the work site for at least 3 hours after cutting for a smoldering fire.

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3.06 Utilities

- A. The demolition operations shall be planned such that the utility lines are operating safely at all times. The utility lines shall be protected if affected by demolition operations. All of the work associated with utility lines shall be coordinated by the contractor with the respective utility companies.
- B. Appropriate safety measures shall be in place to prevent any conflicts with the high voltage transmission lines in the vicinity of the bridges. All submittals shall specifically address the high voltage transmission lines to protect against conflicts if applicable.

3.07 Hazardous Material

- A. If any hazardous materials are found, provide material protection as specified in local hazardous material codes and immediately contact the Railroad.

PART 4: METHOD OF MEASUREMENT

4.01 Measurements

- A. Removal of Existing Structures will be measured for payment in units of each at the location designated on the Plans.
- B. Excavation of earth or rock necessary to perform the removal of existing structures will not be measured for payment.
- C. Hauling and transporting broken concrete will not be measured for payment.
- D. Disposal of all steel material including girders, railings, plates and hardware will not be measured for payment.
- E. Furnishing, installing and removing VINYL FENCE, 4' will be measured for payment in linear feet in place.
- F. Clearing and Grubbing necessary to complete the work in this Specification will not be measured for payment and will be included in the cost of Removal of Existing Structures.
- G. Removal and Disposal of all debris and other appurtenances (excluding ballast, ties, rail, and other track material) located on the structure shall be included in the cost of Removal of Existing Structures and will not be measured separately for payment.
- H. All temporary shoring shall be considered incidental to the Removal of Existing Structures and will not be measured separately for payment.

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PART 5: BASIS OF PAYMENT

5.01 Payments

- A. The work will be paid for at the Contract unit price per each for REMOVAL OF EXISTING STRUCTURES at the location designated on the Plans.

5.02 Payment will be made under:

- A. REMOVAL OF EXISTING STRUCTURES NO. 1, per each.
- B. REMOVAL OF EXISTING STRUCTURES NO. 2, per each.

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SECTION 02115
TRACK REMOVAL

PART 1 - GENERAL

1.01.1 Description: This Specification covers the removal of existing track and includes removing rails, crossties, rail connections, and other track material.

The Work to be performed by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labor, materials, equipment, tools, supplies and incidental items necessary for the satisfactory performance and completion of the work described herein.

PART 2 - EXECUTION

2.01 The material shall become the property of the Contractor and shall be hauled off the site and legally disposed of by the Contractor. Material includes rail, crossties, track bolts, nuts, and lock washers, and track spikes.

PART 3 - MEASUREMENT AND BASIS OF PAYMENT

3.01 This work shall be measured in place per foot, along the centerline of the track, and will be paid for at the contract unit price for TRACK REMOVAL, which price shall include the entire cost of all labor, materials, superintendence and equipment required for removal of track as shown on the drawings and as specified herein.

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SECTION 2201

STRUCTURE EXCAVATION

PART 1- GENERAL

1.01 Description

- A. Provide all labor, materials as specified, equipment, tools and incidentals necessary for excavation associated with the construction of both permanent and temporary structures.
- B. Excavation includes but is not limited to removal and disposal of excavated materials, the removal and disposal of tie backs, sheet piles, drains and other items encountered during the course of the excavation.
- C. Also included is timber shoring required to support earth sides of shallow excavations and bailing, pumping and draining as directed by the Engineer.
- D. Prior to commencing excavation, the Contractor shall submit to the Engineer for approval the proposed area of excavation and proposed temporary sheeting. All drawings for the submittal shall be drawn true to scale.
- E. Except as modified herein, the work shall conform to the applicable portion of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction Section 502.
- F. Temporary soil retention systems shall comply with IDOT GBSP 44 - Temporary Soil Retention System.

1.02 Related Work

- A. REMOVAL OF EXISTING STRUCTURES SECTION 02050
- B. POROUS GRANULAR BACKFILL SECTION 02203

1.03 Definitions

- A. Structure Excavation: Excavation required for removing the existing abutments and wing walls, and other structures and soil to enable construction of the new substructure elements.
- B. Disposal: Disposal consists of the hauling and removal from the site of all excavated material. Written authorization or a permit from the disposal site is required prior to removal of any material from the site.

PART 2 – PRODUCTS

2.01 Porous Granular Backfill: Specified in Section 02203 of these specifications

2.02 Temporary Timber Shoring: All timber used for temporary shoring shall be Southern Pine, Select Structural Grade or better. The timber and hardware shall be in accordance with Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction Section 507.

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PART 3: EXECUTION

- 3.01 The excavation shall be performed in stages after the TEMPORARY SUPPORT SYSTEM has been placed, and in accordance with other applicable staging provisions herein.
- 3.02 Prior to backfilling behind new abutments or wingwalls with porous granular backfill, the existing subgrade shall be benched and uniformly compacted to not less than 95% of the Modified Proctor maximum dry density, ASTM 0698 determined for this material to a depth of at least one foot.
- 3.03 If the new structure or wingwall is to bear on the existing subgrade and the existing subgrade is excessively soft or unsuitable, it shall be excavated to a depth meeting with the Engineer's approval. The bottom of the excavation must then be compacted to a depth of one foot as previously described. The over excavation will then be filled to the correct elevation with material satisfying SECTION 02203 - POROUS GRANULAR BACKFILL.
- 3.04 If after removing the old structure, the depth of excavation is deeper than required for the new structure or wingwall, the bottom of excavation shall be uniformly compacted to a depth of one foot as previously described including removal of any unsuitable material. Then the excavation will be filled to the correct elevation with material satisfying SECTION 02203 - POROUS GRANULAR BACKFILL.
- 3.05 Elevations of the bottom of existing abutment footings shown on the Plans are estimated values.
- 3.06 All excavated material must be disposed of at an approved location. The Contractor shall provide written authorization to ENGINEER for the use of that location.
- 3.07 Removal of the TEMPORARY SUPPORT SYSTEM, except as noted, shall be performed in such a way as to ensure the stability of all adjacent and future construction.

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: This work shall be measured in place and the volume computed in cubic yards.
- 4.02 Payment: The work covered under this Section will be paid for at the Contract unit price per cubic yard as shown for STRUCTURE EXCAVATION.

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SECTION 2203
POROUS GRANULAR BACKFILL

PART 1- GENERAL

1.01 Description

- A. Provide all labor, materials as specified, equipment, tools and incidentals necessary to furnish, place and compact porous granular backfill to be used as backfill behind abutments, behind wing walls, and as required in connection with removal of existing structures and excavation for structures.
- B. Except as modified herein, the work shall conform to the applicable portion of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction Section 207.

1.02 Related Work

- A. REMOVAL OF EXISTING STRUCTURES SECTION 02050
- B. STRUCTURE EXCAVATION (SPECIAL) SECTION 02201
- C. PIPE UNDERDRAINS 6" (MODIFIED) SECTION 02704

PART 2 - PRODUCTS

- 2.01 The material shall consist of granular limestone backfill CA 11 or as approved by the Engineer, in accordance with Section 1004 of the IDOT Standard Specifications except as herein modified.
- 2.02 The use of chats, wet bottom boiler slag, slag sand, or crushed concrete will not be allowed for this item.

PART 3 – EXECUTION

- 3.01 Before the material is deposited, it shall contain the amount of moisture required for compaction. The amount of moisture required will be determined by the Engineer for the material and compaction methods being used.
- 3.02 The porous granular backfill shall be placed in lifts not exceeding 6 inches and compacted to 95% Standard Proctor maximum dry density as determined by ASTM D -1557 Method C. The granular material shall be placed in the full width of the excavation with equipment approved as approved by the Engineer and in such manner which will not cause segregation and which will require minimum blading or manipulation. The equipment and method must be approved by the Engineer.
- 3.03 Backfilling shall proceed immediately after installation of the geocomposite wall drains and underdrain pipes where applicable but not prior to 14 days after placement of the concrete wall to be backfilled, or three days where high early strength concrete is used and as specified by the Engineer.

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3.04 If the moisture is insufficient to maintain satisfactory compaction or to Prevent segregation, water must be added as directed by the Engineer.

3.05 Compaction tests must be made at the direction of the Engineer.

PART 4: MEASUREMENT AND PAYMENT

4.01 Measurement: This work shall be measured in place and the volume computed in cubic yards.

4.02 Payment: The work covered under this section will be paid for at the Contract Unit Price per cubic yard for GRANULAR BACKFILL.

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SECTION 02230

EXCAVATION, EMBANKMENTS AND OTHER FILLS

PART 1 - GENERAL

1.1 SUMMARY

- A. These specifications shall govern the removal of excavation, the placement of embankment and other fills, and the classification of soils to meet the requirements of construction shown on the drawings, described in the contract documents, and stated in the Specifications. The work shall be conducted so that the terrain outside the grading limits will not be disturbed except where approved by the Engineer.

1.2 QUALITY ASSURANCE

- A. Requirements:
1. Comply with government agencies having jurisdiction.
 2. Comply with the directions of the Railroad Engineer, Geotechnical Engineer, and independent testing laboratory.

1.3 DEFINITIONS AND TERMS

- A. The following terms shall be interpreted as follows:
1. Borrow Area - The source, other than required roadbed excavation, where material(s) has been dug for use as fill for embankment and construction at other locations on the project.
 2. Embankment (Fill) - A raised structure of soil, soil aggregate, sand, gravel, or rock; or any mixture thereof that is to be (1) used as the subgrade or foundation materials for track or other roadbeds, building(s), or other facilities; and (2) constructed to perform safely and satisfactorily under proposed train, vehicle, embankment, building and/or other proposed loading conditions.
 3. Excavation (Cut) - Soil or material to be removed and used as fill for construction of a roadbed embankment or foundation for other structures or facilities; or to be disposed of properly.
 4. Subexcavation - Excavation required below finished subgrade level as part of correcting unsuitable subsurface conditions.
 5. Grading Area - The limits (surface) within a designated set of boundaries which includes where both excavations (cuts), embankments (fills), and fills for facilities other than track will be performed.
 6. Lift - A layer (or course) of uncompacted embankment material placed on top of suitable natural subgrade or previously prepared embankmentfill.
 7. Nominal Maximum Size - The maximum U.S. sieve size upon which material is retained.
 8. Roadbed - The bed or foundation that supports road surfacing or a track section (i.e., subballast, ballast, ties and rails).
 9. Subgrade - The upper roadbed materials that underlie and support subballast; ballast; track structure (i.e., ties and rails); road surfacing (i.e., aggregate or pavement) materials, and the floor within the lowest level of a structure.

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10. Unsuitable Material - Earthen and rock subgrade, foundation, borrow, or manufactured materials that do not possess the required strength, stability, and/or consolidation properties to safely and satisfactorily support proposed train or other facility loading conditions.

PART 2 - PRODUCTS

2.1 Excavated Materials

- A. Excavatability – The ease or difficulty, and means of excavating materials that are to be obtained from cut sections or borrow areas for a project will not be established for the Contractor. The Contractor shall be responsible for determining the methods necessary for excavation and handling of materials based on his interpretation of site conditions, geotechnical reports (if available), or other information sources.
- B. Unsuitable soil materials
 1. The contractor shall remove and dispose of unsuitable and/or contaminated materials at a defined location on the property, at other locations shown on the plans, or as directed by the Engineer.
 2. When project site restrictions mandate, the Contractor shall dispose of excess waste materials off the project site. These waste materials shall be legally disposed of at acceptable waste sites. Contaminated waste materials shall be disposed of at landfills approved to handle and store such materials without causing harm to the environment.
 3. Topsoil shall be excavated during the performance of the clearing and grubbing operations for the project. The excavated topsoil materials shall either be stockpiled for later use as top dressing in grassed areas, wasted at locations directed by the Engineer, or used as part of the construction of the outer portions of embankments outside the track, road or other facilities load-bearing area(s). See section 2270.1 for Topsoil – Stockpile and Placing.
- C. Suitable materials
 1. Suitable materials shall be used for embankment or other fill construction.
 2. Excess suitable materials, not used for embankment construction, are to be disposed of in a legal manner as follows: (1) at a designated location(s) within the project limits, (2) at other locations shown on the plans, (3) at a location(s) approved by the Engineer, or (4) at an approved landfill location(s).
- D. Rock materials
 1. Rock is considered to be material requiring blasting or the use of heavy construction breakage equipment (such as a D-8 or larger bulldozer and/or 6,000 ft.-lb. or greater breakage equipment) as part of excavation. Rock shall include all materials in ledges, bedded deposits, and cemented and conglomerated deposits exhibiting the physical characteristics and difficulty of removal that requires removal using systematic drilling and blasting or as determined by the project engineer or geotechnical engineer. The fact that blasting may be resorted to by the Contractor shall not, of itself, entitle the material to be classified as “rock”. Material that the Contractor encounters during excavation shall be uncovered and the Engineer notified so that the Engineer can classify the material. Materials from rock excavation which are to be used for embankment and fill construction shall be processed so as to produce a well-graded material which has a nominal maximum size as defined by the project Engineer or Geotechnical Engineer.

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2.2 Embankment and Fill Materials

- A. Embankment material (fill) is suitable earthen and/or rock that are excavated from on-site and/or off-site borrow areas, and considered suitable for use during construction based on their strength and consolidation properties, and approval by the Railroad's Engineer, Geotechnical Engineer, and/or an independent soils testing laboratory.
- B. Embankment material shall be relatively free of organic materials, and not contain environmentally harmful or noxious substances.
- C. Import fill or off site borrow material supplied by the Contractor shall meet specifications for: 1) granular fill, 2) random fill, 3) an inorganic lean clay having a maximum liquid limit of 45 and a maximum plasticity index of 15, 4) a clayey sand, or 5) pit run sand. Imported borrow materials, other than listed above, that are proposed for use as compacted fill on a project will require approval of the UPRR's Geotechnical Engineer prior to being used on the project.
- D. Embankment and fill materials shall be identified and "classified" as follows:

FINE GRAINED MATERIALS:

1. Clayey Soils - Clay soils shall consist of soils having 50% or more by dry weight passing the No. 200 U.S. Standard sieve, that can be made to exhibit plasticity (cohesive/putty-like properties) within a range of water contents, and that exhibit considerable strength when air dry. For classification purposes, a clay is the fine-grained portion of a soil which exhibits a plasticity index equal to or greater than 4, and for which a plot of plasticity index versus liquid limit for the soil falls on or above the "A" line on the Unified Soil Classification chart. Clays with Liquid Limits above 50 are considered suitable for use as embankment materials when approved for selective placement by the Geotechnical Engineer and/or when chemically treated to reduce undesirable plasticity characteristics and associated soil properties.

2. Silty Soils - Silty soils shall consist of soils having 50% or more by dry weight passing the No. 200 U.S. Standard sieve, that can not be made to exhibit plasticity (cohesive/putty-like properties) within a range of water contents - and that are nonplastic or very slightly plastic and exhibits little or no strength when air dry. For classification purposes, a silt is the fine-grained portion of a soil which exhibits a plasticity index less than 4, and for which a plot of plasticity index versus liquid limit for the soil falls below the "A" line of the Unified Soil Classification chart. Silty soils can become unstable when saturated. As a result, silty soils are only considered suitable for use as embankment and general compacted fill construction when approved for selective placement by the Geotechnical Engineer. Silty materials are predominantly extremely fine sand particles that are best compacted using vibratory construction equipment.

COARSE GRAINED MATERIALS:

1. Sands - Sandy materials consist of granular materials having 50% or more by dry weight retained between the No. 200 and No. 4 U.S. Standard sieves. Sandy materials are generally visible to the human eye.
2. Granular Materials - Coarse grained soil material with more than 50% dry weight retained on the No. 200 U.S. Standard sieve, and which exhibit no characteristics of cohesiveness or plasticity.

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3. Gravels – Gravelly materials consist of granular materials having 50% or more by dry weight retained between the No. 4 and 3-inch U.S. Standard sieve.
4. Cobbles – Cobbles consist of rock materials having 50% or more by dry unit weight retained between the 3-inch and 10-inch U.S. Standard sieves.
5. Boulders – Boulders consist of rock materials having 50% or more by dry unit weight having a diameter greater than 10 inches.
6. Cinders – Cinders consist of a porous by product that routinely is the residual of partially burnt coal. Cinders have the potential for degradation (reduction in volume) when subject to freeze-thaw action and heavy loadings.

B-STONE

1. Material. "B" Stone shall comprise of naturally-occurring limestone, dolomite, quartzite, or granite. Stone must be hard, durable, angular in shape, resistant to weathering and shall be free of cracks, seams, expansive materials or other defects that would cause accumulated deterioration from exposure to climatic conditions.
2. The material shall meet, in addition to the Specifications, the following quality requirements:
 - A. The approval of some "B" Stone from a particular source shall not be construed as constituting the approval of all riprap taken from that source.
 - B. The Engineer shall be the sole judge of "B" Stone quality and sources of material.
 - C. "B" Stone may be rejected on the basis of visual examination, regardless of laboratory tests and/or service records.
 - D. Tests to which the materials may be subjected include specific gravity, abrasion, absorption, soundness, freezing and thawing and such other tests as may be considered necessary.

TEST		REQUIREMENT
(a) Specific Gravity	(ASTM C127)	2.65 Min.
(b) Absorption	(ASTM C127)	2.0% Min. – 8.0% Max.
(c) Soundness, 5 cycles Mg S04	(ASTM C88)	2.0% Min. – 15.0% Max.
(d) Abrasion	(AASHTO)	50% Max.

3. Gradation. All "B" Stone to be loaded and quarried shall conform to the following gradation unless otherwise specified or as shown on the plans:

Nominal 8 inch size:
 100% passing the 10 inch screen
 100% retained on the 6 inch screen

Gradation compliance is determined by visual inspection, monitored by the Engineer. The Engineer may designate the material as too fine or too coarse.

ROCK:

1. Rock shall include all material in ledges, bedding deposits, cemented and conglomerate deposits which exhibit physical characteristics and difficulty of removal without systematic drilling and blasting, or as determined by the Engineer. The fact that blasting may be resorted to by the Contractor shall not, in itself, entitle the material to be classified as rock.

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E. "Types" of embankment (fill) materials shall be identified as follows:

1. Select Fill Material - Select materials shall be limited to sand and gravel materials that possess minimal expansive properties and that meet the following criteria:

<u>Maximum Allowable Percent</u>	
Liquid Limit Passing the No. 200 Sieve (Test Method ASTM D 4318)	(Test Method ASTM D 1140)
Greater than 50	30%
Between 30 and 50	40%
Less than 30	50%

The plasticity index of select fill material (as determined in accordance with ASTM D 4318) shall not exceed 15.

2. Random Fill Materials - Random fill materials are defined as those non-organic cohesive soils, cohesionless soils, combined cohesive and cohesionless soils, and rock materials that possess the minimal required physical strength, consolidation and other characteristics, after placement and compaction, that are required to provide a stable and safe embankment and foundation for the project. Depending upon the physical properties required to provide a stable embankment and fill, routine materials consisting of, but not limited to, clayey silts (CL-ML), lean clays (CL), sandy lean clays (CL), clayey sands (SC), silty sands (SM), sands and gravelly sands (SP & SW), sandy gravels and gravels (GP and GW), rock, and combinations of these materials may prove satisfactory embankment materials. Highly plastic clayey (CH) soils may possess the physical properties required to perform satisfactorily as part of embankment and foundation construction but are routinely either buried within the fill or chemically stabilized prior to placement and compaction to reduce undesirable physical characteristics associated with encountering water. Random fill materials shall be defined by the Railroad and/or Geotechnical Engineers for the project. Rockfill - Rockfill shall consist only of sound, durable rock from solid rock excavation containing not more than twenty (20) percent by weight which passes through a one half (1/2) inch sieve. Mixtures of boulders and silt will not be considered as rockfill. The maximum nominal size of rock shall be twenty four (24) inches and a maximum lift thickness of thirty (30) inches, or as specified by the Engineer or Geotechnical Engineer for the project.
3. Cinder Fills - Cinder are subject to degradation when subject to forces such as frost action, heavy loading, etc. Such degradation can result in a reduction in the mass of the material resulting in settlement of the overlying fill and facilities. Cinder fills shall not be constructed within the load bearing zone under tracks and other structural facilities. Materials containing more than 25% cinders should be either wasted or uniformly blended with cohesive soil such that the blended material contains no more than 25% cinders. The soil/cinder blended material can be used to construct those portions of either the embankment or fill sections located within either the track or structure loading areas when approved by the Railroad and/or Geotechnical Engineers on the project.

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F. SOURCES OF EMBANKMENT

1. If the quantity of materials required for construction of Embankments and fills exceeds the quantity of materials removed from excavation necessary to complete the project, additional Embankment material will first be obtained by widening cuts. If widening cuts does not provide the necessary embankment, then borrow areas, either on-site or off-site, will be used.

a. WIDENING CUTS - The Contractor shall widen cuts in the Grading Area or widen cuts in the vicinity of the project. The Contractor shall consult with the Engineer to determine the location of cuts in the vicinity of Grading Area and to determine the volume of such cuts which are to be widened. Cuts shall be widened in such a manner as to be at least as stable as the original cut, provide adequate drainage for the Roadbed, and retain the same slope lines as the original cut.

b. BORROW AREAS - Borrow Areas within the Right-of-Way, if available, or from Borrow Areas outside of the Right-of-Way, provided by the Contractor, shall be required to complete the embankment. All borrow areas shall be cleared and grubbed (see section 02210). Materials must be tested by an independent testing laboratory and/or approved by the Engineer prior to placement.

PART 3 - CONDITIONS

- 3.1 The contractor shall examine the areas and conditions under which work of this section will be performed, and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- 3.2 Access - The contractor shall maintain access to adjacent areas and facilities at all times, unless approved or directed by the Engineer.
- 3.3 Drainage - All grading shall be performed in a manner and sequence that will provide proper drainage at all times.
- 3.4 Signs - All signs, with the exception of safety related signs (whistle posts, stop signs, etc.) located in the construction area shall be removed, protected, and replaced in the proper locations, as directed by the Engineer. Safety related signs shall be maintained in their original location until such time they are to be relocated as directed by the Engineer. This shall be incidental to the grading.
- 3.5 Signal foundations, or other concrete, will be removed to an elevation of 2' below finished subgrade. Signal foundations will not be removed until new signals have been turned over to operations.
- 3.6 Haul - Transporting excavated or embankment material, whether on-site or off-site, shall be considered incidental to the grading work. Vehicles and equipment used for hauling shall be sufficient in number and capacity to meet the project schedule. The contractor shall route the hauling equipment over the grade in such a manner as to maintain uniform compaction across the grade and minimize damage to completed work.

PART 4 - EXECUTION

4.1 GENERAL

- A. Before grading begins, the area shall be cleared and grubbed. See section 02110 Clearing and Grubbing. The Contractor shall perform all grading as shown on the Drawings, as specified herein, or as otherwise staked in the field. This Work shall consist of

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excavating the material from roadbed areas or the Borrow Areas, and placing the material as embankment, shaping and sloping as necessary for the construction, preparation and completion of roadbeds, facilities, and other earthwork.

4.2 EXCAVATION:

- A. Perform excavation of every type of material encountered within the limits of the work to the lines, grades, and elevations indicated on the plans and specified herein.
- B. EXCAVATION AS EMBANKMENT - The Contractor shall excavate all materials, including rock and common materials, which must be removed to accomplish the excavation as shown on the Drawings. All excavated materials will be used in the formation of Embankments, Roadbeds, and other earthwork so long as such excavation material is satisfactory for such use.
- C. DISPOSITION OF EXCAVATED MATERIALS - The Contractor shall utilize all satisfactory excavated materials in the formation of embankment. Where excess excavation materials or unsatisfactory material exists, such materials will be disposed of in areas on the right of way approved by the Engineer or off the right of way in a legal and proper manner. If the contractor disposes material off of the right of way, it shall be at the Contractor's expense and liability.
- D. SCARIFYING SUBGRADE - In cut sections, the Contractor shall scarify the top six (6) inches of material below the Subgrade, adjust the moisture content, and recompact such scarified material.
- E. PROOFROLLING - After the site has been stripped, and/or excavated to the rough subgrade elevation, the exposed subgrade should be proofrolled prior to placement of any structural fill to identify any soft, disturbed, or unstable areas. Unstable or otherwise unsuitable soils, which are revealed by proofrolling and which cannot be adequately densified in-place, should be remediated under the direction of the Engineer. If required, the methods of stabilization typically include over-excavation and replacement, a lift of crushed stone materials, a geosynthetic over the soft soils, or chemical stabilization with lime. Appropriate remediation methods shall be determined in consultation with the Engineer.
- F. EXCAVATION IN SOLID ROCK AREAS - In cut sections where the material to be excavated is solid rock, the Contractor shall excavate twelve (12) inches below finished track subgrade elevations as shown on the Drawings and shall replace such excavated twelve (12) inches of solid rock with embankment material approved by the Engineer.
- G. BLASTING - No blasting will be allowed without sufficient advanced notice given to the Engineer. This time will permit the safe and continuous operation of the Railroad. See section 02120 Blasting.
- H. DITCHES AND SLOPES - The Contractor shall construct intercepting "V" ditches on the uphill side of cut slopes as directed by the Engineer. The ditches are to be 2 feet deep with 3:1 side slope.
- I. OVER EXCAVATION - The Contractor shall not excavate below the design finished grade elevation without the Engineer's prior approval. Materials that are excavated below design finished grade elevation, prior to obtaining prior approval of the Engineer, shall be reconstructed to design grade with materials designated by the Engineer and at the Contractor's expense.
- J. SUBEXCAVATION - The Contractor shall inform the Engineer when unsuitable subgrade and foundation materials are encountered. Unsuitable subgrade and foundation materials

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shall be removed and replaced with compacted fill placed in accordance with recommendations provided by the Soils Engineer. Subexcavation that is unplanned should be quantified and the information provided to the Engineer. Subexcavation shall include suitable material for backfill, unless otherwise specified. Other considerations in lieu of subexcavation may include surcharging, or the use of geosynthetic fabric and/or geogrid in combination with a granular materials, both of which must be specified and approved by the project Engineer and/or Geotechnical Engineer prior to their installation. Geotextile/filter fabric shall be extra heavy nonwoven geotextile meeting the requirements found in Table 1-10-2 of the AREMA Manual. Geogrid shall be Tensar BX 1100 or an approved equivalent. Quantities are estimated to establish a unit price. Payment will be for square yards as installed and approved.

- J. SOIL TREATMENT OR MODIFICATION – The treatment of soils using lime, fly ash, or other additives may be used when specified, or as directed by the project Engineer and/or Soils Engineer. See section 02241 Lime Stabilization.
- K. BORROW AREAS - Except as otherwise permitted, borrow pits and other excavation areas shall be excavated in such a manner as will afford adequate drainage. After borrowing operations are completed, areas shall be left in a neat, orderly condition with uniformly shaped slopes not steeper than two (2) foot horizontal on one (1) foot vertical. Borrow areas of fine grained material subject to wind erosion and blowing shall be stabilized or seeded. The Contractor shall ensure that the excavation of material from any source results in minimum detrimental effects on natural environmental conditions.

4.3 EMBANKMENT and FILL CONSTRUCTION

A. Earth Fill:

- 1. Embankments and fills shall be constructed and compacted as shown on the plans, in these specifications, in the special provisions, or as directed by the Engineer. Embankments shall be constructed in lifts containing only that amount of material that can be compacted uniformly throughout its entire depth when utilizing the compaction construction equipment available on the project. Compaction shall be accomplished by sheeps foot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Earth fills shall be uniformly compacted to the densities specified by the project Engineer or Soils Engineer for the project using methods and equipment best suited for the materials.
- 2. Each successive lift or layer shall be carefully leveled and completely and uniformly compacted over the full width of the embankment before a succeeding layer is placed. Embankments built of soil material or material consisting of gravel or small pieces of rock 6 inches or less in maximum dimension shall be placed and compacted until the required degree of compaction is obtained thoroughly and uniformly throughout the layer. No stones larger than 3 inches in diameter will be permitted within the top 12 inches of the finished grade elevation.

B. Rock Fill:

- 1. Embankments built of materials comprised predominantly of rock larger than 6 inches in maximum nominal size dimension shall be constructed by placing the material in layers not exceeding the maximum size of the rock present, but in no case shall the thickness of layers exceed 24 inches, unless approved by the Engineer. The maximum size of any individual rock shall not exceed 24 inches in any one dimension, or as approved by the Engineer.
- 2. Rockfill shall be placed using procedures that form a dense, well-graded mass of stone with a minimum of voids. The rockfill lifts shall extend the full width of the roadbed or fill area.

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When directed by the project Engineer or Geotechnical Engineer (1) the bottom, sides and top of the rockfill shall be covered with geosynthetic fabric or (2) the voids shall be filled with finer cohesive or coarse grained materials to prevent migration of finer materials located around the rockfill into the voids, thereby avoiding settlement and/or loss of the finished subgrade profile.

C. PREPARATION OF FOUNDATIONS FOR EMBANKMENTS

1. GENERAL – Following required clearing and grubbing, the foundation and subgrade for the proposed embankments and fills shall be prepared by scarifying the top six (6) inch layer of existing ground, adjusting the moisture content of the scarified material and compacting the scarified soils in accordance with the project specifications.
2. BENCHING OF FILL INTO EXISTING SLOPES – Slopes that are steeper than four horizontal to one vertical (4.0H:1.0V) and to receive embankment and fill materials shall be benched (stepped) to tie the existing and constructed materials. The base of each step shall be cut as nearly horizontal as possible and the face of each step cut no steeper than 1.0H:1.0V to allow fill placed adjacent to the vertical cut to be compacted in its entirety to the degree specified for the project. Benching operations should be performed so as to avoid undermining of any adjacent existing tracks or structures. Steps cut into the slope shall not be allowed to remain unsupported overnight.
- D. GRADING DURING FREEZING CONDITIONS - With the approval of the Engineer, the Contractor may construct embankment and fill materials during freezing weather.
The Contractor shall not place any embankment or fill materials on frozen ground, or use frozen materials for embankment or fill construction. Fill materials that are placed must be completely compacted before freezing. The placing of fill shall stop if the materials freeze before the required compaction is obtained. Frozen materials must be removed at the Contractor's expense before filling operations resume.
- E. TOPSOIL -- Topsoil placed shall be compacted with at least two complete coverages over the area with a multiple wheel, pneumatic-tired roller designed for use in the compaction of earth fills.

PART 5 - MEASUREMENT AND PAYMENT

- 5.1 Measurement: The work under this section shall be measured per IDOT Standard Specifications Sections 204 and 205.
- 5.2 Payment: The work under this section will be paid for at the contract price per cubic yard for Borrow Excavation, Embankment and Other Fills.

END OF SECTION

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SECTION 02434

CULVERTS

CORRUGATED ALUMINUM ALLOY PIPE (AAP), CORRUGATED STEEL PIPE (CSP) AND
CORRUGATED STRUCTURAL PLATE PIPE (CPP).

PART 1 - GENERAL

1.1 SUMMARY

- A. DESCRIPTION. These Pipe Culvert Specifications cover the assembly and installation of (a) corrugated steel pipes, (CSP), (b) corrugated structural plate pipe (CPP), and (c) corrugated aluminum alloy pipe (CAAP), each hereinafter referred to as "pipe culverts." Pipe culverts shall be assembled and installed in accordance with these Specifications and Chapter 1, Part 4 of the current AREMA Specifications for Culvert installation and the Union Pacific Railroad Company's Engineering Culvert Pipe Standard Drawings 680000, 680010 and 680030. The most restrictive provisions shall govern when there are differences in the requirements.
- B. Except as provided herein, the work shall conform to the applicable portion of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction Section 542.
- C. RELATED WORK. Documents affecting work of this section include, but are not necessarily limited to Division I, General conditions and Section 2345 Smooth Steel Pipe Culvert.

PART 2 - PRODUCTS

2.1 PIPE CULVERT MATERIAL

- A. All pipe culverts will be furnished with annular corrugations. The exposed ends of all corrugated pipes shall be square. Pipe culvert material, if any, furnished by the Contractor, must meet the standards for pipe culverts set forth in Chapter 1, Part 4 of the current AREMA Specifications and the Union Pacific Railroad Company's Engineering Culvert Pipe Standard Drawings 680000, 680010 and 680030 or as required and approved by the Engineer. 3" x 1" annular corrugations shall be used for all CMP pipes with 36" diameters and larger, 2-2/3" x 1/2" or 3" x 1" annular corrugations shall be used for 30" diameter CSP pipes. 3" x 1" annular corrugations shall be used for all CAAP pipes. 6" x 2" annular corrugations and a Minimum of 4 bolts per foot for all SPP pipes. Bolts and nuts shall be per the current AREMA Specifications, chapter 41, part 4. Minimum gage requirements are specified in UPRR Engineering Culvert Pipe Standards. All CMP culverts under the railroad shall be aluminized and double-riveted. Any deviations of these Specifications are to be submitted to the Engineer for approval prior to starting construction.
- B. All flared end sections furnished by the Contractor must meet the standards for pipe culverts set forth in Chapter 1, Part 4 of the current AREMA Specifications. Flared end sections shall match the annular corrugations and gage of the adjacent pipe culvert. Any deviations of these Specifications are to be submitted to the Engineer for approval prior to starting construction.

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PART 3 - EXECUTION

3.1 HANDLING OF PIPE CULVERT MATERIAL

- A. The Contractor shall handle pipe culverts and the pipe culvert material carefully in order to prevent damage, including, but not limited to, distortion of the pipes, injury to bituminous and other pipe culvert coatings. Pipe culverts shall never be dragged over the ground, but shall be handled with skids, rolling slings, or cranes. The Contractor shall promptly repair, to the satisfaction of the Engineer, any damage to the pipe culvert or pipe culvert material. In the event such damaged pipe culverts or pipe culvert material cannot be repaired to the satisfaction of the Engineer, replacement pipe culverts or pipe culvert material must be provided by the Contractor at his expense.

3.2 EXCAVATION AND LOCATION

- A. Preparation for the culvert bedding shall be included in the culvert installation or extension cost and shall include all necessary clearing and grading necessary to place the bedding material, as well as placement and compaction of aggregate base bedding. The Contractor may use CLSM for the culvert bedding. Any ditching required, unless there is a bid item for ditching, shall be incidental to the culvert installation. Culvert bedding preparation is included in the cost per foot and will not be classified as subexcavation.
- B. If any shoring is required for culvert work, it shall be incidental to the service item. Shoring plans must conform to the General Shoring Requirements (dwg.# 710000), and must be stamped by a P.E. in the state where the work is to be performed. The shoring plan is to be submitted to the UPRR Structures Design Group for review and approval.
- C. Pipe culverts shall be placed at the location, elevation and alignment shown on the Drawings.
- D. **CULVERT PIPE EXCAVATION AND EMBANKMENT** - The Contractor shall perform all pipe culvert excavation. Prior to pipe culvert excavation, embankment must be constructed to a height no less than two (2) feet above the top of the proposed pipe culvert. When embankment is placed, alternate methods may be used if approved by the Engineer. Pipe culvert excavations shall be wide enough to permit thorough compaction of the backfill under and around the pipe culvert as required by paragraph "laying culvert pipe" page 4 of this section. The base width of the pipe culvert excavation shall not exceed the external width of the pipe culvert plus
1. 12 inches on each side for pipes less than 48 inches in diameter.
 2. 18 inches on each side for pipes 54-78 inches in diameter.
 3. 24 inches on each side for pipes 84 inches in diameter or larger.
- E. **PROTECTION OF FOUNDATION AND BEDDING**. Unless soft soil is encountered in which case "Soft Soil Condition" Page 3 shall govern. Pipe culvert excavation shall be deep enough to permit compliance with the foundation and bedding requirements for pipe culverts. Care shall be taken to insure drainage is diverted away from the pipe bed during preparation. Any damage to or deterioration of pipe bedding prior to installation shall be repaired by the Contractor at no expense to the Railroad.
- F. The Contractor shall comply with all current and applicable Federal, State, local rules, and regulations governing the safety of men and materials during pipe culvert excavation, installation and backfilling operations. The Contractor shall observe requirements of the Occupational Safety and Health Administration relating to excavations, trenching and shoring as set forth in Title 29, Part 1926, Subpart Paragraph P, Sections 1926.650 through 1926.653, Code of Federal Regulations, and any subsequent revisions.

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3.3 FOUNDATION, BEDDING, AND COMPACTION

- A. Pipe culverts shall be placed at the flowline grade and elevation established by the Engineer on a uniform bed of stable earth or granular material such as gravel or sand, and such bedding shall be compacted to not less than one hundred (100) percent of maximum density determined by ASTM D 1557 with moisture content adjusted. The compacted bed shall contain the camber required by the Engineer or as covered by these Specifications, Para. 3.4 Camber. The compacted bed shall also be shaped to fit the bottom one-third (1/3) of round pipe culvert or shaped to fit the entire bottom of pipe arch culvert. Where the granular material is used for bedding, the ends of the pipe culvert in embankment shall be sealed to prevent leaking and infiltration of water along the pipe culvert. Such sealing can often be accomplished by blanketing the ends of the pipe culvert embankment with well tamped clay. In all cases, ends of pipe culverts shall be protected by riprap as outlined in the UPRR Engineering Culvert Pipe Standards.
- B. SOFT SOIL CONDITIONS. Where the flowline grade crosses soft areas of soil which will not provide a suitable uniform foundation for the pipe culvert bed, the Contractor shall excavate eighteen (18) inches below the flowline grade for a width equal twice the outside width of the pipe culvert. Prior to backfilling, the Engineer shall inspect the excavation and the Contractor shall perform any additional excavation beneath eighteen (18) inches of the flowline grade which may be required by the Engineer; provided, however, that the expense of any such additional excavation beneath eighteen (18) inches of the flowline grade shall be considered extra work. Upon completion of the excavation, the Contractor will backfill such excavation with granular material which shall be compacted and formed as described above.
- C. ROCK. When the flowline grade passes over rock, the Contractor shall excavate such rock to a depth which is at least (12) inches below the flowline grade. Excavations in rock shall maintain sufficient area so that the pipe culvert will not rest on rock at any point. The Contractor will backfill excavation in rock with granular material which shall be formed as described above.

3.4 CAMBER

- A. Camber shall be placed in all culverts where it is anticipated that the culvert will settle as the result of high embankment construction or compressible foundation soils below the culvert bedding. Unless otherwise specified by the Engineer, all culverts shall be cambered in accordance with the following:
 - 1. In no case shall the culvert be cambered so high in the center that water will be pocketed at the inlet end of the pipe.
 - 2. Culverts resting on rock foundation need not be Cambered. Refer to Paragraph 3.3 C ROCK.
 - 3. Embankments up to 8 feet high (measured base of rail to flowline) require a 1-1/2 inch camber.
 - a. Embankments 8 feet to 12 feet high require a 2 - 1/2 inch camber.
 - b. Embankments 12 feet to 24 feet high require a 4-inch camber.
 - c. Embankments 24 feet to 36 feet high require a 6-in. camber.

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- B. The above camber standards, based on the height of embankments, may be adjusted in the field, where at the discretion of the Engineer a greater or lesser amount of camber should be built into pipe to adjust for soil conditions encountered at the site. For fills higher than 36 feet, the Chief Engineer will provide the camber requirements.

3.5 RIPRAP PROTECTION

Both the inlet and outlet ends of all culverts shall be protected by riprap, concrete headwall, or as shown on the Drawings. Riprap shall be installed per detail on Drawing 680000, or as shown on the Plan.

3.6 INSTALLATION

A. ASSEMBLY OF CULVERT PIPE

1. Pipe culverts will generally be joined using two (2) foot wide corrugated metal connecting bands. The inside of corrugated connecting bands and the outside of pipe culverts to be joined by corrugated connecting bands shall be kept clean and free of all dirt or gravel to ensure that the corrugations on the connecting bands and the pipe culvert fit snugly as the connecting bands are tightened. They should be tapped with a mallet or hard rubber hammer to ensure a tight joint. Connecting bands for 48 inch or less coated culvert pipe shall be two (2) foot wide, two pieced type, connecting bands and the outside surface of the culvert pipe under the connecting band often need be lubricated with fuel oil or similar solvent to allow the connecting bands to be drawn firmly into place.
2. Corrugated structural plate pipe shall be assembled in accordance with the manufacturer's detailed assembly instructions. Bolts shall be tightened progressively uniformly, starting at one end of the corrugated structural plate pipe after all plates are in place. Tightening shall be repeated to ensure all bolts are tight.
3. When a power wrench is used for tightening bolts, the Contractor shall check the tightening of the bolts with one handled structural or socket type torque wrench. Bolts shall be torqued uniformly to a minimum of 100 ft. lb. and a maximum of 300 ft. lb. or as specified in the manufacturer's detailed assembly instructions.
4. Where field cutting of culvert pipes is required, the Contractor shall make saw cuts. Torch burning will not be permitted.

B. LAYING CULVERT PIPE

Each pipe culvert shall be laid true to the flowline grade. The minimum gradient for any pipe culvert shall be 0.5 percent unless indicated otherwise on the Plans, or as directed by the Engineer. If two or more pipe culverts are to be laid parallel to each other, such parallel pipe culverts shall be spaced per Drawing 6800000 and to permit thorough compaction of the backfill as required by Para. 3.7. Parallel culverts shall be spaced to permit thorough compaction of the backfill as required by Para. 3.7. Parallel culverts shall be separate by a distance of at least one-half (1/2) of the nominal diameter of the pipe culverts or one-third (1/3) the span width of pipe arch culverts but not less than twelve (12) inches, nor does it in any case need to exceed 48 inches. Riveted corrugated metal pipe culverts must be placed with the inside circumferential laps pointing downstream. The Contractor shall cover exposed metal on the surface of any bituminous coated pipe culvert before backfilling is commenced. Such exposed metal must be covered with material which is approved by the Engineer and which includes:

1. Fiber Bonded Bituminous (composite) coating ASTM A-825 (steel only)

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2. Polymeric Coating - ASTM A762 or AASHTO M245 (steel only)
3. Galvanized - AASHTO M218 or Aluminum (Type 2) - AASHTO M274 (steel only)
4. Asphaltic Coating - AASHTO M190 (steel and aluminum) (only 3 and 4 for structural plate pipe)

Such material shall be applied to a thickness of approximately one sixteenth (1/16) of an inch.

C. SPECIAL INSTALLATION CONDITIONS

1. STRUTTING: All pipe culverts with a nominal diameter of 48 inches or greater shall be provided with a five (5) percent vertical elongation. Field strutting shall be required only on very large structural steel pipes (10 foot or greater). Strutting shall be removed immediately after installation and backfill are complete. In all cases, strutting may be required if specifically stated in the Request for Bids

3.7 BACKFILLING AND COMPACTION.

- A. Backfill materials shall be placed simultaneously on both sides of the pipe culvert in uniform layers not to exceed six (6) inches in thickness. For multiple pipes, the backfill shall be placed simultaneously in uniform 6 inch layers between and outside of pipes. Each successive layer shall be compacted, in accordance with the Railroad's Specifications 02230 through 02270, and to not less than one hundred (100) percent of maximum density as determined by ASTM D 1557 with moisture content adjusted if necessary, and each (6) inch layer shall be properly compacted before the next layer is placed.
- B. Backfilling shall be started and completed as quickly as possible after the pipe culvert has been assembled and placed on its bed.
- C. Where granular material is used for backfill, the ends of the pipe culvert embankment shall be sealed with well tamped clay to prevent leaking and infiltration of water along the pipe culvert.
- D. Where compaction may be difficult to obtain due to space constraints or other factors, the Contractor may, with the approval of the Engineer, utilize Controlled Low-Strength Concrete Fill Material (CLSM), commonly called flowable fill, as backfill material to a point one foot above the top of the culvert per Drawing 680000.
- E. PIPE PROTECTION. Materials used to complete the embankment over the pipe culvert should be essentially the same as the material used for the pipe culvert backfill and should be placed and compacted in the same manner as pipe culvert backfill materials are placed. Such material must be used to complete the embankment at least to a height over the top of the pipe culvert equal to the nominal diameter of the pipe culvert, or if the height of the completed embankment over the top of the pipe culvert is less than the nominal diameter of the pipe culvert then such material must be used to complete the embankment. The pipe culvert must be protected from damage during the entire construction period, especially if heavy compaction equipment is used. Heavy construction equipment shall not be operated over the pipe culvert until it has been covered with compacted backfill material to a depth of twenty-four (24) inches.

3.8 RETIGHTENING OF BOLTS

As soon as possible after completion of the embankment over corrugated structural plate pipes, all bolts in the corrugated structural pipe must be retightened to the standards set forth in Para.

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3.6. Such retightening must be started at one end of the pipe culvert and all bolts must be tightened progressively through the length of the pipe culvert.

3.9 PREPARATION OF EXISTING PIPE CULVERTS

- A. The Contractor shall remove existing headwalls and the ends of damaged culverts that are to be extended. The Contractor shall also verify the culvert size prior to ordering material for the culvert extension. All culverts in the project limits are to be cleaned by the Contractor unless they are to be removed or plugged and filled.
- B. The Contractor shall use Controlled Low-Strength Concrete Fill Material (CLSM) per Drawing 680000, with an unconfined compressive strength of between 50 and 300 PSI, for filling culverts that are to be plugged and filled.
- C. Culverts that are to be removed become the property of the Contractor and must be removed from Railroad property, unless otherwise noted.

PART 4 - MEASUREMENT AND PAYMENT

- A. Measurement: The work in this section shall be measured in place in accordance with Standard Specification Section 542.
- B. The cost of RIP RAP is to be included in the price per linear foot of pipe.
- C. No additional payment will be made for the use of CLSM, or flowable fill, as backfill around culverts, but shall be considered subsidiary to the cost of the culvert pipe.
- D. Payment: The work covered in this section shall be paid for at the contract unit price for Pipe Culverts, Class A, Type 3, 30" per Standard Specification 542.

END OF SECTION

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SECTION 02435

SMOOTH STEEL PIPE CULVERTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. These specifications shall govern fabrication, furnishing, and installation of smooth steel pipe culverts in accordance with these special conditions, standard construction specifications and the details shown on the plans.
- B. Except as provided herein, the work shall conform to the applicable portion of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction Section 542.
- C. The size, type, length, wall thickness, and location of pipe culverts will be shown on the plans or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. See Standard Plan No. 680010 for material requirements, diameter, wall thickness, and welding requirements.
- B. Fabrication and materials shall be in accordance with Chapter 1, Part 4 of the AREMA Manual for Railway Engineering except as specified otherwise.

2.2 END TREATMENT

- A. End treatments shall be provided as specified on the plans or as directed by the Engineer.
- B. Ends of smooth steel pipes shall be finished square.

PART 3 - EXECUTION

3.1 HANDLING

- A. Material shall be handled to final position in such a manner as to prevent its damage. Steel pipes shall not be dropped to, or dragged over, the ground, but shall be handled with rolling slings, on skids, or with cranes.
- B. Bent or otherwise damaged steel pipes shall be straightened and repaired, if feasible and as directed by the Engineer, before being placed in final position. No extra payment will be allowed for this work unless authorized in writing by the Engineer.

3.2 PIPE CONNECTIONS

- A. Pipe connections shall be as shown on the plans or as stated in the specifications.

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- B. Sections of smooth steel pipe shall be joined by complete joint penetration welds in accordance with Standard Plan No. 680010 and AWS D1.1 Structural Welding Code unless specified otherwise on the plans or by the Engineer.

3.3 PIPE EXTENSIONS

- A. Connection of smooth steel pipe for extensions shall be as shown on the plans or as stated in the specifications. Sections of smooth steel pipe shall be welded as specified.
- B. Prior to performing any pipe/culvert extensions, the pipe shall be cleaned out. Pipes shall be free of any obstructions that could impede the flow. The clean out of the pipe/culvert is incidental to the cost of performing the pipe extension and shall be included in the contract unit price for pipe extensions.

3.4 PIPE ABANDONMENT

- A. All pipes/culverts being abandoned will be plugged and filled as indicated on the plans or special conditions. No abandoned pipes will be left open, unless otherwise directed by the Engineer. The abandoned pipes will be indicated on the plans.
- B. Culverts that are to be removed become the property of the Contractor and must be removed from Railroad property, unless otherwise noted.

3.5 FOUNDATION PREPARATION

- A. No foundation preparation shall be required for the length of pipe installed by jacking and boring.
- B. Foundation preparation shall be performed as required by Section 02434.

3.6 PROTECTION OF FOUNDATIONS

- A. The Contractor shall by diversion ditches, dikes, or other means, keep the foundations free of water at all times after the work is started, and until the embankment is placed over the pipe. Any channel work necessary to allow free flow through the pipe shall be completed before the embankment is placed.

3.7 EARTH BORING AND JACKING CULVERT PIPE

- A. General:
 - 1. Only smooth steel pipe shall be used for installation by jacking or boring.
 - 2. Pipe damaged in jacking or boring operations shall be repaired in place to the satisfaction of the Engineer. Pipe damage beyond repair shall be removed and replaced. Repair or removal and replacement of damaged pipe shall be done at the Contractor's expense.

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3. Excessive voids shall not be permitted in the jacking process. If voids develop during installation, or track or ballast movement exceeds $\frac{1}{4}$ ", stop work immediately, notify UPRR and submit a corrective action plan.
4. If the grade of the pipe at the jacking or boring end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking or boring operation and for placing end joints of the pipe. The pits shall be a minimum of 12 feet from centerline of the nearest track. Shoring for jacking pits shall meet the requirements of Standard Plan No. 710000. Jacking pits will not be permitted in Zone A unless approved by the Engineer. Design of shoring for jacking pits shall be performed, signed and sealed by a licensed Civil Engineer in the respective State the project is located. Temporary guardrail shall be provided for protection of the pit or trench when specified by the Engineer. Excavations greater than five (5) feet in depth shall be protected in accordance with OSHA Trench Safety Guidelines.
5. Where pipe is required to be installed under railroad embankments, highways, streets, or other facilities by jacking or boring methods, installation shall be made in such a manner that it will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure.
6. The pits or trenches excavated to facilitate jacking or boring operations shall be backfilled immediately after the installation of the pipe has been completed.

B. Jacking:

1. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head and suitable bracing between the jacks and the jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. Joint cushioning material of plywood or other material may be used as approved by the Engineer. Plywood cushioning material shall be $\frac{3}{4}$ -inch minimum thickness. Cushioning rings may be made up of single or multiple pieces. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct the pipe in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, the embankment material shall be excavated just ahead of the pipe, the material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.
2. The excavation for the underside of the pipe, for at least one-third of the circumference of the pipe, shall conform to the contour and grade of the pipe. Over-excavation to provide not more than 1 inch of clearance may be provided for the upper half of the pipe. This clearance shall be tapered to zero at the point where the excavation conforms to the contour of the pipe. Over-excavation in excess of 1 inch shall be pressure grouted the entire length of the installation.

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3. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but shall not exceed 2 feet. This distance shall be decreased when directed by the Engineer.
4. Preferably, the pipe shall be jacked from the low or downstream end. The final position of the pipe shall not vary from the line and grade shown on the plans, or established by the Engineer, by more than 1/8 inch per 1 foot. The maximum deviation shall be $\pm 2''$ from the line and grade shown. The variation shall be regular and in one direction and the final flow line shall be in the direction shown on the plans.
5. The Contractor may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto the pipe.
6. Work should be done continuously to minimize the tendency of the material to "freeze" around the pipe.
7. Excavated material shall be disposed of by the Contractor, as approved by the Engineer.

C. Boring:

1. The boring shall proceed from a pit provided for the boring equipment and workmen. The location of the pit shall be approved by the Engineer. The boring shall be done mechanically either using a pilot hole or by the auger method.
2. When the pilot hole method is used, an approximate 2 inch pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. This pilot hole shall serve as the centerline of the larger diameter hole to be bored.
3. When the auger method is used, a smooth steel pipe of the appropriate diameter equipped with a cutter head to mechanically perform the excavation shall be used. Augers shall be of sufficient diameter to convey the excavated material to the work pit.
4. Excavated material shall be disposed of by the Contractor, as approved by the Engineer. The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings; jetting will not be permitted.
5. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10 percent of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of the pipe.
6. Allowable variation from line and grade shall be as specified in Paragraph 3.7.B.4.

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PART 4 - MEASUREMENT AND PAYMENT

- A. Measurement: The work in this section shall be measured in place in accordance with Standard Specification Section 542.
- B. The cost of RIP RAP is to be included in the price per linear foot of pipe.
- C. No additional payment will be made for the use of CLSM, or flowable fill, as backfill around culverts, but shall be considered subsidiary to the cost of the culvert pipe.
- D. Payment: The work covered in this section shall be paid for at the contract unit price for Smooth Steel Pipe Culverts, 24", per Standard Specification 542.

END OF SECTION

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SECTION 02450
Deck Protection Ballast

PART 1- GENERAL

1.01 Description

A. Provide all labor, materials as specified, equipment, tools and incidentals necessary for placing and tamping a 4" layer of track ballast as protection over the completed waterproofing system on steel plate bridge decks.

1.02 Related Work

A. INTEGRATED BALLAST PROTECTION MAT, BRIDGE DECKS SECTION 07102
B. TRACKWORK CONSTRUCTION SECTION 05050

PART 2 – PRODUCTS

2.01 Ballast shall be UP Ballast Class 1 shown in the UPRR Standard Drawing 0010B. Slag material will not be permitted. Ballast installation shall be per Section 05050.

PART 3 – EXECUTION

3.01 The Contractor shall coordinate the installation of the bridge deck waterproofing with the placement of ballast so that the waterproofing is not damaged.

3.02 The Contractor shall place a layer of ballast on the waterproofed sections of the bridge deck as soon as the waterproofing is completed to protect the waterproofed surface. Extra ballast shall be placed along the waterproofed ballast curbs for their protection.

PART 4: MEASUREMENT AND PAYMENT

4.01 Measurement: This work shall be measured in place and the volume computed in cubic yards. The Contractor must verify the quantity on his own. The Contractor is expected to install the ballast as shown on the plan regardless of any quantity differences and no additional extras will be permitted.

4.02 Payment: The work covered under this section will be paid for at the Contract unit price per cubic yard for DECK PROTECTION BALLAST.

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SECTION 02704

PIPE UNDERDRAINS 6" (MODIFIED)

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies requirements for the end bent pipe underdrains. The work under this Section includes furnishing all labor, materials, tools and equipment required for construction of the end bent pipe underdrains including, but not necessarily limited to all pipes, fittings, elbows and their joining; underdrain backfill; geotextile fabric wrap; geocomposite wall drain materials; cleanouts; capping, concrete headwalls and all appurtenant items as will be required to complete this item as shown on the Plans or as directed by the Engineer.
- 1.02 Standards:
- A. Except as modified herein, Geocomposite Wall Drain work will conform to the applicable portion of the IDOT Standard Specifications, Section 591.
 - B. Except as modified herein, Pipe Drain and Underdrain work will conform to the applicable portions of the Standard Specifications, Section 601.
- 1.03 Related Work:
- A. POROUS GRANULAR BACKFILL Section 02203
 - B. CONCRETE STRUCTURES (SPECIAL) Section 03300
 - C. MEMBRANE WATERPROOFING Section 07102

PART 2: PRODUCTS

- 2.01 Pipe Materials:
- A. Pipe for underdrains behind the abutments must be 6 inch diameter perforated corrugated metal pipe conforming to the requirements of Article 1006.01(a) of the Standard Specifications and must be bituminous coated in accordance with the requirements of AASHTO M190, Type A.
- 2.02 Geotextile Fabric: Fabric considered for use under this section must consist of stabilized nonwoven filaments of polyester meeting the applicable portions of Article 1080.02 of the Standard Specifications. Nonwoven fabric must be needle punched; no resin or heat conditioning will be allowed. The filaments must be dimensionally stable (i.e., filaments must maintain their relative position with respect to each other) and resistant to delamination. The filaments must be free from any chemical treatment or coating that might significantly reduce porosity and permeability. The fabric must meet or exceed the following requirements:

Weight (oz./sq. Yd.) (ASTM D 3776)	3.5
Grab Strength (lbs) (ASTM D 4632)	100*

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Grab Elongation(%) 20*
 (ASTM D 4632)

* Fabrics must be tested wet.

Equivalent Opening Size 30 nonwoven**
 (EOS No.) (Corps of
 Engineers)
 (CW 02215.77)

** Manufacturer's certification of fabric to meet requirement.

- 2.03 Geocomposite Wall Drain: Geocomposite Wall Drain must be a flexible geocomposite consisting of a supporting structure or core conforming to the requirements of Article 1040.07 of the IDOT Standard Specifications. Material must be compatible with any coatings it has contact with.
- 2.04 Underdrain Backfill: Backfill of the geotextile fabric envelope must be coarse aggregate of gradation CA 7 in accordance with Section 1004 of the IDOT Standard Specifications.
- 2.05 Impervious Clay Layer: The clay layer beneath the underdrain shall be a fine grained, inorganic clay of low to medium plasticity (Soil Classification CL).

PART 3: EXECUTION

- 3.01 The geocomposite wall drains must be installed on the soil side of the end bents and wingwalls after the walls are waterproofed according to manufacturer's instructions. The limits of the geocomposite wall drains must be as shown on the plans. For waterproofing back of walls, see Section 03300 – CONCRETE STRUCTURES (SPECIAL).
- 3.02 Place supporting layer of impervious backfill under geotextile fabric where drainage pipe is to be laid to depth indicated.
- 3.03 All filter fabric must be installed at pipe underdrains as shown on the Plans and as specified herein. After excavation has been completed and impervious backfill bedding has been placed at underdrain locations, install filter fabric of sufficient width so that after installation of the underdrain and placement of the underdrain backfill, the fabric can be folded back over the backfill and will lap a minimum of one foot.
- 3.04 The fabric should not be stretched so that it will tear when the envelope aggregate is placed. When several sections of fabric are used, the fabric must overlap a minimum of 2 feet to assure continuity of the filter. Enough fabric must remain uncovered to provide for fabric overlap at the top.
- 3.05 Place geotextile envelope backfill over drain lines after satisfactory testing of drain lines. Place geotextile envelope backfill in layers not exceeding 3" in loose depth and compact each layer placed. Place backfill to provide 9-inch cover. After backfilling operations, the fabric must be lapped over the top.

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- 3.06 Backfilling must immediately follow completion of the geocomposite wall drain and underdrain work, as specified in Section 0223 – Porous Granular Backfill

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: This piping work shall be measured in place for payment in lineal foot for PIPE UNDERDRAINS 6" (MODIFIED).
- 4.02 Payment: Payment will be made at the Contract unit price per linear foot for PIPE UNDERDRAINS 6" (MODIFIED).
- 4.03 Measurement: Geocomposite wall drain shall be measured for payment in place and the area computed in square yards.
- 4.04 Payment: Geocomposite wall drain will be paid at the contract unit price per square yard for GEOCOMPOSITE WALL DRAIN.

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SUBBALLAST
 Section 02851

SECTION 02851

SUBBALLAST

PART 1 - GENERAL

1.1 SUMMARY

- A. "Subballast": This item shall consist of a foundation course for asphalt surface course or railroad ballast and shall be composed of crushed stone from an approved source, materials and shall be constructed as herein specified in one or more courses in conformity with the typical sections shown on plans and to the lines provided by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. REQUIREMENTS

Materials shall be 100% crushed stone produced from oversize quarried aggregate, sized by crushing and produced from a naturally occurring single source. Aggregate shall have a percentage of wear, by the Los Angeles abrasion test, of not more than 50. A higher or lower percentage of wear may be specified by the Engineer, depending on the material available. 10% max loss freeze/thaw test.

B. GRADATIONS

It is the intent of this specification, that unless otherwise indicated on the plans, the subballast shall consist of gradations as set forth in the following table:

SIEVE SIZE	2"	1"	3/8"	No. 10	No. 40	No. 200
% passing (opt.)	100	95	67	38	21	3
% passing (perm.)	100	90-100	50-84	26-50	12-30	0-8

2.2 DESIGN REQUIREMENTS

- A. Subballast will be used as indicated by the following charts or as directed by the Engineer:

6" OF SUBBALLAST SHALL BE REQUIRED WHEN SUB-GRADE MATERIAL SIZES ARE SMALLER THAN LISTED ABOVE, BUT NOT FINER THAN THE GRADATIONS LISTED BELOW:

PERCENT PASSING	SIEVE SIZE	GRAIN SIZE
By Weight	No. Mesh per in.	In mm.
19	200	.08
74	100	.16
92	60	.26
100	40	.42

12" OF SUBBALLAST SHALL BE REQUIRED WHEN SUB-GRADE MATERIALS HAVE GRADATION SMALLER THAN LISTED ABOVE.

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SUBBALLAST
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PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

- A. Preparation of Subgrade. The road bed shall be shaped in conformity with the typical sections shown on plans and to the line and grades provided by the Engineer. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material. All holes, ruts and depressions shall be filled with approved material and if required, the subgrade shall be properly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the subballast material. Sufficient subgrade shall be prepared in advance to insure satisfactory progression of the work.
- B. If the required compacted depth of the subballast exceeds 6 inches, the subballast shall be constructed in two or more layers of approximate equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches and shall be compacted to a density of not less than 95% modified proctor compaction.
- C. If the material is laid and compacted in more than one layer, the Contractor shall plan and coordinate this work in such a manner that the previously placed and compacted layers be allowed ample time for curing and development of sufficient stability before vehicles hauling materials for the succeeding layers, or other heavy equipment are permitted on the subballast. Prior to placing the succeeding layers of material, the top of the under layer shall be sufficiently moist to insure a strong bond between the layers. The edges and/or edge slopes of the subballast shall be bladed or otherwise dressed to conform to the lines and dimensions shown on the plans and present straight, neat, and workmanlike lines and/or slopes as free of loose material as practicable.

PART 4 - MEASUREMENT AND PAYMENT

Placement of subballast shall be measured in cubic yards within the neat lines of the typical sections, line, grades and slopes established. Subballast shall be paid for at the contract unit price as placed according to the specifications including furnishing, unloading, hauling, compacting, dressing, testing and incidental work or equipment required.

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SECTION 02854

BALLAST

PART 1 GENERAL

1.01 DESCRIPTION

- A. These specifications cover the types, characteristics, property requirements and manufacture of mineral aggregates for processed (prepared) ballast. Processed ballast shall be hard, dense, of angular particle structure, providing sharp corners and cubicle fragments and free of deleterious materials. Ballast material shall provide high resistance to temperature changes, chemical attack, have high electrical resistance, low absorption properties and free of cementing characteristics. Materials shall have sufficient unit weight (measured in pounds per cubic foot) and have a limited amount of flat and elongated particles.
- B. The type or types and gradation(s) of processed ballast materials as covered in these specifications and testing requirements shall govern the acceptance or rejection of ballast materials by the Engineer.
- C. A material safety data sheet shall be provided with all proposed materials.

PART 2 MATERIALS

2.01 PROPERTY REQUIREMENTS - PHYSICAL ANALYSIS

- A. Methods of sampling and testing as defined by this specification are those in effect August 1, 2001 and may be revised or altered by the Railroads' Designated Engineers. Refer to items 1 and 2 below and to Tables 1 and 2 for the appropriate testing methods and applicable test values.
 - 1. Mill Abrasion - A representative sample is obtained and sized using current ASTM methods of test. From the course aggregate, split a representative portion into a sample consisting of 3.3 pounds passing the 2 inch sieve and retained on the 1 inch sieve, plus 3.3 pounds passing the 1 inch sieve and retained on the 1/2 inch sieve. The sample shall be washed and oven-dried in accordance with the Los Angeles Abrasion Procedure. The sample will be placed in a 1-gallon, 9-inch external diameter porcelain ball mill pot, along with 6.6 pounds of distilled water. The mill pot shall be sealed and rotated at 33 R.P.M. for a total of 10,000 revolutions (5 hours). The sample shall then be washed-sieved through a number 200 sieve and oven-dried before weighing. Mill abrasion shall be calculated as a percentage of loss in weight by the following formula:

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Mill Abrasion = Loss in Weight x 100% Original Weight.

2. Abrasion Number - The Abrasion number is a number calculated with the results of the Los Angeles Abrasion Test and Mill Abrasion Test. The Abrasion number shall be calculated by the following formula:

Abrasion Number = L.A. Abrasion + 5 x Mill Abrasion.
(Note: L.A. Abrasion is at 1,000 Cycles.)

Union Pacific will perform its own Modified Mill Abrasion testing which includes 100 freeze/thaw cycles to determine suitability of ballast materials and compliance to specifications. Supplier will provide the above Mill Abrasion number as initial comparative test only.

2.02 LIMITING TEST VALUES

- A. The following Tables Nos. 1 and 2 outline the limiting values of testing as may be defined by the designated test specifications. The values for unit weight and bulk specific gravity are minimum values while the remainder are maximum values.

2.03 GRADATIONS

- A. The following Table No. 3 outlines the required gradations to which materials are to be processed for use as ballast. Grading of the processed ballast shall be determined with laboratory sieves conforming to ASTM Specification E 11.

2.04 PRODUCTION AND HANDLING

- A. The aggregate production facility shall be of such design to permit production and/or blending without excessive working of the materials. The facility must be approved by the Railroads' Designated Engineers. The capacity of the production facility shall be adequate to efficiently produce anticipated daily loadings and provide sufficient stockpiles to facilitate loading without delays.
- B. The blending, stockpiling and other production handling operations shall be managed by the producer to minimize segregation of the finished product. Stockpiling operations shall minimize, as practical, breakage or excessive fall in stockpiling operations, and movement of wheeled or tracked machines over stockpile material shall be limited. Processed ballast shall be rewashed as necessary to remove fine particle contamination as defined by the specifications.

2.05 LOADING

- A. The producer shall ensure the fitness of the cars for loading of prepared materials, arranging to clean cars of deleterious material, plug leaks, close doors and other like operations as necessary.

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2.06 INSPECTION

- A. The Railroad or its representative reserve the right to unscheduled visits to the producer's facility during usual business hours for the following purposes:
 - 1. Observe sampling and testing procedures to assure compliance with the requirements of these specifications.
 - 2. Obtain representative samples of prepared material being produced and shipped.
 - 3. Review plant inspection, methods, quality control procedures, equipment and examine test results for current and previous tests. Producer shall provide the inspector with such assistance, materials and laboratory testing equipment as necessary to perform on production site gradation and percent passing 200 mesh sieve analysis. Performance of these tests at the time of an unscheduled inspection visit is the right, but not the duty, of the inspector.

2.07 SAMPLING AND TESTING

- A. The quality of the material to be used for ballast shall be determined by the supplier prior to its acceptance by the Railroads' Designated Engineers. A series of tests by the supplier, as specified herein, shall be made at a testing laboratory approved by the Railroads' Designated Engineers to establish the characteristics of the material being tested.
- B. Once a source has been accepted to supply ballast material, periodic quality control samples shall be taken by the supplier to ensure continued compliance with the specification. A representative sample of prepared ballast shall be taken for gradation from each 10,000 tons of ballast being loaded for shipment. This sample shall be taken in accordance with ASTM D 75 in the quantities as listed within that standard. The gradation report shall be prepared on each sample containing the following information: source identification, date, sample number, shipment or car number and the sieve analysis. The gradation specification shall appear on the test form.
- C. In event any two individual samples fail to meet gradation requirements, immediate corrective action shall be taken to restore the production process to acceptable quality. The Railroads' Designated Engineers shall be advised in writing of the corrective action begin taken. In the event of repeated failure, i.e., two or more samples failing in two successive shipments, purchaser reserves the right to refuse the shipment.
- D. A full range of laboratory testing as defined in the specification shall be performed at least two times a year or as directed by the Railroads' Designated Engineers to ensure the quality of the material being produced. The producer may not change the location of the source without prior approval of Railroads' Designated Engineers. If the producer encounters changes within the supply source, laboratory testing will be performed on the new material to ensure compliance with the specifications and test results supplied to the Railroads' Designated Engineers for approval.

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- E. Prior to installation, the producer should provide the Railroads' Designated Engineers with certified results of ballast quality and gradation as conducted by a testing laboratory acceptable to the Railroads' Designated Engineers. The producer shall receive approval from the Railroads' Designated Engineers for the testing laboratory prior to performing the above-mentioned tests.

2.08 MEASUREMENT AND PAYMENT

- A. Ballast will not be measured separately but shall be considered incidental to Track Work which shall constitute full payment for labor, equipment and incidentals necessary to install the Track Work. Refer to Section 05050.

PART 3 -EXECUTION

3.01 GENERAL REQUIREMENTS

- A. See Section 05050 for execution requirements.

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 RAILROAD COMPANYS
 Table No. 1
 Limiting Test Values
 For Main Track Ballast
 FULLY WASHED MAIN TRACK BALLAST MATERIAL**

PROPERTY	VALUE	ASTM TEST
Percent Material, Passing No. 200 Sieve	0.5%	X1.3 or C 117
Bulk Specific Gravity (See Note #2)	2.6%	C127
Absorption Percent	0.5%	C127
Clay Lumps & Friable Particles	0.5%	C142
Abrasion Number L. A. Abrasion	40.0% 25% max	C535 and MMA C-535
Soundness (Sodium Sulfate) 5 Cycles	2.0%	C88
Flat and/or Elongated Particles	5.0%	USACE CRD-C119 or D-4791
Plasticity Index L.A. Fines	NP	D423, D424
Total Sample Liquid Limit	25	D423, D424
Total Sample Plasticity Index	6	D423, D424

NOTE #1: The limit for Bulk Specific Gravity is a minimum value. Limits for the remainder of the tests are maximum values.

NOTE #2: With the implementation of these specifications, the railroads will only accept ballast which has been washed into the cars or stockpile. Deluge type washing of ballast after loading is not acceptable. The larger gradations will be sampled on the belt, material finer than a #200 sieve will be sampled from loaded cars.

NP = Nonplastic.

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 RAILROAD COMPANYS
 Table No. 2
 Limiting Test Values
 Branch and Yard Ballast

FULLY WASHED BRANCH AND YARD BALLAST MATERIAL

PROPERTY	VALUE	ASTM TEST
Percent Material, Passing No. 200 Sieve	0.5%	X1.3 or C-117
Bulk Specific Gravity (See Note #2)	2.6%	C27
Absorption Percent	0.5%	C127
Clay Lumps & Friable Particles	0.5%	C142
Abrasion Number L.A. Abrasion Number	50.0% 35% max	C535 and MMA C-535
Soundness (Sodium Sulfate) 5 Cycles	5.0%	C88
Flat and/or Elongated Particles	5.0%	USACE CRD-C119 or D-4791
Plasticity Index L.A. Fines	NP	D423, D424
Total Sample Liquid Limit	25	D423, D424
Total Sample Plasticity Index	6	D423, D424

NOTE #1: The limit for Bulk Specific Gravity is a minimum value. Limits for the remainder of the tests are maximum values.

NOTE #2: With the implementation of these specifications, the railroads will only accept ballast which has been washed into the cars or stockpile. Deluge type washing of ballast after loading is not acceptable. The larger gradations will be sampled on the belt, material finer than a #200 sieve will be sampled from loaded cars.

NP = Nonplastic.

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UNION PACIFIC & BURLINGTON NORTHERN SANTA FE
 RAILROAD COMPANYS
 Table No. 3
BALLAST GRADATIONS

NOMINAL SIZE		PERCENT PASSING (BY WEIGHT)								
SIZE NO.	SQ. OPENING	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8
Class 1	2" - 3/8"	100	90-100	50-80	10-35	0-10	0-5			
Class 2M	1 3/8" - No. 8			100	95-100		25-60		1-10	0-5
Class 2	1" - No. 4			100	90-100	40-75	15-35	0-15	0-5	
Class 3	3/4" - No. 8				100	90-100	20-55	0-10	0-5	0-1

NOTE #1: Gradation designation Class 1 is main track ballast material. Gradation designation Class 2 is secondary main, branch and yard ballast. Gradation designation Class 3 is for screening materials. With the implementation of these specifications, Class 1 and Class 2 ballast materials are required to be washed prior to loading.

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DIVISION 3 – CONCRETE

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SECTION 03100

CONCRETE FORMWORK

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies requirements for furnishing, installing and removing concrete formwork. The work under this Section includes furnishing and installing all labor, materials, tools, equipment and incidentals necessary for the installation of concrete formwork and shoring, the installation of items into formwork and/or concrete including but not limited to, anchor bolts, anchorages, and inserts (but not including reinforcement bars unless specifically noted), and removal of all temporary formwork and shoring.
- 1.02 Standards: The work will be performed in accordance with the applicable portions of the Standard specifications, Article 503.06, as well as the requirements of this Section.
- 1.03 Related Work:
- A. CONCRETE STRUCTURES (SPECIAL) Section 03300
- 1.04 Quality Assurance:
- A. Qualifications of Workmen: The Contractor must provide at least one person who will be present at all times during execution of this portion of the work who must be thoroughly familiar with the type of materials installed, the referenced standards, and the requirements of this work, and who will direct all work performed under this Section.
- B. Codes and Standards: Unless otherwise shown or specified, the design, construction, erection, maintenance, and removal of forms and related structures for cast-in-place concrete work must be in compliance with American Concrete Institute Standards ACI 347, "Recommended Practice for Concrete Formwork" and ACI 318, "Building Code Requirements for Reinforced Concrete" (latest edition) and AREMA, Chapter 8.
- C. Allowable Tolerances: Except as specified in paragraph 3.02.D herein, formwork must be constructed to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347. Before concrete placement, the lines and levels of erected formwork must be checked. Corrections and adjustments must be made to ensure proper size and location of concrete members and stability of forming systems. During concrete placement, formwork and related supports must be checked to ensure that forms are not displaced and that completed work will be within specified tolerances.
- 1.05 Submittals: The Contractor must submit to the Engineer his proposed installation and support procedure for the formwork. The Contractor will make modifications, if required, to his procedure to the satisfaction of the Engineer, but it is understood that

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the Engineer's approval will not relieve the Contractor from his sole responsibility for obtaining satisfactory results.

PART 2: PRODUCTS

- 2.01 Form Materials: Concrete surfaces must be formed with steel forms with steel facings as manufactured by Symons Corporation or Peri Formwork Systems, Inc. or an approved equal. A ¼ inch chamfer will be required on all edges.
- 2.02 Ties And Spreaders: Ties must be factory-fabricated, adjustable-length, snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Ties must be fabricated so that the portion remaining within concrete after removal of the exterior parts is at least one and one-half (1½) inches from the outer concrete surface and will not leave a hole larger than one (1) inch diameter in the concrete surface. Form ties fabricated on the site and wire ties are not acceptable.
- 2.03 Form Coating: Form-coating compounds must be commercial formulated that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compound.

PART 3: EXECUTION

3.01 Design of Work:

A. General Requirements:

1. The design and engineering of the formwork as well as its construction will be the responsibility of the Contractor and must conform to "Recommended Practice for Concrete Formwork", ACI 347.
2. Forms must conform to shape, lines, and dimensions shown on the drawings. They must be substantial and designed to safely resist the pressure and weight of concrete and must be properly tied and braced or shored as to maintain position and shape.
3. Formwork must be designed to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

B. Formwork for grade beams and footings: Side forms are required for all footings and grade beams.

C. Temporary Openings: Temporary openings must be provided where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete. Temporary closures must be braced and set tightly to forms to prevent loss of concrete mortar. Temporary openings must be located on forms in as inconspicuous locations as possible, consistent with Project requirements.

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3.02 Construction Formwork

- A. General: All required forms are to be substantial, sufficiently tight to prevent leakage of mortar, and able to withstand internal pressure when filled with wet concrete.
- B. Layout:
 - 1. All required, cast-in-place concrete must be formed to the shapes, sizes, lines, and dimensions indicated on the drawings.
 - 2. Particular care must be exercised in the layout of forms to avoid necessity for cutting of concrete after forms have been removed.
 - 3. Proper provisions must be made for all openings, offsets, recesses, anchorage, blocking, and other features of the work as shown or required.
 - 4. The Plans and Specifications must be carefully examined and other trades consulted as required, relative to provisions for openings, reveals and anchor bolts, and other items in the forms.
- C. Bracing:
 - 1. The forms must be properly braced and tied together so as to maintain position and shape and to ensure safety to personnel during concrete placement.
 - 2. All bracing, supporting members, and centering must be constructed of ample size and strength to safely carry, without excessive deflection, all dead and live loads to which they may be subjected.
 - 3. The forms must be properly apart and securely tied together, using metal spreader ties that give position tying and accurate spreading.
- D. Tolerances: All forms must be straight, true, plumb, and square within a tolerance horizontally of one in two hundred and a tolerance vertically of one in five hundred.
- E. Wetting: Forms must be sufficiently wetted to prevent joints opening before concrete is placed.

3.03 Work Prior to Concrete Placement

- A. Form Coatings: Form surfaces must be coated with form-coating compound before reinforcement is placed. Excess form coating material must not be allowed to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Form coating must be applied in compliance with manufacturer's instructions. Steel forms must be coated with a non-staining, rust preventative form oil or otherwise protected against rusting. Rust-stained steel formwork is not acceptable.

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- B. Cleaning and Tightening: Forms and adjacent surfaces must be thoroughly cleaned to receive concrete. Chips, wood, sawdust, dirt, or other debris must be removed just before concrete is to be placed. Forms must be tightened immediately after placement as required to eliminate mortar leaks.
 - C. Edge Forms and Screed Strips: Edge forms or bulkheads and intermediate screed strips for slabs must be set to obtain required elevations and contours in the finished slab surface. The Contractor will provide and secure units to support types of screeds required.
- 3.04 Removal of Formwork: Forms must be left in place a minimum of 72 hours after casting the concrete.
- 3.05 Re-Use of Forms: Any surfaces of forms to be re-used in work must be cleaned and repaired. Damaged form facing material will not be acceptable. New form coating compound material must be applied to concrete contact surfaces as specified for successive concrete placement. Contractor must thoroughly clean surfaces, remove fins, and laitance, and tighten forms to close all joints. Joints must be aligned and secured to avoid offsets. The Engineer will have the right to reject the re-use of any forms.

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: No separate measurement or payment will be made for CONCRETE FORMWORK, the cost of which will be included in Section 03300 – CONCRETE STRUCTURES (SPECIAL).

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SECTION 03300
CONCRETE STRUCTURES (SPECIAL)

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies the requirements for cast-in-place concrete for the permanent UPRR railroad bridge and shoe-fly bridge components. The work under this Section includes furnishing all labor, materials, tools and equipment required for constructing expansion and contraction joints and waterstops for cast-in-place concrete; normal and rubbed surfaces; waterproofing of all concrete surfaces to be backfilled or exposed to water, embedded steel items including anchor rods, sleeves, plates and dovetail slots; drilling and grouting dowels and pins; and all other appurtenant work, as specified herein, shown on the Plans or as directed by the Engineer.
- 1.02 Standards: Except as modified herein, the work performed under this Section will conform to the applicable portions of the IDOT Standard Specifications, Sections 503 and 508.
- 1.03 Related Work:
- A. CONCRETE FORMWORK Section 03100
- 1.04 Submittals:
- A. The Contractor shall submit his proposed concrete mix designs for the review and approval of the Engineer. All mix designs shall be IDOT mix designs approved for the ready-mix supplier:
- B. Samples: Prepare and submit samples of remolded fillers for approval.
- C. Manufacturers Data: Furnish copies of the manufacturer's specifications for the admixtures, bonding agent, patching and surfacing compound, non-slip material, form oil, joint filler, sand and vapor barrier, including methods of application and installation.
- D. Ready-Mix Delivery Tickets:
1. Maintain a record at the job site showing date, time and place of each pour of concrete, together with ready-mix delivery tickets certifying contents of each pour.
 2. Make the record available to Engineer for inspection upon request and upon completion of the work delivers the record and the delivery tickets to the Engineer.

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L05 Quality Assurance:

A. Codes and Standards: All work included in this section will be performed in accordance with pertinent provisions of the following codes and standards, except where otherwise shown or specified:

1. ACI 301 Specifications for Structural Concrete for Building@.
2. ACI 304 Recommend Practice for Measuring, Mixing, Transporting and Placing Concrete.
3. ACI 305 Recommended Practice for Hot Weather Concreting.
4. ACI 306 Recommended Practice for Cold Weather Concreting.
5. ACI 309 Recommended Practice for Consolidation of Concrete.
6. ACI 311 Recommended Practice for Concrete Inspection.
7. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
8. ACI 318 Building Code Requirements for Reinforced Concrete.

B.

Where provisions of the above codes and standards are in conflict with the building code in force for this work, the building code must govern. In case of conflict between the project Specifications and ACI 301, the project Specifications must govern.

C.

The following material specifications are referred to hereinafter:

1. ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement
2. ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. ASTM C33 Concrete Aggregate
4. ASTM C94 Ready Mixed Concrete
5. ASTM C150 Portland Cement
6. ASTM C260 Air-Entraining Admixtures for Concrete
7. ASTM C494 Chemical Admixtures for Concrete
8. ASTM 0994 Preformed Expansion Joint Filler for Concrete (Bituminous Type)

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9. ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Type)
- D. The following testing methods are referred:
1. ASTM C31 Making and Curing Concrete, Test Specimens in the Field
 2. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens, Test For
 3. ASTM C42 Drilled Cores and Sawed Beams of Concrete, Obtaining and Testing
 4. ASTM C143 Slump of Hydraulic Cement Concrete, Test For
 5. ASTM C173 Air Content of Freshly Mixed Concrete by the Volumetric Method
 6. ASTM C192 Making and Curing Concrete Test Specimens in the Laboratory
 7. ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method, Test For
 8. ASTM E96 Water Vapor Transmission of Materials
- E. Unless a date is specified, the edition of all Standard Specifications or codes current as of 90 days prior to date of bid documents shall be used and applicable copies of the above recommended practices must be available on the site at all times. Note that ACI 318 includes additional materials and testing specifications which by the above reference to ACI 318 become a part of this Specification.
- F. Ready-Mixed Concrete: All ready-mix structural concrete must be furnished by an approved supplier whose plant is certified by the National Ready Mix Concrete Association.
- G. Correction of Defective Work: All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances, and finishing, must be corrected as directed by the Engineer at the Contractor's expense. The Contractor will be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

PART 2: PRODUCTS

2.01 Concrete Materials:

- A. Portland Cement: ASTM C150, domestic brand, Type 1, normal Portland Cement; Type III for high-early strength Portland cement. The same brand of Portland Cement must be used for exposed concrete throughout the job

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unless a change is approved by the Engineer.

- B. High-early strength concrete may be used subject to Engineers approval. All provisions of the specifications will apply except that the 7 day compressive strength must be equal the 28 day strength required for normal concrete.
- C. Coarse Aggregate: ASTM C33, Sections 7 through 10 for crushed stone and must meet the following requirements: Size CA7, for slabs, wall and foundations.
- D. Fine Aggregate: ASTM C33, Sections 3 through 6 for natural sand.
- E. Admixtures: Use air-entraining admixture in all concrete, except concrete to be placed in drilled shafts. Add air-entraining admixture at the manufacturers prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Water-reducing Admixture: ASTM C494, Type A, Pozzolith 322N (Master Builders Co.) WRDA (W.R. Grace & Co.) or Plastocrete 161" (Sika Chemical Corp.).
- G. Air-entraining Admixture: ASTM C260, Darex (W.R. Grace & Co.) or A.E.R. (Sika Chemical Corp.), MBVR STD. (Master Builders Co.).
- H. Fly Ash: Must not be used.
- I. Calcium Chloride: Must not be used.
- J. Water: Must be potable.
- K. Bonding Agent: Epoxy type: Resided Concrete Bonding R7650 Adhesives (HB Fuller Co.), PR-930" (Products Research Co.); Epoweld 812 (Coast Pro-Seal & Manufacturing Co.), Sta-Crete T1 (Sta-Crete, Inc.).
Use Bonding Agent where patching is allowed for certain concrete, subject to the Engineers approval. Apply in accordance with the manufacturers printed instructions.
- L. Patching and Surfacing Compound: Epoxy Type: PR-940 Patching and Surfacing Compound (Products Research Co.) Chemcrete (Protex-A-Cote, Inc.), Resiweld 7640 Series with sand aggregate (HB. Fuller Co.), Sta-Crete 12" with sand aggregate (Sika Chemical Corp.). Use where patching compound is allowed for certain concrete work, subject to the Engineer's approval. Apply in accordance with the manufacturers printed instructions. Patching and surfacing compound for use on exposed concrete surfaces must be equal in color and texture to the basic concrete structure, as approved by the Engineer.
- M. GROUT: Must be non-metallic, non-shrink type in accordance with CRD-C 621, Corps of Engineers specification for non-shrink grout. Compressive strength of grout must be minimum of 5,000 psi in accordance with ASTM-C109.

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- N. Burlap Curing Blankets: Concrete must be cured for seven (7) days with damp or wetted burlap. The burlap blankets must be made from whole stock widths of new burlap and must be two feet longer than the width of slab being placed. The burlap must be free from substances which may be deleterious to freshly laid concrete. Sacks or burlap reclaimed from uses other than curing must not be used. Reused burlap must be in a condition satisfactory to the Engineer. The burlap will conform to the following requirements:
1. Weight per square yard, not less than 9 oz.
 2. Ash (based on dry weight), not more than 3.0%.
 3. The burlap must be composed of not less than 95% jute and manila fibers.
- O. Waterproof Paper Blankets: Waterproof paper blankets must meet the requirements of AASHTO M 171 with the following changes and additions:
1. General Requirements: The paper composing the blankets must be 100% sulphate kraft. The color of the top sheet must be that which the paper industry terms white for this grade of paper and must meet the approval of the Engineer. Blankets must be reinforced by jute, cotton or glass yarn of satisfactory weight, completely embedded in the bituminous cement, running in both longitudinal and transverse directions not more than 2 inch apart and crossing at approximately right angles. Unspun fibers may be used, in which case approximately 1,400 lineal feet per square yard must be embedded in the bituminous cement in a manner that will provide adequate reinforcing in both longitudinal and transverse directions. A suitable bituminous cement will be used.
 2. Impermeability: When tested in accordance with AASHTO T155; mortar specimens having the surfaces sealed with samples of impermeable paper blanket proposed for use, must show moisture losses no greater than 0.150 grams per square inch of exposed surface after 72 hours.
 3. Tensile Strength: The specimens to be tested wet must be immersed in water having a temperature between 70° F and 75° F for a period of one hour immediately prior to testing.
- P. White Polyethylene Sheeting: White polyethylene sheeting must be of single sheet stock manufactured from virgin resin and must contain no scrap or additives. It must be free from visible defects and of uniform appearance; and must not easily tear, puncture or otherwise become unfit for use. Its color must be white and must meet the approval of the Engineer. The sheeting must meet the following physical requirements:
1. Impermeability: When tested by the applicable parts of the method prescribed in Paragraph 2.01.0.2, above, mortar specimens having the surface sealed with samples of the sheeting proposed for use must show moisture losses no greater than specified.

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2. Tensile Strength and Elongation: When tested in accordance with ASTM 0882 Method B, the polyethylene sheeting must have a tensile strength of not less than 1700 pounds per square inch in the machine direction and 1,200 pounds per square inch in transverse direction. The elongation must not be less than 225 percent in the machine direction and 350 percent in the transverse direction. Tests must be made at a temperature between 75° F and 78° F.

- Q. Burlap-Polyethylene Blanket: The burlap and polyethylene must be bonded together so that the blanket acts as a unit. The burlap must conform to the requirements of Paragraph 2.01.N, above. The polyethylene sheeting must conform to the requirements of Paragraph 2.01.P, above. When tested by the applicable parts of the method prescribed in Paragraph 2.01.O.2, above, mortar specimens having the surface sealed with samples of blanket proposed for use must show moisture losses no greater than specified herein.

2.02 Curing and Finishing Materials:

- A. Liquid Membrane-Forming Compounds for Curing Concrete: Fed. Spec. TT- C-800A, Type I Styrene Acrylate or Type II Chlorinated Rubber; non-pigmented; "Kure-N-Sear (Sonneborn Div. of Contech, Inc.), "Dekore T130" (W.R. Grace & Co.) or CR-26" (W.R. Meadows, Inc.).

Cure for seven (7) days, i.e., apply each day for seven days after forms are removed.

- B. Curing compounds must be guaranteed not to affect the bond, adhesion or effectiveness of damp proofing, or surface treatments.

2.03 Jointing Materials:

- A. Premolded joint filler must be of thickness shown on the Drawings. Exterior joints adjacent to existing abutment walls to remain, part of walkways, building walls or foundations must be cork type conforming to ASTM 01752, Type II; asphalt impregnated fiber ASTM 01751.
- B. Waterstops shall be polyvinyl chloride (PVC) made from virgin raw materials and shall conform to the requirements of the U.S. Army Corps of Engineers Specifications CRD C572, in accordance with the AREMA Manual, Chapter 8, Part 1, Section 1.11.7.

2.04 Design Mixes:

- A. General: The Contractor, at his own expense, will employ a technical agency, approved by the Engineer, familiar with local construction conditions and materials to design concrete mixes.
- B. Mix Designs: Must be formulated with ample lead time (6 weeks) to allow testing and verification of the design as hereinafter specified so that mixes can be reviewed by the Engineer prior to job use. All concrete must have a

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minimum of six (6) bags of cement per cubic yard and must attain a minimum compressive strength of 4,000 psi at 28 days, except as otherwise specified.

- C. Mix designs reviewed by the Engineer are to be on file in the Contractors field office prior to pouring concrete.
- D. Concrete mix designs must be made on the basis of Laboratory Trial Batches or of Field Experience with the material to be employed, for each type of concrete required, in accordance with the Drawings and Specifications. Chapter 4: Concrete Quality of ACI 318 must apply unless specified otherwise herein.
- E. List design mixes stating where each applies, and properly identified. F.

The design mixes must be obtained from the following:

1. All concrete must be normal weight type, with water reducing admixture.
 2. Strength requirements must be as noted on the Drawings.
 3. The maximum slump must be 3 inches, plus or minus 1 inch, for unpumped concrete; 4-1/2 inches, plus or minus 1 inch for pumped concrete and lean concrete.
 4. A water reducing admixture must be used in strict accordance with the manufacturers information on the varying quantities to be used to suit variations in temperatures.
 5. All weather exposed concrete such as pavements, curbs, abutments and piers must be air-entrained 5% to 7% of volume.
 6. A retarding admixture may be permitted in hot weather with the approval of the Engineer. The retarding admixture must be in accordance with Articles 1020.05 (b) and 1021.03 of the IDOT Standard Specifications.
- G. Verify the adequacy of the design mixes for compressive strength in accordance with ACI 301, and with a minimum of 12 cylinders; 6 tested at 7 days and 6 tested at 28 days with appropriate ASTM procedures for compressive and split cylinder strength.
 - H. The Contractor must immediately notify the technical agency and the Engineer, if, at any time during construction, the concrete, resulting from the approved mix design, proves to be unsatisfactory for any reason, such as: too much water; lack of sufficient plasticity to prevent segregation, honey-comb, etc.; or insufficient strength. The technical agency must modify the design, subject to approval of the Engineer until a satisfactory concrete is obtained.
 - I. The Engineer will review the concrete test reports and the design mix for the concrete, check that all required tests are made and laboratory tests are submitted, order such changes ⁶⁶ for the concrete mix as required to produce

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concrete construction for compliance with the specifications and approved Plans, and report to the Owner any deviation from the requirements of these Specifications as indicated by records of inspection and reports of tests.

2.05 Ready Mix Concrete:

A. General Requirements:

1. All ready-mixed concrete must comply with ASTM C94 and as herein specified.
2. The ready-mixed concrete producer must submit duplicate delivery tickets, one for the Contractor and one for the Engineer, with each load of concrete delivered to the site.
3. Delivery tickets must provide the following information:
 - a. Date
 - b. Name of ready-mix concrete plant
 - c. Contractor
 - d. Job Location
 - e. Type (Standard or H.E.S.) and brand of cement
 - f. Design Mix
 - g. Cement content in bags per cubic yard of concrete
 - h. Truck number
 - i. Time dispatched, and time unloaded
 - j. Amount of concrete in load in cubic yards
 - k. Admixtures in concrete, if any
 - l. Type of maximum size and aggregate
 - m. Maximum allowable slump

Special Requirements:

1. Delete the reference in ASTM C94 allowing extra water to be added to the batch for material with insufficient slump. Addition of water to batch will not be permitted.
2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is between 85 °F and 90 °F, reduce the mixing and delivery time from 1-1/2 hours to 74 minutes and when air temperature is above 90 °F, reduce the mixing and delivery time to 60 minutes.

2.06 Cast-In-Place Provisions: The PVC pipe sleeves to be cast in the abutment wingwalls shall be smooth wall polyvinyl chloride pipe conforming to ASTM D1785 and of the size shown on the Plans.

2.07 Surface Treatment: Polymer-modified Portland cement coating "Sika Top 144" or equal. Apply in accordance with manufacturer's directions.

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- 2.08 Joint Waterproofing: Construction joints must be covered with a two foot strip of 3/32 inch thick butyl rubber membrane with adhesive in accordance with the applicable provisions of Section 580 of the Standard Specifications.

PART 3: EXECUTION

3.01 Concrete Placement:

- A. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit the installation of their work and cooperate with other trades in setting such work as required. Thoroughly wet wood forms where permitted immediately before placing concrete as required where form coatings are not used. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- B. General Requirements: Comply with ACI 304 and also with all of the following specific requirements:
1. Short troughs or pipes used as aids in placing concrete must be arranged and used in such a manner that the ingredients of the concrete are not separated.
 2. Dropping the concrete a distance of more than 5 feet or depositing a larger quantity at any point and running or working it along the forms will not be permitted.
 3. Special care must be exercised to prevent splashing concrete on forms and reinforcement, and any hardened deposit must be removed before covering with fresh concrete.
 4. The placing of concrete must be carried on continuously between construction joints. Construction joints must be as approved by the Engineer and be as detailed. When it is necessary, because of an emergency, to place less than a complete horizontal layer at one operation, the layers must terminate with a keyed joint.
 5. In any given layer, the separate batches must follow each other so closely that each one will be placed and compacted before the preceding one has taken its initial set. Green concrete must not be injured and there must be no line of separation between the batches, or between layers. The operation of depositing and compacting the concrete must be conducted so that exposed surfaces must be smooth and of uniform texture and completely free of honey-combing and voids.
 6. Concrete must be placed with the aid of internal mechanical vibrator equipment capable of 6,000 to 9,000 impulses per minute. Vibration must be transmitted directly to the concrete. The duration of vibration at any location must be held to a minimum necessary to produce thorough compaction.

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7. Concrete must be placed in layers not over 24 inches deep and each layer must be vibrated into place in such a manner as will not cause the ingredients to separate. Where necessary, vibration must be supplemented by hand spading to secure these results. Vibrators must be kept constantly in motion and must not be held in one location long enough to draw a pool of grout or water from the concrete. Maintain spare equipment to avoid breakdown delays.
8. Submit vibration methods and equipment information for prior approval to Engineer.
9. Footings and Foundations: The bottom of all excavations must be properly leveled off before placing concrete. Footings and foundations must be of sizes and shapes as shown on the Drawings. Concrete must be placed as soon as possible after excavations have been completed. All concrete must be placed continuously from bottom to top.
10. Maintain reinforcing in the proper position during concrete placement operations.

C. Cold Weather Placement:

1. When cold weather conditions exist that would impair the quality and strength of concrete, place concrete in compliance with ACI 306 "Recommended Practice for Cold Weather Concreting" and as herein specified.
2. When cold weather protection is required it must be provided with a heated enclosure. Adequate equipment must be provided for heating concrete materials and protecting the concrete during freezing or near-freezing weather. All concrete materials and reinforcement; forms, fillers, and ground with which the concrete is to come in contact with must be free from frost. No frozen materials or materials containing ice will be used.
3. Take whatever precautions are necessary during the construction period to prevent damage to foundations and interior building slabs on grade resulting from heaving of ground due to frost. Blankets must be used when night time temperature is 40° F or below and heated enclosures when less than 40° F.

D. Hot Weather Placement:

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
2. Cool ingredients before mixing to maintain concrete temperature at all times of placement below 90° F. Mixing water may be chilled, or crushed ice may be used to control the concrete temperature provided

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the water equivalent of the ice is included in the total amount of mixing water.

3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
4. Wet forms thoroughly before placing concrete.
5. Retarding admixture may be used if approved by the Engineer.

3.02 Concrete Curing and Protection:

A. General Requirements:

1. Curing must be in accordance with the applicable portions of Section 1020.13 of the IDOT Standard Specifications.
2. Protect freshly placed concrete from premature drying and excessive cold or heat, and maintain without drying at a relatively consistent temperature for a period of time necessary for hydration of cement and proper hardening.
3. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.
4. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 (seven) days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period. Perform curing of concrete by moisture retaining cover curing, by membrane curing, or by combination thereof, as hereinafter specified.

B. Moisture Curing: Provide moist curing by one of the following methods:

1. Keep concrete surface continuously wet by covering with water.
2. Continuous water-fog spray.
3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.

C. Moisture Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

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- D. **Membrane Curing:** Apply membrane forming curing compound to damp concrete surfaces as soon as water film has disappeared. Apply uniformly in 1-coat continuous operation by power spray equipment in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. **Curing Formed Surfaces:** Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- F. **Curing Unformed Surfaces:** In general, cure unformed surfaces, such as slabs, and other surfaces by membrane curing.
- G. **Curing surfaces which are to receive a seamless floor coating or a waterproof membrane:** A sprayed on curing compound will not be used unless approved by the surfacing manufacturer. These surfaces will be cured by one of the following methods:
1. **Waterproof Paper Method:** The surface of the concrete must be covered with waterproof paper as soon as the concrete has hardened sufficiently to prevent marring the surface. The surface of the concrete must be wetted immediately before the paper is placed. The blankets must be lapped at least 12 inches end to end, and these laps must be securely weighted with a windrow of earth, or other approved method, to form a closed joint. The same requirements will apply to the longitudinal laps where separate strips are used for curing edges, except the lap must be at least 9 inches. The edges of the blanket must be weighted securely with a continuous windrow of earth or any other means satisfactory to the Engineer to provide an air-tight over. Any torn places or holes in the paper must be repaired immediately by patches cemented over the openings, using a bituminous cement having a melting point of not less than 180° F. The blankets may be reused, provided they are air-tight and kept serviceable by proper repairs.
 - a. A longitudinal pleat must be provided in the blanket to permit shrinkage where the width of the blanket is sufficient to cover the entire surface. The pleat will not be required where separate strips are used for the edges. Joints in the blanket must be sewed or cemented together in such a manner that they will not separate during use.
 - b. The Engineer may approve the use of other impermeable covering, in lieu of waterproof paper, provided it has been shown through laboratory and field investigation that the results obtained are at least as satisfactory as those obtained with waterproof paper.

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2. Polyethylene Sheeting Method:

- a. The surface of the concrete must be covered with white polyethylene sheeting as soon as the concrete has hardened sufficiently to prevent marring the surface. The surface of the concrete must be wetted immediately before the sheeting is placed. The edges of the sheeting must be weighted securely with a continuous windrow of earth or any other means satisfactory to the Engineer to provide an air-tight cover. Adjoining sheets must overlap not less than 12 inches and the laps must be securely weighted with earth, or any other means satisfactory to the Engineer, to provide an air-tight cover.
- b. Any torn places or holes in the sheeting must be repaired by cemented patches. When sheets are no longer serviceable as single unit, the Contractor may select from such sheets and reuse those which will serve for further applications, provided two sheets are used as a single unit; however, the double sheet units may be rejected when the Engineer deems that they no longer provide an air-tight cover.

3. Wetted Burlap Method: The surface of the concrete must be covered with wetted burlap blankets as soon as the concrete has hardened sufficiently to prevent marring of the surface. The blankets must overlap 6 inches. At least two layers of wetted burlap must be placed on the finished surface. The burlap must be kept saturated by means of mechanically operated sprinkling system. In place of the sprinkling system, the following may be used: two layers of burlap covered with impermeable covering. The burlap must be kept saturated with water. Plastic coated burlap may be substituted for one layer of burlap and impermeable covering. The blankets must be placed so that they are in contact with the edges of the concrete, and that portion of the material in contact with the edges must be kept saturated with water.

3.03 Concrete Joints: General Requirements: Isolation joints, construction joints, and control joints must be as shown on the Drawings, and as specified. Additional construction joints must be subject to approval by the Engineer.

3.04 Concrete Finishing:

- A. All exposed surfaces are to have a rubbed finish in accordance with the applicable portions of Article 503.15 (b) of the Standard Specifications.
- B. Concrete work which has not been installed as indicated on the Plans, or which is out of line or level, or has defective surfaces must be considered not conforming with intent of these Specifications and will be removed, unless the Engineer grants permission to patch defective areas. Permission to patch any special area must not be considered a waiver of Engineers right to require complete removal of defective work if patching does not satisfactorily restore quality and appearance of surface.

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- C. Immediately after stripping forms, inspect surfaces, cut ties, remove fins or projections, fill tie holes, patch honeycombing. This is also to be done on sides which will not be exposed to view.
- D. Patching must be done before concrete is thoroughly dry. Patching must be with same materials and proportions as concrete, except coarse aggregate will be omitted. On exposed work white Portland cement must be substituted for a part of the gray cement in order to produce a color matching that of the surrounding concrete, and determined by a trial patch. Dampen area to patch; Add only enough water to permit working mortar into defects, strike off and allow to set. Rub with carborundum to bring surface to same texture, color, etc., as adjacent surfaces.
- E. All surfaces of concrete to remain exposed after removal of forms must have holes left by withdrawal of rods, or the hole left by removal of ends of ties, filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall, a plunger type grout gun must be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas must be held over the hole on the outside and when the hole is completely filled, the excess mortar must be struck off with a cloth flush with the surface. Holes not passing entirely through the wall must be filled with a small tool that will permit packing the hole solidly with mortar. Any excess mortar at the surface of the wall must be struck off flush with a cloth. Exposed face of mortar must have aggregate embedded similar to that on adjacent surface.

3.05 WATERPROOFING: Construction joints between the abutment cap and the backwall, and between the cap and wingwall and other locations as directed by the Engineer must be covered by a two foot strip of butyl rubber membrane secured one foot each side of the joint with adhesive before applying the asphalt waterproofing. The back of abutments and wingwalls must be waterproofed according to the requirements of Article 503.18 of the Standard Specifications. The waterproofing of the walls must be completed and accepted by the Engineer before installing the geocomposite wall drains as per Section 02704 – PIPE UNDERDRAINS.

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: This work shall be measured based on the dimensions shown in the plans and measured for payment per Standard Specification Section 503.21. The waterproofing work will be measured in place and computed in square yards.
- 4.02 Payment: This work will be paid for at the Contract Unit Price per cubic yard of concrete for CONCRETE STRUCTURES, and other pricing, per Standard Specification Section 503.22. The waterproofing work will be paid for at the concrete unit price per square foot for ASPHALT WATERPROOFING.

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SECTION 03601

DRILL AND GROUT BARS

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies requirements for drilling and epoxy grouting of anchor rods or bars for the beam bearings, and other locations shown on the Plans. The work under this section will consist of furnishing all labor, materials, tools and equipment required for drilling and epoxy grouting the anchor rods.
- 1.02 Submittals: Prior to performing the work, the Contractor must submit a notarized certification by the formulator stating that epoxy-resin grout meets the requirements as set forth herein.
- 1.03 Related Work:
- A. CONCRETE STRUCTURES (SPECIAL) Section 03300

PART 2: PRODUCTS

- 2.01 The epoxy grout must be a two-component, epoxy-resin bonding system conforming to the requirements of ASTM C881, Type I, Grade 2, Class A, B or C. The class supplied must be governed by the range of temperatures for which the material is to be used. The resin must contain a white pigment and the hardener must contain a black pigment in such proportions that the resulting mixture is concrete gray.
- 2.02 The two-component, epoxy-resin grout must be furnished by the manufacturer in pre-measured, pre-assembled cartridges suitably designed for mixing and application of the grout, or in containers individually marked to clearly identify each component.
- 2.03 Packaging: The epoxy grout must be packaged in a kit with each component in a separate container. The containers of each kit must be filled with the grout components in exact mixing proportions, and one container must be large enough to mix both of the components. The size of the kit must be the total volume of the mixed grout which must be one gallon or five gallons as specified. Regardless of how it is furnished, the manufacturer must supply mixing instructions.

PART 3: EXECUTION

- 3.01 Drilling: Holes must be drilled in the concrete to 1/4" larger diameter than the diameter of the anchor rods or bolts or as shown on the drawings and to the depth shown on the Plans. A template or other approved method must be used to assure accurate location of the drilled holes. All holes must be blown free of concrete dust and chips, and must be absolutely dry prior to placing the epoxy grout.
- 3.02 Installation: Prior to inserting the anchor rod into the hole, the hole must be filled approximately one-third full of the mixed epoxy grout. The anchor rod must be inserted into the partially filled hole and moved up and down several times to ensure total contact of the grout with the concrete, as well as the anchor rod. Extrude additional grout to proper concrete level and finish as necessary. Align anchor rod to

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maintain perpendicular plane. No load must be applied to the anchors until the grout has cured for at least 24 hours.

PART 4: MEASUREMENT AND PAYMENT

~~4.01 Measurement: This work shall be measured per each.~~

~~4.02 Payment: Payment shall be made at the Contract Unit Price per each for DRILL AND GROUT BARS.~~

4.01 No separate measurement or payment will be made for Drill and Grout Bars the cost of which will be included in Section 03300-Concrete Structures (Special).

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DIVISION 5 – METALS

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SECTION 05050
TRACKWORK CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall provide all labor, materials as specified, equipment, tools layout survey and incidentals necessary to construct trackwork complete as indicated in the contract plans. The work includes unloading, stockpiling, transporting and inventory of material, distributing and placing of ties, tie plates, all other track material (OTM), fittings and fastenings. Track Construction shall also include the laying, bolting, gauging and spiking of rail and all thermal corrections, welding and adjustments of rail, the placing and tamping of ballast, the installing of bumping posts, derails, frogs, switches, guardrails, switch stands, road crossings and the placing of ballast, lining, surfacing and finishing of tracks.

B. Work by Others

1. UPRR will construct track shifts and rail welding during the shift, and turnout and spur track. See the UPRR Track Plans for the detailed track scope of work for the Contractor and for the UPRR. Contractor shall coordinate his work with the UPRR track work.
2. All signal work is to be performed by UPRR. Contractor shall coordinate his work with the UPRR signal forces.

C. Contractor shall provide all track material as noted in Part 2 – Products, for use by Contractor and for use by the UPRR.

1.2 TRACK STANDARD REFERENCES

Current versions of the following rules, standards, specifications, and references shall apply to all track work:

- A. Union Pacific Railroad Safety Rules
- B. Union Pacific Railroad Maintenance of Way Rules
- C. Union Pacific Railroad Engineering Standards
- D. Union Pacific Railroad Chief Engineer's Bulletins
- E. Union Pacific Railroad Engineering Track Maintenance Field Manual
- F. Union Pacific Railroad Form 7913 – Instructions Governing the Inspection, Welding, Grinding and Heat Treating of Track Components
- G. AREMA: Manual for Railway Engineering
- H. Track Safety Standards of the Federal Railroad Administration

1.3 SUBMITTALS

The Contractor shall submit the following in accordance with the General and Special Conditions:

- A. Shop Drawings: Submit shop drawing and product data for trackwork items not specifically defined by engineering standards.
- B. Equipment: Submit suitability of track construction equipment including

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equipment manufacturer's specifications. Include equipment specification for ballast consolidation and tamping equipment. Track tamper shall be laser guided.

- C. Tools: Submit list of all track tools and equipment to be employed for installation of rail including rail cutting equipment, rail heating device and distressing equipment.
- D. Material Handling: Submit procedure for transport, stockpiling and handling of trackwork materials within the limits of the project site.
- E. Submit procedures for the work as requested by the Engineer.

1.3 QUALITY ASSURANCE

- A. CONSTRUCTION SUPERVISION - The track construction shall be progressed with skilled supervision and labor and the Contractor shall assemble the track material in such a manner as may be required by the Engineer. Any supervisor or laborer not satisfactory to the Company shall be removed from the project on request of the Engineer.
- B. INSPECTION OF SUBGRADE - Shall be made just prior to track laying. Track construction shall not commence until the subgrade has been approved by the Engineer.
- C. DAMAGE AND RESTORATION - The Contractor shall perform hauling, loading and unloading operations as well as track construction in such a manner as to cause no damage to the roadbed, ditches, shoulders, slopes, drainage pipes, risers, drop inlets, roads and any other facilities. Any damage to the foregoing shall be repaired or replaced, where necessary, in a manner satisfactory to the Engineer and at the expense of the Contractor. In making repairs and replacements, equivalent materials shall be used and the method of placement shall be as directed by the Engineer.

PART 2 – TRACK MATERIAL AND EQUIPMENT

2.1 SUMMARY

- A. Track material – Contractor shall purchase, deliver unload and carefully handle to avoid damage when unloading, hauling, stockpiling, and installing for all track material required by the contractor and the UPRR including but not limited to the following:
 - 1. Subballast
 - 2. Ballast
 - 3. 136 RE Continuously Welded Rail (CWR)
 - 4. Ties, wood 9' for the shoo-fly track, mainline track and spur
 - 5. Tie Plates
 - 6. Cut Spikes, Lock Spikes, Screw Spikes
 - 7. Rail Anchors
 - 8. One Turnout
 - 9. Track Bolts, Nuts, and Spring Washers

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10. Joint Bars- Quantity of bars shall be sufficient to facilitate construction assuming welding is performed on a reasonable schedule so bars can be reused during the life of the project.
11. Insulated Plugs
12. Field Rail Welding Kits
13. Transition rails
14. Tie Plugs
15. Wood Preservative
16. Small Fasteners and Fittings

All material shall be new.

The Contractor shall also be responsible for unloading rail from the rail train. All track material shall be provided loose and transported in railroad cars or other means of transportation. The Contractor shall supply a waterproof container or trailer for storage of weld kits, supplies, and any other material that requires protection from the weather. Storage and security of all track material shall be at the expense of the Contractor and will be incidental to the track work pay item.

- C. When handling track material, the Contractor must comply with the Union Pacific Railroad Engineering Track Maintenance Field Manual and Maintenance of Way Rules.
- 2.2 CWR, continuous welded strings of rail, and stick rail shall be handled in accordance with Engineering Track Maintenance Field Manual, using special equipment provided for that purpose. With the exception of bonded joint plugs, rail less than 15' shall not be installed in the track without the engineer's approval. Bonded joint plugs shall be paid for as part of track construction and welds shall be paid for per each successfully installed weld. The temporary joint bars and bolts will be the responsibility of the contractor and incidental to the track construction.
 - 2.3 The contractor shall unload and place or stockpile the ballast; clean, close and lock the doors and release the cars to the engineer within 2 working days after delivery to the job site. The Contractor shall be required to stockpile the ballast if it cannot be dumped directly on the track. Ballast shall be uniformly distributed and the track raised, lined, surfaced and tamped, with the finished surface of the ballast dressed in accordance with the Engineering Track Maintenance Field Manual, standard drawings and plan drawings.
 - 2.4 The Contractor shall provide the following equipment for use by the UPRR for a period of 24 working days:
 - a. Motor Grader – Caterpillar 140G or equal with operator
 - b. Excavator – Caterpillar 330, Komatsu 300, JD 330 or equal with operator
 - c. Front End Loader – Rubber tired – Caterpillar 980B or equal with operator
 - d. Truck – Water 4000 gallon minimum – with operator
 - e. Bulldozer – Caterpillar D6H LGP or equal with operator – angle/ tilt blade & winch
 - f. Light Plant mobile with four 1000 watt sodium floodlights & 30' extendable tower
 - g. Truck – Dump – 12cy minimum – tandem axel – with operator
 - h. Labor – Survey Crew – 2 personnel & equipment – for Survey work
 - i. Flagging Truck – to be used by the UPRR flagman

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PART 3 – EXECUTION

- 3.1 All horizontal and vertical field track survey layout required, for both Contractor and UPRR work, shall be by the Contractor and included in the unit track price. The UPRR will furnish horizontal and vertical control points and track layout plans or coordinate files. The final track surface, cross level and line shall not deviate from the plans more than limits defined in the Engineering Track Maintenance Field Manual for the specified class of track.
- 3.12 ROADBED PREPARATION AND DRAINAGE
- A Clearing and grubbing, grading, excavation, embankment preparation, drainage, subgrade preparation and subballast are specified in Section 02230.
- B. Where the subgrade or roadbed is damaged during distribution of materials, ruts and depressions shall be filled and compacted and the roadbed surface leveled by the Contractor. The damaged roadbed shall be re-approved by the Engineer prior to track construction. No additional compensation will be given for this work.
- 3.13 All track construction shall conform to the Engineering Track Maintenance Field Manual with the following modifications:
- A. Project track material, to be installed by Contractor and UP forces, shall be delivered to a location as directed by the UPRR Engineer
- B. Tracks on wood ties shall be constructed at 24 ties per 39 ft. rail length (19-1/2" centers).
- C. New treated ties shall not be adzed without authority from the Engineer. If adzing is authorized, an approved preservative shall be applied to the adzed surface.
- B. Insulated joints shall be installed as indicated on the plans. If not indicated on the plans, insulated joints may be required at locations as directed by the Engineer.
- C. Tie plugs, where required, shall fill holes from which spikes are drawn. The plugs shall conform to the current AREMA Specifications for tie plugs. All spike holes must be filled with standard wooden tie plugs or another suitable plugging material as approved by the Chief Engineer, before re-spiking.
- D. Rail anchors shall be installed after the ballast operation and the track is raised, lined and distressed. Anchors shall be installed on the same side(s) of the tie on both rails. Anchors must not be applied to one rail only, but must be applied to both rails in a uniform pattern.
- E. When using sledge to remove rail anchors, the foot must be placed on top of the rail anchor in such a manner to prevent the anchor from flying and causing injuries. Spike mauls must not be used in lieu of sledges for applying and removing rail anchors.
- F. Track panels may be utilized in track construction when approved by the Engineer. Care shall be taken in unloading or moving the panel sections so as not to skew or bend the section.

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- G. Rails shall not be moved into position with a hammer, maul, or similar tool, but shall be moved with rail tongs, rail forks, or lining bars.
- H. Laying of continuous welded rail in track using a track-laying machine is acceptable.
- I. Where track panels have been utilized in track construction and are to be relayed with CWR, the provisions governing CWR and thermal correction shall apply. All spikes removed shall have the holes plugged with approved tie plugs. Anchors shall be applied per these specifications. All jointed rail and OTM shall be loaded in rail cars or stock piled as directed by the Engineer.
- J. When rail is released from track, it shall be promptly classified by the Engineer in accordance with Chief Engineer's instructions.
- K. Welding shall be performed under the direct supervision of an experienced and certified welding foreman or supervisor. All welds given fault indication by ultrasonic inspection, magnetic particle inspection, or visible inspection, shall be replaced at no expense to the IDOT, including the addition of the rail plug and additional welds as required. All initial testing shall be performed as directed by the Engineer. If a defective weld is found, it shall be cut out and replaced with a section of rail not less than 15 feet long.

The Contractor shall inform the Engineer of the location of completed welds in order for the Engineer to arrange testing, if required. A record shall be kept by the Contractor for each completed weld. All welds shall be marked on the rail per requirements of Form 7913.

K.1. The Contractor shall perform the following incidental work to complete rail welds:

1. Re-space cross ties as necessary to prevent a weld from sitting on a tie.
2. Tamp and dress the track as necessary to provide firm support at the weld.
3. Plug ties and re-spike as necessary.
4. Reapply and adjust anchors as necessary to conform to the anchor pattern.
5. Clean up all waste from the welding process and dispose of superfluous materials.

K.2. Ultrasonic Testing of Rail Welds

All thermite rail welds installed as part of the project shall be hand tested ultrasonically for defects or inclusions before track is placed into service. Prior to ultrasonic inspection, each weld will be ground to a finish that eliminates grooves, heavy facets, or debris that could interfere with hand test operation. All test surfaces will be free of debris, scale, grease and heavy rust, which may inhibit inspection.

The operator in charge of the testing crew shall have a minimum of American Society of Nondestructive Testing (ASNT) Level II training and experience. Documentation of each qualified operator's certification and a proposed written

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procedure for testing will be provided to Railroad for approval. The written procedure shall be prepared and the approved testing program shall be administered by a certified ASNT Level III or comparable individual. The written procedure shall describe the program for the control and administration of the testing personnel training, examination and certification. Qualifications shall be specific to the equipment and method used. The Railroad reserves the right to disqualify an operator from testing on Railroad property because of previous experience with operator's performance or operator's ability without further explanation. Any exceptions to these rail testing qualifications shall be pre-approved in writing by the UPRR.

Functionality of the UT hand testing instrumentation shall be checked, and the equipment shall be calibrated and normalized by use of a calibration standard at the beginning and end of the daily testing operation, after inactivity or delay if practical, and any time when a malfunction is suspected. If any malfunction is discovered, all material shall be reexamined to the previous valid calibration and normalization.

Each weld will be hand tested with each of the following transducer angles: 70 degree, 37.5 or 45 degree, and 0 degree.

1. The 70 degree (+/-) sound envelope hand test transducer, full railhead coverage (gage, center and field) shall be capable of detecting transverse flaws, with calibration and detection minimums of a 1/32 inch flat bottom hole.
2. The 37.5 (+/-) degree or 45 (+/-) degree transducer will inspect fillet, web and base of rail with calibration and detection minimums of a 1/32-inch flat bottom hole.
3. The 0 degree transducer will inspect the head, web and base. Detection capabilities for web, head web flaw minimums 1/32 inch. In addition to detection of transverse or horizontal flaws from top of rail, the 0 degree transducer will be employed to inspect the head from side of the rail, at 90 degrees to vertical, for vertical split head separations. 0-degree detection minimums shall be 1/32-inch flat bottom hole.

All testing shall be performed by personnel qualified and certified in accord with the approved written procedure. The testing operator will locate and mark defects found according to Railroad specifications and accuracy requirements. Each defective weld shall be marked with a highly visible marking on both sides of the rail web and base. The UPRR also reserves the right to independently re-test suspect welds at the Contractor's expense.

Welds with single 1/16 inch or greater reflective surface shall be rejected. Welds with three or more 1/32 inch reflective surfaces within range of transducer scan shall be rejected also. Defective welds will be reported and subsequently repaired at UPRR's direction.

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The UPRR will be provided all test records following the UT inspection. The Contractor shall certify all test records and maintain a copy of all test records for a minimum of four years following the test.

- L. At the end of the project, UPRR will perform Verse testing for distressing rail, which the contractor must support with appropriate labor. When the contractor is supporting the VERSE testing, he shall be responsible for any damaged clips or inserts. Anticipate testing to occur every 500 to 1000 feet. If the any of the VERSE tests fails, the Contractor shall be responsible for any remediation necessary to pass the test. Verse testing shall be performed on all new track. Verse tester is to be approved by the UPRR field engineer.

3.15 TURNOUTS

- A. TURNOUTS - Shall be constructed in strict conformity with the Engineering Track Standard plans. The switch stands shall be fastened securely to headblocks and shall be square with the track. The targets shall be lined parallel with the rails of the major track when the switch is lined for the major track. All switch ties shall be fully tie plated. All frogs, with the exception of self-guarded frogs, shall be protected by guardrails installed in accordance with the standard plans before any train is allowed to pass over them. Turnouts shall also include switchman walkways.
- B. PANEL TURNOUTS - Shall be constructed in strict conformity with the standard plans and these specifications. Care shall be taken in unloading or moving the panel sections so as not to skew or bend the sections or cause damage to the prepared subgrade. The Contractor shall adjust anchors, ties, spikes, switch plates, braces, etc., as necessary to conform to the standard plan.

3.16 DERAILS & BUMPERS

- A. Where required, derails and bumpers shall be installed in conformity with standard plans and/or instructions, and shall be inspected and approved by the Engineer before final acceptance and operation over the track.
- B. It is the Contractor's responsibility to install temporary derails as necessary to protect the main track or any track in that may be in operation.

3.17 BALLASTING AND SURFACING

- A. SURFACING - The track shall be laid and connected before ballast is spread and track raised. Immediately prior to unloading ballast for the final raise of not more than four (4) inches, the track shall be lined as close as practical to the stakes and all ties straightened and re-spaced as necessary. Ballast shall then be spread evenly and leveled to the required section, taking care to assure that subgrade material is not intermixed with the ballast. Ballast shall be spread and the track raised in a series of lifts to the approved elevation. No single lift shall be higher than 4 inches. In raising track, the operation shall be so regulated as to avoid the bending of angle bars or straining of joints. Care shall be taken to avoid sharp breaks or bends in the rail when

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- the track is raised. Both rails shall be raised simultaneously and to proper cross-level. Ballast shall be tamped with an approved tamping machine (Jackson 6700 or equivalent) and/or tamping tools in good condition with less than twenty (20) percent surface area missing. The number of insertions by the tamper on each lift should be monitored to ensure adequate and even ballast compaction, yet prevention of center bound track must also be considered.
- B. If track is raised above the designed and staked grade, the cost to lower the track shall be born by the Contractor.
 - C. Turnouts shall be tamped using a switch/production tamper designed to tamp turnouts. Tamping may also be done, in areas where a production tamper cannot be utilized, with tamping bars, "jitter bugs" or by machines approved by the Engineer in a manner that will produce uniform compaction. Locations in turnouts, which cannot be mechanically tamped (example, heel blocks or frogs), shall be thoroughly hand tamped under the rail seat areas. Switchman walkways shall be constructed as required using walkway or Class 2 ballast.
 - D. Tamping must not disturb subgrade/sub-ballast. Dressing of the ballast by placing earth higher than the toe of ballast, thus preventing proper drainage, will not be permitted.
 - E. Thorough tamping under the rail seat is required, and joint ties shall be tamped especially firm. Tamping will not be permitted at the middle of a tie where ballast is to be left to settle on its own accord. Both ends of a tie, inside and outside of the rail, shall be tamped simultaneously. All ties that are pulled loose or skewed in the track raising operation shall be placed in their proper position and properly tie-plated, plugged and fully spiked before tamping, insuring all set areas are clean and free of dirt and ballast. Any anchors, bolts, braces or switch material which has been damaged, loosened or does not comply with these specifications shall be adjusted accordingly. The track shall be true to line, grade and cross level as designed and staked.
 - F. During each track raise, the track is to be tamped in such a manner that it will be uniform. During the raising and tamping operations, approved track level boards or other approved measuring devices shall be constantly used to ensure the correct surface and cross level in the track after tamping work is completed. After ballasting is completed and the track is in correct gauge, surfaced and lined according to the stakes, the ballast shall be neatly trimmed or regulated to the section shown on the drawings, and any surplus material shall be spread evenly along the slopes of the ballast section.
 - G. Unless specified otherwise, construct yard tracks with 8" ballast under the ties, and main tracks and siding tracks with 12 inches of ballast under the ties. Some areas may vary slightly. In all cases it is necessary that the top of rail elevations be followed as indicated.

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PART 4- MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Track Work shall be measured in place, per track foot as measured in feet along the centerline of track excluding the turnouts and switch point details.

4.2 PAYMENT

A. Track Construction-Track Work

This work shall be paid for at the Contract unit price per track foot and shall constitute full payment for material, labor, equipment, tools and incidentals necessary to install track complete. The price shall include all costs for unloading and handling materials, installation of rail, welds, ties, ballast including walking ballast, distressing, surfacing track to the line and grade indicated on the drawings and all incidental work in accordance with the Contract Drawings and Specifications.

B. Field Welds

Field Welds will not be measured separately, but shall be considered incidental to Track Work. The price shall include all costs for unloading and handling materials, installing field welds and all incidental work in accordance with the Contract Drawings and Specifications. The quantity of field welds will be agreed upon between the Engineer and the Contractor prior to performing any field welding in accordance with these specifications.

C. Track Material for use by UPRR

This item will be paid at the contract unit price per foot for material for use by UPRR. Material includes subballast, ballast, rail, ties, turnout, earthen bumper, D rail, transition rail and all other track material for track to be constructed by UPRR including track shifts as shown in the UPRR contract drawings. The price shall include all costs to furnish, deliver, unload handling, and stock piling.

D. Equipment for use by the UPRR

Adjust the unit price per track foot to include the cost of mobilization, labor, equipment rental, fuel, maintenance, insurance and all other costs associated with providing the equipment listed in Section 2.4 for use by the UPRR.

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SECTION 05120

FURNISHING AND ERECTING STRUCTURAL STEEL

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies requirements for furnishing and erecting structural steel for the permanent UPRR railroad bridge and shoofly bridge. The work under this section shall include furnishing all labor, materials, tools, equipment and incidentals required to furnish and erect structural steel for the bridge including, but not limited to, purchase, preparation and fabrication of structural steel components; all welding, drilling, bolting and other means of connection; carbon structural steel and high-strength low alloy steel components; bearing plates, polyurethane bearing pads, bearing anchor bolts; non-destructive testing and any repairs and corrections determined by the Engineer to be necessary; all erection, field modifications as required, field connections, temporary erection bents, erection derricks, shoring and cribbing; all shop and field cleaning including sandblasting, all shipping and handling including special permits if required; and all other appurtenant items required for this work.
- 1.02 Standards: All materials, fabrication, inspection, testing and erection procedures shall conform to the applicable provisions of the following codes except as modified herein.
- A. Standard Specifications, Sections 505 and 506, including the current Supplemental Specifications for these sections.
 - B. American Railway Engineering and Maintenance-of-Way Association (AREMA) "Manual for Railway Engineering", Chapter 15, "Steel Structures", current issue, Parts 1, 3 and 4 with particular emphasis on Section 15.1.14, FRACTURE CRITICAL MEMBERS.
- 1.03 Submittals: Submittals shall include the following:
- A. Mill Affidavits and Certifications: The Contractor shall supply to the Engineer mill chemical and physical test reports, and Charpy test results, when required, for all structural steel and Welder certificates for all welders involved with fabrication or erection.
 - B. Shop Drawings: Prior to fabrication of structural steel, the Contractor shall submit Shop Drawings for structural steel fabrication and erection prepared by a qualified steel detailer. The Shop Drawings shall indicate all connections, lengths, locations of field and shop splices, attachments, erection and fabrication plans, and types of steel used. The Contractor shall review all Shop Drawings and verify all dimensions and procedures. The Contractor shall submit Shop Drawings to the Engineer for his review. Fabrication shall not commence until approval is received from the Engineer. The Contractor shall direct the Shop Drawing preparer to make all corrections and modifications, as directed by the Engineer, and resubmit the Drawings to the Engineer. The Engineer's approval of the Shop Drawings in

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- no way shall relieve the Contractor of responsibility for erectability, fabrication and fit in the field.
- C. Bolt, Nut and Washer Affidavits and Certifications: The Contractor shall supply to the Engineer the bolt manufacturer's chemical and physical mill test reports by heat, including nut-proof load and washer hardness.
- D. Non-destructive Testing: The Contractor shall submit to the Engineer all radiographic, ultrasonic, magnetic particle and other test records and test reports. This requirement shall in no way relieve the Contractor of the responsibility for determining the suitability or adequacy of the materials and procedures.
- 1.04 Qualifications: The structural steel fabricator fabricating the steel, shall be certified under the American Institute of Steel Construction Quality Certification Program, Category III- Major Steel Bridges Including Rolled Beam Bridges, in accordance with Article 3.1.1 (a) and 3.1.1 (c) Part 3, Chapter 15 of the AREMA Specifications. Evidence of certification shall be submitted to the Engineer for his approval before beginning work:
- 1.06 Inspection: All materials and workmanship shall be subject to inspection by the Engineer in accordance with Article 505.05 "Inspection", of the Standard Specifications.
- 1.07 Non-Destructive Testing of Welding: Radiographic, ultrasonic and magnetic particle inspections shall be performed on all welded steel construction in accordance with Article 505.04 (q) of the Standard Specifications except as modified herein.
- A. The radiographic, ultrasonic and magnetic particle inspections shall be performed by the Contractor or his representative. Such inspections shall be at the Contractor's expense. In addition, the Engineer may use any method of non-destructive testing for examination of weld passes or completed welds.
- B. The Contractor shall give the Engineer sufficient advance notice of the date on which the material will be radiographic, ultrasonic or magnetic particle inspected so that he may be present during the inspection.
- C. An interpretation of all radiographic films shall be furnished to the Engineer by the Contractor. The interpretation report shall be submitted on a form approved by the Engineer. In the event the Contractor questions the Engineer's interpretation of the radiographic films, a joint review of the film will be made; however, the Engineer's final interpretation shall govern.
- 1.08 The bridge steel support structure will be grounded. Plans of the grounding system shall be prepared by a Qualified Grounding Company and submitted to ENGINEER for approval. The Grounding Company shall also furnish evidence that they have been engaged in the successful installation of grounding systems for at least 10 years and obtain ENGINEER's approval. The design and details shall be signed, and sealed by a licensed Professional Electrical Engineer in the State of Illinois.

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PART 2: PRODUCTS

- 2.01 Steel:
- A. All structural steel shall be carbon structural steel conforming to the requirements of Structural Steel, ASTM A709, Grade 50, unless otherwise specified herein or on the Plans.
 - B. The deck plates, cover plates, backwall plate and the curb flashing plates shall conform to the requirements of ASTM A709, Grade 50. The flashing plates, cover plates and backwall plates shall be hot-dipped galvanized in accordance with the requirements of ASTM A123.
 - C. The longitudinal steel beams of the bridge shall conform to the Supplemental Requirements for Non-Fracture Critical Impact Test Requirements for Zone 2. These components are noted on the Plans as Notch Toughness Requirements (N.T.R.).
 - D. All other steel required for diaphragms, deck support brackets, sole plates, cover plates and other minor parts which are nominally stressed, will be exempt from the above notch toughness requirements.
 - E. Rimmed or capped steel will not be permitted.
 - F. Ballast curbs, diaphragms, diaphragm connectors, deck support brackets, and sole plates shall be corrosion-resistant steel conforming to ASTM A588.
 - G. Drain pipe to be ASTM A53, Grade B.
- 2.02 Bearing Anchor Bolts: Bearing anchor bolts shall be as shown on the Plans. The anchor rods shall be ASTM F1554, GRADE 36, with 2-heavy hex nuts and wrought washer. The nuts shall meet the requirements of ASTM A563A Heavy Hex. Washers shall be galvanized after fabrication in accordance with ASTM A123. Anchor bolts and nuts shall be hot-dip galvanized in accordance with ASTM F2329.
- 2.03 Bearings: See the Railroad Bridge Bearings Special Provisions.
- 2.04 High-Strength Bolts: All bolts in structural connections shall be heavy hex high strength structural bolts conforming to ASTM A325, galvanized. Bolt heads to be on exterior surfaces of the structure.
- 2.05 Nuts: All nuts shall be heavy hex nuts conforming to ASTM A563-DH3.
- 2.06 Washers: Washers shall be hardened washers conforming to ASTM F436-3.
- 2.07 Joint Sealant: Joint sealant to fill the gaps between the field welded deck plates shall be a multi-component, single base, non-sag polyurethane sealant, and shall be subject to the approval of the Engineer.

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PART- 3:EXECUTION

- 3.01 Fabrication: Structural steel shall be fabricated in accordance with Section 505 "Steel Structures", of the Standard Specifications, and also in accordance with Parts 1 and 3, Chapter 15 of the AREMA Manual. Where differences occur in the provisions of the Standard Specifications and the AREMA Manual, the more stringent requirements shall be followed as determined by the Engineer.
- 3.02 Holes: Holes for shop and field connections for the bridge shall be subpunched or subdrilled and reamed to size with parts assembled as required by the AREMA Specifications.
- 3.03 Shop Assembly: The steel shall be shop assembled in the shop and checked for fit and accuracy and all parts matchmarked.
- A. Top flanges of the beams shall be in a true plane to provide uniform support for the deck plates. The flanges of girders at bearings shall be perpendicular to the web.
- 3.04 Connections: All shop and field connections for the bridge shall be bolted with high-strength bolts, except as otherwise shown or noted on the Plans. High-strength bolts shall be installed in accordance with the procedure for the installation of high-strength bolts, using turn-of-nut method. All high-strength bolts shall have a hardened washer under the element (nut or bolt head) turned in tightening.
- 3.05 Welded Construction: All welding on the bridge shall be in accordance with the requirements of Chapter 15 of the current edition of AREMA Specifications and the applicable provisions of Article 505.04 (q) of the Standard Specifications except as specified herein or on the Plans. In case of conflict between the AREMA Specifications and the Standard Specifications, the AREMA Specifications shall take precedence and shall govern. Electroslag and electrogas welding will not be permitted.
- A. All welding inspection shall be at the Contractor's expense. Inspection procedures and inspection personnel qualifications for non-destructive testing of welded members shall be in accordance with the applicable requirements of Chapter 15 of the AREMA Specifications except as modified herein. The welded work shall be inspected within the following minimum limits:
1. All welds shall be visually inspected by the fabricator.
 2. All fillet welds shall be inspected by magnetic particle - 10%.
 3. The inspection service shall report the amount of inspection performed in lineal feet, location and length of defects, if any, and furnish a certification that these tests were performed in accordance with these specifications.
 4. Welds requiring repairs shall be retested after repairs are made.
- B. ENGINEER shall be furnished copies of all welding inspection reports including a certificate stating that these inspections have been made and that

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all welds meet the quality requirements of the Standard Specifications, or AREMA Manual of Railway Engineering, Chapter 15, Part 1, Section 14 - Fracture Critical Members.

C. Welding Requirements:

1. All field welding shall be with the SMAW or FCAW process. Welding electrodes must be E7018 for SMAW or E70T-1,5 for FCAW.
2. All other welding shall be with the SAW or SMAW.
3. All welding shall be per AWS 01.5, Bridge Welding Code.
4. All welders must possess valid certification.

3.06 Assembly and Erection: Structural steel shall be assembled and erected in accordance with Section 505 "Steel Structures", of the Standard Specifications, and also in accordance with Part 4 "Erection", Chapter 15 of the AREMA Manual. Where differences occur in the provisions of the Standard Specifications and the AREMA Manual, the more stringent requirement shall be followed, as determined by the Engineer.

- A. Field welds other than those shown on the Plans or specified herein are prohibited.
- B. The 3/4" deck plates splice shall be field welded as shown on the Plans and specified herein under Section 3.05 (C).
- C. Bolt heads shall face outward on exterior girder webs.
- D. The Contractor shall prepare the bridge seats, place the bearing units and perform other necessary work before erection to avoid unnecessary delay in erecting the structural steel in place.
- E. The Contractor shall be required to submit to the Engineer an erection plan sufficiently in advance of erection to allow the Engineer time to approve the proposed method. The erection plan shall include the type and size of crane to be used for erection, total weight of the crane, location of the crane and its outriggers in relation to the existing beams, boom heights and maximum "reach-length" of the boom. Also included shall be the safety requirements and restrictions for operating machinery and equipment under any electrical transmission line. The Contractor shall not proceed with the steel erection until the erection plan has been approved by the Engineer.

3.07 Shop and Field Cleaning: Metal structures shall be cleaned in the shop and field in accordance with Section 506 "Cleaning and Painting Metal Structures", of the Standard Specification or as specified by the Engineer.

- A. All faying surfaces, regardless of location, shall be cleaned to a minimum of SSPC-SP6, Commercial Blast Cleaning.

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- B. All steel surfaces shall be cleaned to a minimum of SSPC-SP1, solvent cleaning except as specified herein.
 - C. All steel surfaces visible from sides (beams, curbs and brackets) shall be cleaned to a minimum of SSPC-SP6, Commercial Blast Cleaning.
- 3.08 Unauthorized Fittings: The use of field welding, except as permitted on the Plans, or the temporary attachment of hooks, pintles, lifting or fitting devices, or field burning of holes are prohibited.
- 3.09 Grounding: After the bridge has been erected, the steel superstructure shall be grounded in accordance with the approved grounding system specified herein under Section 1.09.
- 3.10 Bearing pads shall be shipped flat.

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: All structural steel shown on the Plans for the permanent UPRR Bridge will be included for payment.
- 4.02 Payment: Structural steel and other material complying with the requirements of this item, furnished and erected complete in place, in accordance with the specifications and accepted, will be paid for at Lump Sum Price for FURNISHING AND ERECTING STRUCTURAL STEEL, which price shall be payment in full for all materials and fabrication, shop work, transportation and erection. No payment shall be made until the material is erected complete in place.

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SECTION 05571

STRUCTURE MARKER SIGNS

PART 1: GENERAL

- 1.01 Description of Work: This Section specifies the requirements for furnishing and installing structure marker signs. The work under this Section includes all labor, materials, tools, equipment, connectors and incidentals necessary to furnish and install the structure marker signs at each bridge as specified herein, and as required for a complete and proper installation.
- 1.02 Standards: All materials, fabrication and installation procedures must conform to the applicable portions of Section 515 in the Standard Specifications except as modified herein. The details of the structure marker sign must be in accordance with UPRR Standard Drawing 0507, included with these specifications. The Contractor must coordinate with and obtain from the UPRR the bridge designation number to be shown on the structure marker sign for each of the bridges.
- 1.03 Related Work:
- A. FURNISHING AND ERECTING STRUCTURAL STEEL Section 05120
- 1.04 Submittals:
- A. The Contractor must submit Shop Drawings for the fabrication of the structure marker signs including details covering all materials, layout, sizes, shapes and finishes.
- B. The Contractor must submit Shop Drawings for the installation of the structure marker signs including details covering connection methods, fasteners and locations.
- C. The Contractor must submit samples of structure marker signs material with appropriate finish.
- 3.01 Installation:
- A. The structure marker signs must be installed in the proper location as shown on Standard Drawing 0507 or as directed by the Engineer.
- B. The structure marker signs must be installed straight and true.
- C. The structure marker signs must be rigidly secured to the end plate of the through plate girder according to the details shown on the Standard Drawing 0507 or as directed by the Engineer.

PART 4: MEASUREMENT AND PAYMENT

- 4.01 Measurement: This work will be measured per each.

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4.02 Payment: This work shall be paid for at the Contract Unit Price per each for
STRUCTURE MARKER SIGNS.

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LETTER SIGN
 Dimensions: 6" wide, 8" high. Top and bottom corners have a 1/2" radius. Two 3/8" square holes are spaced 1" from the top and bottom edges. Material: SILVER.

6" NUMERAL SIGN
 Dimensions: 6" wide, 8" high. Top and bottom corners have a 1/2" radius. Two 3/8" square holes are spaced 1" from the top and bottom edges. Material: SILVER.

3" NUMERAL SIGN
 Dimensions: 3" wide, 6" high. Top and bottom corners have a 1/4" radius. Two 3/8" square holes are spaced 1/2" from the top and bottom edges. Material: SILVER.

LETTER SIGN

LETTER	ITEM NO.	LETTER	ITEM NO.
A	393-8250	N	393-8276
B	393-8252	O	393-8270
C	393-8254	P	393-8280
D	393-8256	Q	393-8282
E	393-8258	R	393-8284
F	393-8260	S	393-8286
G	393-8262	T	393-8288
H	393-8264	U	393-8290
I	393-8266	V	393-8292
J	393-8268	W	393-8294
K	393-8270	X	393-8296
L	393-8272	Y	393-8298
M	393-8274	Z	393-8300

6" NUMBERS

NUMERAL	ITEM NO.
1	393-8201
2	393-8202
3	393-8203
4	393-8204
5	393-8205
6 OR 9	393-8206
7	393-8207
8	393-8208
0	393-8210

3" NUMBERS

NUMERAL	ITEM NO.
1	393-8220
2	393-8211
3	393-8212
4	393-8213
5	393-8214
6	393-8215
7	393-8216
8	393-8217
9	393-8219
0	393-8218

NOTES:
 SIGNS TO BE 3870 SILVER 3M SILVER HIGH INTENSITY BACKGROUND ON 0.80" 3105 ALUMINUM SHEET.
 FOR MILE MARKER DETAIL, SEE STD DWG 0535
 FOR VARIOUS MARKER DETAILS, SEE STD DWG 0507
 FOR TUNNEL SIGN DETAIL, SEE STD DWG 0553
 FOR HIGHWAY CROSSING DETAIL, SEE STD DWG 0529
 FOR LETTER DETAIL, SEE STD DWG 0501
 FOR NUMERAL DETAIL, SEE STD DWG 0501

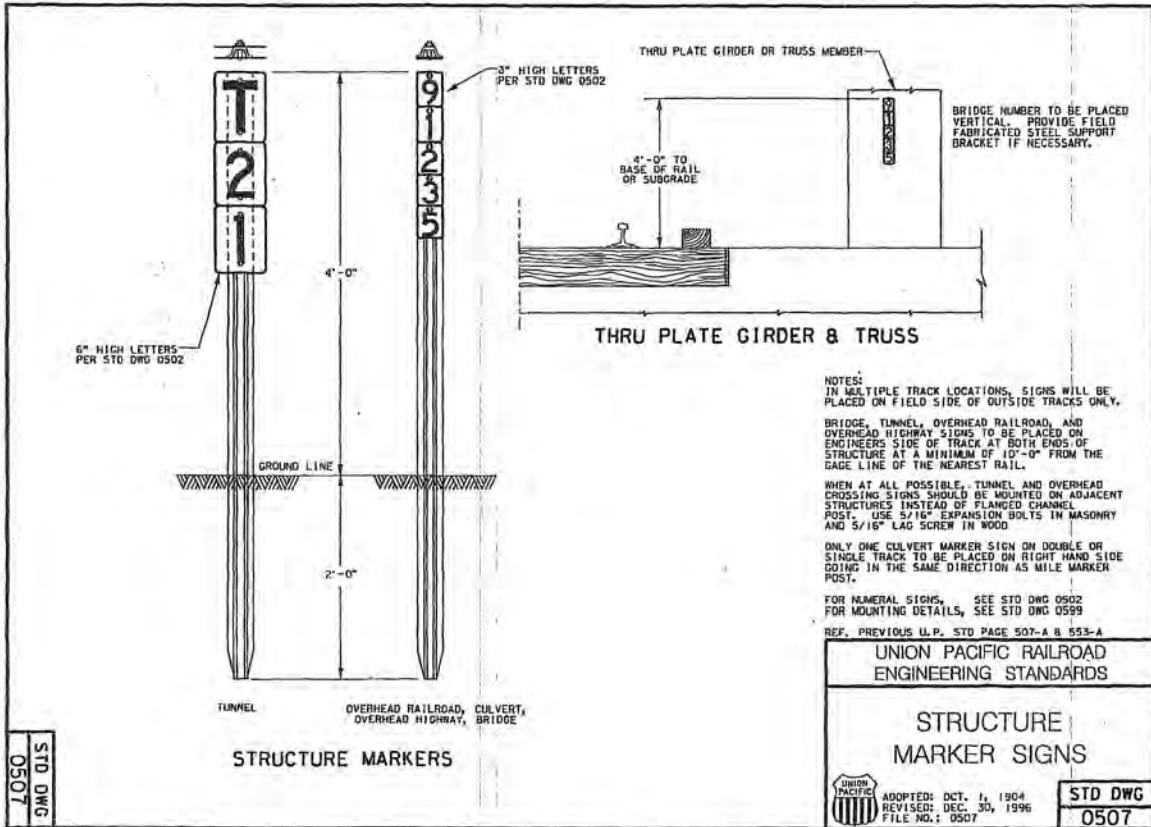
**UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS**

**SINGLE LETTER AND
 NUMERAL SIGN**

ADOPTED: JAN. 24, 1997
 REVISED: MARCH 1, 1998
 FILE NO.: 0502

**STD DWG
 0502A**

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DIVISION 7 – THERMAL AND MOISTURE PROTECTION

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CONTRACT NO. 60K8097

SECTION 07102
Integrated Ballast Protection Mat for Rail Bridge Decks

PART 1- GENERAL

1.01 Summary

- A. Furnish labor, products, and equipment required for the application of a seamless spray-applied Integrated Ballast Mat system to suitable concrete, masonry, or metal surfaces. B. The Integrated Ballast Mat system shall be spray-applied, 100% solids, fast cure, high build polymer system combined with proprietary SBR rubber blend, and shall chemically bond to the base waterproofing membrane.
- C. The base membrane system shall pass the ASTM C 1305 Crack Bridging Test. The thickness to be tested shall be either 80 mils minimum, or the minimum thickness required to pass the crack bridging test. The thickness required to pass the test shall be the minimum thickness required for all field application of the base membrane.
- D. The base membrane system shall be tested for long-term performance of waterproofing systems under heavy axle loads (HAL) at the Facility for Accelerated Service Testing (FAST) in Pueblo, Colorado.
- E. The base membrane and Integrated Ballast Mat systems shall pass the North American Ballast Impact Test without any penetrations through the membrane after 2,000,000 cycles.
- F. The base membrane and Integrated Ballast Mat systems shall meet AREMA C-29.9.10 cold applied waterproofing membrane.
- G. Primer shall be applied to concrete surfaces at a rate of 130-200 ft² per gallon. Primer shall be applied to steel surfaces at 600-800 ft² per gallon.
- H. Base Bridge Deck Membrane (BDM) shall be spray applied at minimum thickness of 80 mils, or the minimum thickness required to pass the ASTM C 1305 Crack Bridging Test. Immediately following the installation of the BDM base membrane, a slower setting Bridge Deck Top Coat shall be applied at 40 mils per lift, and SBR rubber aggregate shall be broadcast into the Top Coat material. Two (2) 40 mil lifts with broadcast rubber shall be applied, followed by a third and final 40 mil coat to seal rubber aggregate particles.
- I. Broadcast Rubber Aggregate applied at 0.25-0.35 lbs. per ft² to achieve a minimum 100% coverage rate. Remove excess loose rubber aggregate after initial set and repeat process.

1.02 Definitions

- A. Concrete Surface Preparation-SSPC SP13/NACE No.6
- B. Metal Surface Preparation-SSPC-SP10 Near White Blast

1.03 Submittals

- A. Manufacturer shall provide independent laboratory test results from an AASHTO-accredited laboratory illustrating each component's conformance to the physical property requirements listed in corresponding product data sheets.
- B. The manufacturer's material safety data sheet (MSDS) for each of the components.
- C. The manufacturer's current product data sheets. Provide all primers and membranes from the same manufacturer.
- D. The manufacturer's current installation and testing procedure document. This document shall conform in its entirety with all the requirements specified herein.
- E. Two sample coupons (4"x4") that are representative of the finished membrane surface.

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texture, and color. Approved samples will serve as a basis for acceptance of the work for the duration of the product.

- F. List of projects similar in nature and complexity completed in the last 10 years.

1.04 Project Conditions

A Environmental Requirements

1. Install system when air and surface temperatures are above -20°F and substrate temperature is 5°F above the dew point and rising.

B. Personal Requirements

1. Provide protective clothing, gloves, and respirators for use by installers as required.

1.05 Quality Assurance

A Manufacturer Qualifications: Use ISO 9001 certified manufacturer with a minimum of five (5) years experience providing the principal materials for work in this section. The manufacturer should be a primary blender with proprietary formulations, an Authorized Applicator program, and capacity to provide field technical services as required. Provide all primers and membranes from the same manufacturer.

B. Manufacturer's On-Site Representative: Manufacturer shall provide an authorized representative to be on the job site at all times to observe the installation of each portion of the membrane system. The manufacturer's representative, upon consultation with the Engineer, may suspend any item of work that is suspect and does not meet the requirements of this specification. Resumption of work will occur only after the manufacturer's representative and the Engineer are satisfied that appropriate remedial action has been taken by the contractor.

A Contractor Qualifications: Contractor applying the waterproofing system shall be authorized to apply the system by the manufacturer. This authorization shall apply to the individuals installing the materials. Manufacturer authorized applicators shall be re-certified yearly. The contractor shall be an established firm regularly engaged in satisfactory installations of similar materials on projects similar in nature and complexity. Provide a list of specific projects contractor has previously completed with Class 1, commuter, and light rail references.

C. Schedule pre-installation conference to review installation schedule, shut down, and restricted access procedures. Indicate Owner's representative and Contractor's superintendent.

D. Inspect surface preparation, application procedures, and review proposed dry film thickness at each installation location.

1.06 Delivery, Storage, and Handling

A Deliver product in manufacturer's original containers. B.

Store product in warm dry conditions.

C, Replace product damaged by shipment, weather, or job conditions.

1.07 Related Sections

A Section : Cold Spray-Applied Elastomer Waterproofing Membrane, Concrete Rail Bridge Decks

B. Section : Cold Spray-Applied Elastomer Waterproofing Membrane, Steel Rail Bridge Decks

C. Section : Preformed Elastomeric Expansion Joint- Rail Bridge Decks

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PART 2 - PRODUCTS

2.01 Manufacturer: Bridge Preservation, LLC,
 686 South Adams Street
 Kansas City, KS 66105
 913-321-9000

2.02 Materials

A Primer: Bridge Deck Primer-Two-component polymer primer with the material properties shown in Table 1.

Table 1: Multi-Component Polymer Primer

Physical Property	Test Method	Value
Gel Time		>5 minutes
Tack Free Time, max @ 77°F		<4 hours
Mixing Ratio		Per Manufacturer
Adhesion to Concrete	ASTM D 4541	>150 psi

B. Spray-Applied Base Membrane: Bridge Deck Membrane-100% solids, rapid curing elastomer with the material properties shown in Table 2.

Table 2: Spray Applied Base Waterproofing Membrane

Physical Property	Test Method	Value
Solids Content		100% Gel Time
<10 seconds Cure Time		<30 seconds
Tack Free Time		<30 minutes Shore Hardness
ASTM D 2240	>40D Water Vapor Transmission	ASTM E 96
0.94 perms Adhesion to Concrete	ASTM D 4541	>150 psi
Tensile Strength	ASTM D 638	>2,000 psi Tear Strength
(pli: Die C)	ASTM D 638	>350 pli
Elongation at Break	ASTM D 638	>150%
Crack Bridging Ability (80 mils Neat $\frac{1}{8}$ " opening@ -15°F, 40 cycles)	ASTM C 1305	Pass @ 40 cycles
North American Ballast Impact Test		Pass@ 2,000,000 cycles

C. Spray-Applied Ballast Protection Mat: Integrated Ballast Mat-100% solids, rapid curing elastomer with the material properties shown in Table 3.

Table 3: Spray Applied Integrated Ballast Mat

Physical Property	Test Method	Value
Solids Content		100%
Gel Time		>30 seconds
Tack Free Time		>5 minutes
Open to Traffic		1 hour

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Shore Hardness	ASTM D 2240	>40D Tensile
Strength	ASTM D 638	>2,000 psi Tear Strength (pli); Die
C)	ASTM D 638	>350 pli Elongation at Break
ASTM D 638	>150%	
North American Ballast Impact Test Loading 9.2-281 Kips, 2,000,000 cycles		Pass@ 2,000,000 cycles
Ballast Penetration Test Modified AREMA Chapter 8, Part 29.10.3.3(o)	ASTM D 1833	Pass

PART 3-EXECUTION

3.01 Inspection

- A Prior to application of primer, inspect and approve substrate preparation.

3.02 Preparation

- A Provide clean, sound concrete substrate. B. Provide clean, sound metal substrate.
- C. Repair spalls and other defects in concrete substrate with Five Star Structural Concrete or approved alternative.
- D. Prepare concrete surfaces to SSPC-SP13/NACE No. 6 Surface Preparation of Concrete and achieve a Concrete Surface Profile (CSP) of 3-5.
- E. Prepare metal surfaces to SSPC-SP10 Near White Blast and achieve a 3-5 mil blast profile.
- F. Test prepared concrete surfaces using Elcometer adhesion testing in accordance with ASTM D 4541. Minimum pull strength is 300 psi.
- G. Mask protected surfaces prior to spray applications. H. Erect spray curtains and partitions as required.

3.03 Installation

- A Do not begin membrane installation until all materials and equipment necessary to perform the installation and all required repairs are at the job site.
- B. Contractor shall maintain spray and other installation equipment in proper operating condition throughout installation. Provide reserve equipment as required.
- C. Manufacturer's on-site representative shall perform and record relevant field quality control readings throughout the installation process. See section 3.04 Field Quality Control for complete requirements.
- D. Concrete Surfaces: spray, squeegee, or roll primer at 130-200 ft² per gallon over surfaces to receive spray applied waterproofing membrane. Allow primer to go tack free before spraying base waterproofing membrane.
- E. Metal Surfaces: spray, squeegee, or roll primer at 600-800 ft² per gallon over surfaces to receive spray applied waterproofing membrane. Allow primer to go tack free before spraying base waterproofing membrane.
- F. Spray base waterproofing membrane over primed surfaces at a minimum thickness of 80 mils (20 fl2 per gallon) or the minimum thickness required to pass the ASTM C 1305 Crack Bridging Test (see Section 1.01, Part C of this document). Spray additional base coats as required to achieve the specified thickness.
- G. Spray Bridge Deck Top Coat at 40 mils nominal thickness.
- H. Immediately apply rubber aggregate to refusal at 0.25 to 0.35 lbs. per ff2 to achieve 100%

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- I. coverage rate. Remove excess aggregate after initial set and repeat process a second time.
- I. Apply a final seal coat of Bridge Deck Top Coat at 40 mils nominal thickness.
- J. Ballast may be placed directly on membrane one (1) hour after the installation has been completed.

3.04 Field Quality Control

- A. All work in this section to be completed by waterproofing manufacturer's on-site representative. Representative shall record all readings and test results into a "Quality Control Daily Log". A copy of each daily log shall be submitted to the Engineer at the end of each day.
- B. Record environmental conditions readings at least once every four hours, when ambient conditions significantly change, or immediately prior to contractor performing new task (prior to installing primer, prior to installing base membrane, etc.), whichever is more frequent.
- C. Record material batch numbers, processing information, and quantity of each material used.
- D. Perform tensile adhesion bond testing of both primer and base membrane in accordance with ASTM D 4541. On metal surfaces, the minimum adhesion value is 300 psi.
- E. Perform dry film thickness testing of base membrane in accordance with SSPC-PA2 or SSPC-PA9 Measurement of Dry Coating Thickness. Destructive or stroke per gallon methods are also suitable methods of thickness assurance on most projects.
 - 1. If on-site representative uses magnetic test equipment, testing shall be performed in accordance with SSPC-PA2 Measurement of Dry Coating Thickness with Magnetic Gages.
 - 2. If on-site representative uses ultrasonic test equipment, testing shall be performed in accordance with SSPC-PA9 Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages.
 - 3. Ultrasonic testing is usually accurate to +/- 5%.
 - 4. Spray equipment is calibrated and tested to a stroke count per gallon of material sprayed.
 - 5. Repair destructive areas by respraying or filling with special two component gun grade material provided by the waterproofing manufacturer.
 - 6. Other components of system may be tested for thickness using wet film or stroke per gallon methods.
- F. Perform visual inspections throughout installation process. Holidays or other defects in the waterproofing membrane shall be marked or repaired.

3.05 Cleaning

- A. Clean spills and oversprays as they occur.
- B. Consult manufacturer's literature and MSDS for proper cleaning products and methods. C. Clean site to Owner's satisfaction prior to final acceptance.

3.06 Protection

- A. Protect installed work prior to acceptance by Owner.

3.07 Schedules

- A. Submit spray schedule if required.

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PART 4: MEASUREMENT AND PAYMENT

4.01 Measurement: This work will be measured based on the dimensions shown in the plans and the quantity calculated in square feet.

4.02 Payment: Work in this section will be paid at the contract unit price per square foot for Membrane Waterproofing (Special).

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EXHIBIT D – MINIMUM CONSTRUCTION REQUIREMENTS

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Minimum Construction Requirement ExD
Standard Form, Approved AVP-Law 05/01/2006



EXHIBIT D

TO PUBLIC ROAD CROSSING OVERPASS/UNDERPASS AGREEMENT

MINIMUM CONSTRUCTION REQUIREMENTS

1.01 DESCRIPTION

This project includes construction work within the right-of-way and/or properties of the Union Pacific Railroad Company ("UPRR") and adjacent to its tracks, wire lines and other facilities. This section describes the minimum special requirements for coordination with UPRR when work by the Contractor will be performed upon, over or under the UPRR right-of-way or may impact current or future UPRR operations. The Contractor will coordinate with UPRR while performing the work outlined in this Contract, and shall afford the same cooperation with UPRR as it does with the Agency.

For purposes of this project, the UPRR Designated Representative shall be the person or persons designated by the UPRR Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 DEFINITION OF AGENCY AND CONTRACTOR

As used in these UPRR requirements, the term "Agency" shall mean the Political Body.

As used in these UPRR requirements, the term "Contractor" shall mean the contractor or contractor's hired by the Agency to perform any project work on any portion of UPRR's property and shall also include the contractor's subcontractor's and the contractor's and subcontractor's respective officer, agents and employees, and others acting under its or their authority.

1.03 UPRR CONTACTS

The primary UPRR point of contact for this project is:

Richard Ellison, Tel: 312-777-2048 office

For UPRR flagging services and track work, contact:

Daryl Clark, Tel: 708-649-5273 Office

1.04 REQUEST FOR INFORMATION / CLARIFICATION

All Requests for Information ("RFI") involving work within any UPRR right-of-way shall be in accordance with the procedures listed elsewhere in these bid documents. All RFI's shall be submitted to the Engineer of Record. The Engineer of Record will submit the RFI to the UPRR Designated Representative for review and approval for RFI's corresponding to work within the UPRR right-of-way. The Contractor shall allow four (4) weeks for the review and approval process by UPRR.

1.05 PLANS / SPECIFICATIONS

The plans and specifications for this project, affecting the UPRR, are subject to the written approval by the UPRR and changes in the plans may be required after award of the Contract. Such changes are subject to the approval of the Agency and the UPRR.

1.06 UTILITIES AND FIBER OPTICS

All installations shall be constructed in accordance with current AREMA recommendations and UPRR specifications and requirements. UPRR general guidelines and the required application forms for utility installations can be found on the UPRR website at uprr.com.

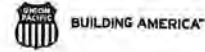
1.07 GENERAL

A. Contractor shall perform all its work in compliance with all applicable UPRR and FRA rules and regulations. Contractor shall arrange and conduct its work in such manner and at such times as shall not endanger or interfere with the safe operation of the tracks and property of UPRR and the traffic moving on such tracks, or the wires, signals and other property of UPRR, its tenants or licensees, at or in the vicinity of the Work.

Minimum Construction Requirement ExD
Standard Form, Approved AVP-Law 05/01/2006

Exhibit D
Minimum Construction Requirements
To Public Road Crossing Overpass Agreement

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Minimum Construction Requirement ExD
Standard Form, Approved AVP-Law 05/01/2006



B. Construction activities will be permitted within 12 feet of the operational tracks only if absolutely necessary and UPRR's Designated Representative grants approval. Construction activities within 12 feet of the operational track(s) must allow the tracks to stay operational.

C. Track protection is required for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail.

D. The Contractor is also advised that new railroad facilities within the project may be built by UPRR and that certain Contractor's activities cannot proceed until that work is completed. The Contractor shall be aware of the limits of responsibilities and allow sufficient time in the schedule for that work to be accomplished and shall coordinate its efforts with the UPRR.

1.08 RAILROAD OPERATIONS

A. The Contractor shall be advised that trains and/or equipment are expected on any track, at any time, in either direction. Contractor shall be familiar with the train schedules in this location and structure its bid assuming intermittent track windows in this period, as defined in Paragraph B below.

B. All railroad tracks within and adjacent to the Contract Site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. The Contractor shall coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Work windows for this Contract shall be coordinated with the Agency's and the UPRR's Designated Representatives. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. **Conditional Work Window:** A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and adjacent to the railroad tracks within 25 feet of the nearest track, a UPRR flag person will be required. At the direction of the UPRR flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the UPRR Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. **Absolute Work Window:** An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window the railroad tracks and/or signals must be completely operational for train operations and all UPRR, Public Utilities Commission (PUC) and Federal Railroad Administration (FRA) requirements, codes and regulations for operational tracks must be complied with. In the situation where the operating tracks and/or signals have been affected, the UPRR will perform inspections of the work prior to placing that track back into service. UPRR flag persons will be required for construction activities requiring an Absolute Work Window. **Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for UPRR review.**

1.09 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Prior to beginning any work on or over the property of, or affecting the facilities of, the UPRR, the Contractor shall enter into an agreement with the UPRR in the form of the "Contractor's Right of Entry Agreement", attached as **Exhibit E**, or latest version thereof provided by the UPRR. There is a fee for processing of the agreement. This cost shall be borne by the Contractor. Contractor shall submit a copy of the executed agreement and the insurance policies, binders, certificates and endorsements set forth therein to the Agency prior to commencing work on UPRR property. The right of entry agreement shall specify working time frames, flagging and inspection requirements, and any other items specified by the UPRR.

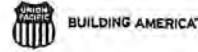
B. The Contractor shall give the advance notice to the UPRR as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over UPRR's right-of-way and shall observe UPRR's rules and regulations with respect thereto.

C. All work upon UPRR's right-of-way shall be done at such times and in such manner as not to interfere with or endanger the operations of UPRR. Whenever work may affect the operations or safety of trains, the method of doing such work shall first be submitted to UPRR's Designated Representative for approval, but such approval shall not relieve the Contractor from liability.

Minimum Construction Requirement ExD
Standard Form, Approved AVP-Law 05/01/2006

Exhibit D
Minimum Construction Requirements
To Public Road Crossing Overpass Agreement

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
Minimum Construction Requirement ExD
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Any work to be performed by the Contractor, which requires flagging service or inspection service, shall be deferred until the flagging protection required by UPRR is available at the job site. See Section 3.18 for railroad flagging requirements.

D. The Contractor shall make requests in writing for both Absolute and Conditional Work Windows, at least two weeks in advance of any work. The written request must include:

1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

The Contractor shall provide a written confirmation notice to the UPRR at least 48 hours before commencing work in connection with approved work windows when work will be performed within **25 feet of any track center line**. All work shall be performed in accordance with previously approved work plans.

E. Should a condition arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of UPRR, the Contractor shall make such provisions. If in the judgment of UPRR's Designated Representative such provisions are insufficient, the UPRR's Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the UPRR. UPRR or the Agency shall have the right to order Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the UPRR's Designated Representative, the Contractor's operations could endanger UPRR's operations. In the event such an order is given, Contractor shall immediately notify the Agency of the order.

1.10 INSURANCE

Contractor shall not begin work upon or over UPRR's right-of-way until UPRR has been furnished the insurance policies, binders, certificates and endorsements required by the "Contractor's Right-of-Entry Agreement" and UPRR's Designated Representative has advised the Agency that such insurance is in accordance with the Agreement. The required insurance shall be kept in full force and effect during the performance of work and thereafter until Contractor removes all tools, equipment, and material from UPRR's property and cleans the premises in a manner reasonably satisfactory to UPRR.

1.11 RAILROAD SAFETY ORIENTATION

All personnel employed by the Contractor and all subcontractors must complete the UPRR course "Orientation for Contractor's Safety"; and be registered prior to working on UPRR property. This orientation is available at www.contractororientation.com. This course is required to be completed annually.

1.12 COOPERATION

UPRR will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of UPRR's right-of-way in performing the work.

1.13 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

The Contractor shall abide by the Construction of Maintenance Agreement for Contract 63598 between Agency and UPRR.

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
 Minimum Construction Requirements LAKE COUNTY
 Standard Form, Approved AVP-Law 05/01/2006



1.14 APPROVAL OF REDUCED CLEARANCES

- A. The minimum track clearances to be maintained by the Contractor during construction are specified in Section 3.07 herein.
- B. Any proposed infringement on the specified minimum clearances due to the Contractor's operations shall be submitted to UPRR's Designated Representative through the Agency at least 30 days in advance of the work and shall not be undertaken until approved in writing by the UPRR's Designated Representative.
- C. No work shall commence until the Contractor receives in writing assurance from UPRR's Designated Representative that arrangements have been made for flagging service, as may be necessary and receives permission from UPRR's Designated Representative to proceed with the work.

1.15 CONSTRUCTION AND AS-BUILT SUBMITTALS

- A. Submittals are required for construction materials and procedures as outlined below. The submittals shall include all review comments from the Agency and the Engineer of Record. All design submittals shall be stamped and signed by a Professional Engineer registered in the State of Name of State.
- B. The tables below provide UPRR's minimum submittal requirements for the construction items noted. Submittal requirements are in addition to those specified elsewhere in these bid documents. The minimum review times indicated below represent UPRR's requirements only. The Contractor shall allow additional time for the Agency's review time as stated elsewhere in these bid documents.
- C. Submittals shall be made by the Agency to the UPRR Manager of Industry and Public Projects unless otherwise directed by the Railroad. Items in Table 1 shall be submitted for both railroad overpass and underpass projects, as applicable. Items in Table 2 shall be submitted for railroad underpass projects only.

TABLE 1

ITEM	DESCRIPTION	SETS REQD.	UPRR's Minimum Review Time
1	Shoring design and details	4	4 weeks
2	Falsework design and details	4	4 weeks
3	Drainage design provisions	4	4 weeks
4	Erection diagrams and sequence	4	4 weeks
5	Demolition diagram and sequence	4	4 weeks

Prior to or during construction of railroad underpass structures, the UPRR requires the review of drawings, reports, test data and material data sheets to determine compliance with the specifications. Product information for items noted in Table 2 be submitted to UPRR's Designated Representative through the Agency for their own review and approval of the material. The signed submittal and the Agency's review comments will be reviewed by UPRR or their consultant. If a consultant performs the reviews, the consultant may reply directly to the Agency or its Designated Representative after consultation with UPRR. Review of the submittals will not be conducted until after review by the Agency or its Designated Representative. Review of the submittal items will require a minimum of four (4) weeks after receipt from the Agency.

U.S. RTE 41 (FAP 346) AND IL 132 (FAU 1218)
 Minimum Construction Requirement ExD
 Standard Form, Approved AVP-Law 05/01/2006



TABLE 2

ITEM	DESCRIPTION	SETS REQD.	NOTES
1	Shop drawings	4	Steel and Concrete members
2	Bearings	4	For all structures
3	Concrete Mix Designs	4	For all structures
4	Rebar & Strand certifications	4	For superstructure only
5	28 day concrete strength	4	For superstructure only
6	Waterproofing material certifications and installation procedure	4	Waterproofing & protective boards
7	Structural steel certifications	4	All fracture critical members & other members requiring improved notch toughness
8	Fabrication and Test reports	4	All fracture critical members & other members requiring improved notch toughness
9	Welding Procedures and Welder Certification	4	AWS requirements
10	Foundation Construction Reports	4	Pile driving, drilled shaft construction, bearing pressure test reports for spread footings
11	Compaction testing reports for backfill at abutments	4	Must meet 95% maximum dry density, Modified Proctor ASTM D1557

D. As-Built Records shall be submitted to the UPRR within 60 days of completion of the structures. These records shall consist of the following items:

Overpass Projects

1. Electronic files of all structure design drawings with as-constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all structure design drawings with as-constructed modifications shown.

Underpass Projects

1. Electronic files of all structure design drawings with as-constructed modifications shown, in Microstation SE or Acrobat PDF format.
2. Hard copies of all structure design drawings with as-constructed modifications shown.
3. Final approved copies of shop drawings for concrete and steel members.
4. Foundation Construction Reports
5. Compaction testing reports for backfill at abutments

1.16 APPROVAL OF DETAILS

The details of the construction affecting the UPRR tracks and property not already included in the Contract Plans shall be submitted to UPRR's Designated Representative through the Agency for UPRR's review and written approval before such work is undertaken. Review and approval of these submittals will require a minimum of four (4) weeks in addition to the Agency's review time as stated elsewhere in these bid documents.

1.17 MAINTENANCE OF RAILROAD FACILITIES

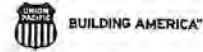
A. The Contractor shall be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from Contractor's operations; to promptly repair eroded areas within UPRR's right of way and to repair any other damage to the property of UPRR, or its tenants.

B. All such maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

Minimum Construction Requirement ExD
 Standard Form, Approved AVP-Law 05/01/2006

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C. The Contractor must submit a proposed method of erosion control and have the method reviewed by the UPRR prior to beginning any grading on the Project Site. Erosion control methods must comply with all applicable local, state and federal regulations.

1.18 SITE INSPECTIONS BY UPRR's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by UPRR's Designated Representative at significant points during construction, including the following if applicable:

1. Pre-construction meetings.
2. Pile driving/drilling of caissons or drilled shafts.
3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
4. Erection of precast concrete or steel bridge superstructure.
5. Placement of waterproofing (prior to placing ballast on bridge deck).
6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by UPRR.

C. A detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to be performed, shall be provided to the Agency for submittal to UPRR's Designated Representative for review prior to commencement of work. This schedule shall also include the anticipated dates when the above listed events will occur. This schedule shall be updated for the above listed events as necessary, but at least monthly so that site visits may be scheduled.

1.19 UPRR REPRESENTATIVES

A. UPRR representatives, conductors, flag person or watch person will be provided by UPRR at expense of the Agency or Contractor (as stated elsewhere in these bid documents) to protect UPRR facilities, property and movements of its trains or engines. In general, UPRR will furnish such personnel or other protective services as follows:

B. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

C. For any excavation below elevation of track subgrade if, in the opinion of UPRR's Designated Representative, track or other UPRR facilities may be subject to settlement or movement.

D. During any clearing, grubbing, excavation or grading in proximity to UPRR facilities, which, in the opinion of UPRR's Designated Representative, may endanger UPRR facilities or operations.

E. During any contractor's operations when, in the opinion of UPRR's Designated Representative, UPRR facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

F. The Contractor shall arrange with the UPRR Designated Representative to provide the adequate number of flag persons to accomplish the work.

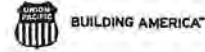
1.20 WALKWAYS REQUIRED

Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than twelve feet (12') from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while UPRR's flagman service is provided shall be removed before the close of each work day. Walkways with railings shall be constructed by Contractor over open excavation areas when in close proximity of track, and railings shall not be closer than 8' - 6" horizontally from center line of tangent track or 9' - 6" horizontal from curved track.

Minimum Construction Requirement ExD
Standard Form, Approved AVP-Law 05/01/2006

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Minimum Construction Requirements
To Public Road Crossing Overpass Agreement

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1.21 COMMUNICATIONS AND SIGNAL LINES

If required, UPRR will rearrange its communications and signal lines, its grade crossing warning devices, train signals, and tracks, and facilities that are in use and maintained by UPRR's forces in connection with its operation at expense of the Agency. This work by UPRR will be done by its own forces and it is not a part of the Work under this Contract.

1.22 TRAFFIC CONTROL

Contractor's operations that control traffic across or around UPRR facilities shall be coordinated with and approved by the UPRR's Designated Representative.

1.23 CONSTRUCTION EXCAVATIONS

A. The Contractor shall be required to take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of OSHA, AREMA and UPRR "Guidelines for Temporary Shoring".

B. The Contractor shall contact UPRR's "Call Before Your Dig" at least 48 hours prior to commencing work at 1-800-336-9193 during normal business hours (6:30 a.m. to 8:00 p.m. central time, Monday through Friday, except holidays - also a 24 hour, 7 day a week number for emergency calls) to determine location of fiber optics. If a telecommunications system is buried anywhere on or near UPRR property, the Contractor will co-ordinate with UPRR and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near UPRR property.

1.24 RAILROAD FLAGGING

Performance of any work by the Contractor in which person(s) or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach within twenty-five (25) feet of any track, may require railroad flagging services or other protective measures. Contractor shall give the advance notice to the UPRR as required in the "Contractor's Right of Entry Agreement" before commencing any such work, so that the UPRR may determine the need for flagging or other protective measures to ensure the safety of the railroad's operations. Contractor shall comply with all other requirements regarding flagging services covered by the "Contractor's Right of Entry Agreement". Any costs associated with failure to abide by these requirements will be borne by the Contractor.

The estimated pay rate for each flag person is \$950.00 per day for an 8 hour work day with time and one-half for overtime, Saturdays, Sundays; double time and one-half for holidays. Flagging rates are set by the UPRR and are subject to change.

1.25 CLEANING OF RIGHT-OF-WAY

Contractor shall, upon completion of the work to be performed by Contractor upon the premises, over or beneath the tracks of UPRR, promptly remove from the right-of-way of UPRR all of Contractor's tools, implements, and other materials whether brought upon the right-of-way by Contractor or any subcontractors, employee or agent of Contractor or of any subcontractor, and leave the right-of-way in a clean and presentable condition to satisfaction of UPRR.

STATE OF ILLINOIS

Special Provisions

**ROADWAY INTERCHANGE RECONSTRUCTION
AND UPRR BRIDGE REPLACEMENT**

Contract No. 60K80

U.S. RTE. 41 (FAP 346) AND IL 132 (FAU 1218) Section 125X-N

Lake County

October 20, 2016 Submittal

for

January 20, 2017 Letting

Volume 2

Harry O. Hefter-Associates, Inc.

SECTION C
UPRR BRIDGE & TRACK
STANDARD DRAWINGS & REFERENCES

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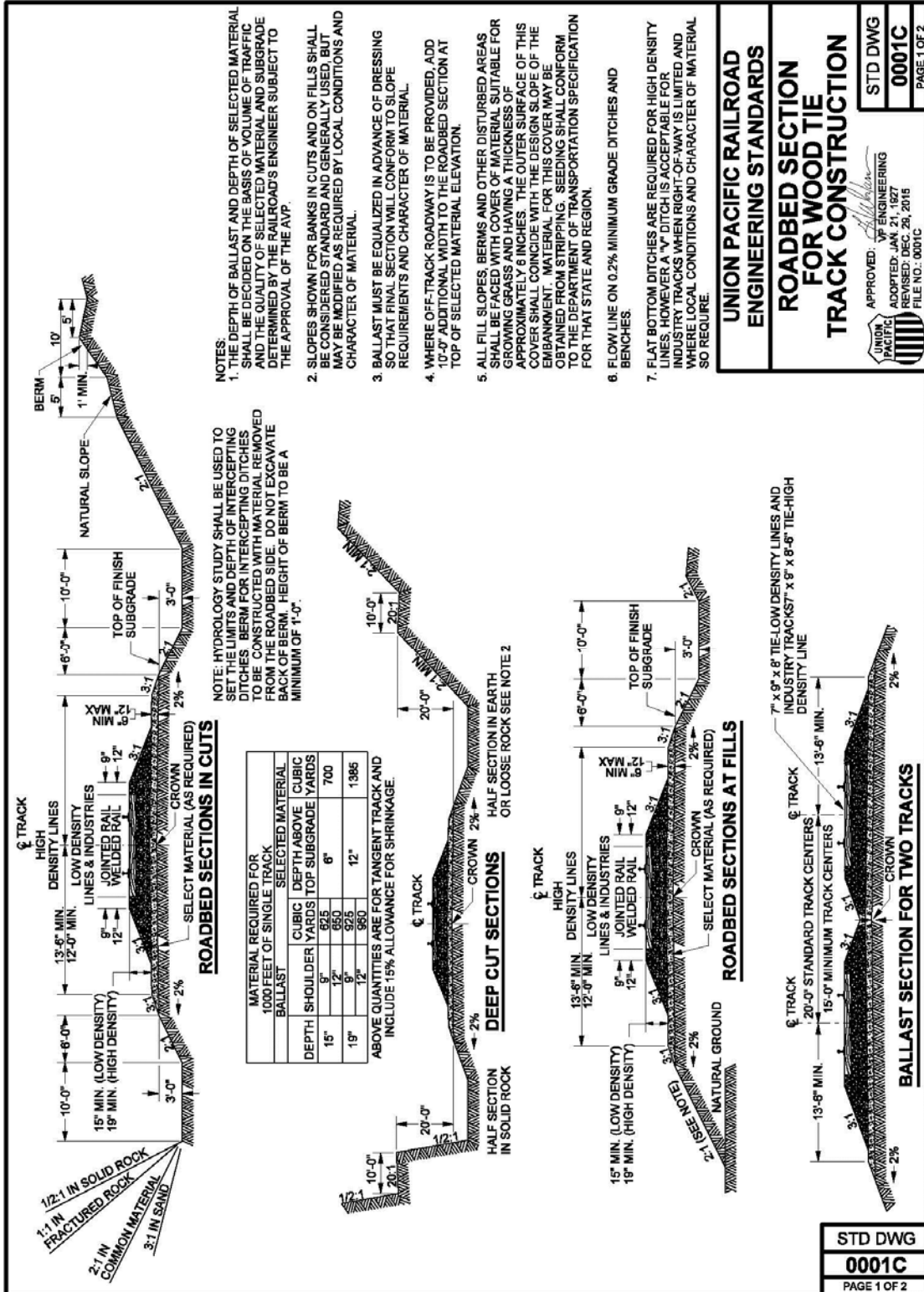
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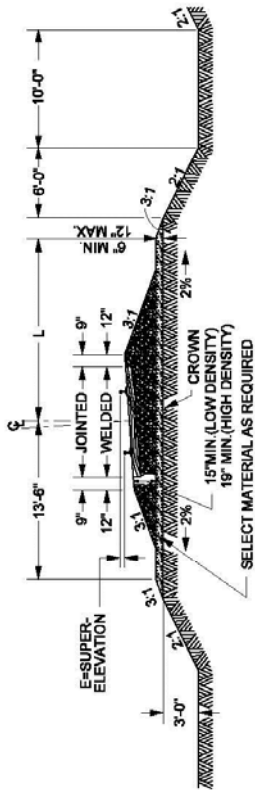
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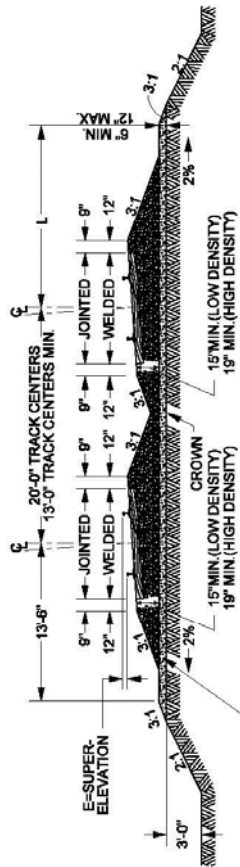
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IDOT Contract 60K80





BALLAST SECTIONS FOR SINGLE CURVED TRACK WOOD TIE CONSTRUCTION



BALLAST SECTIONS FOR TWO CURVED TRACKS WOOD TIE CONSTRUCTION

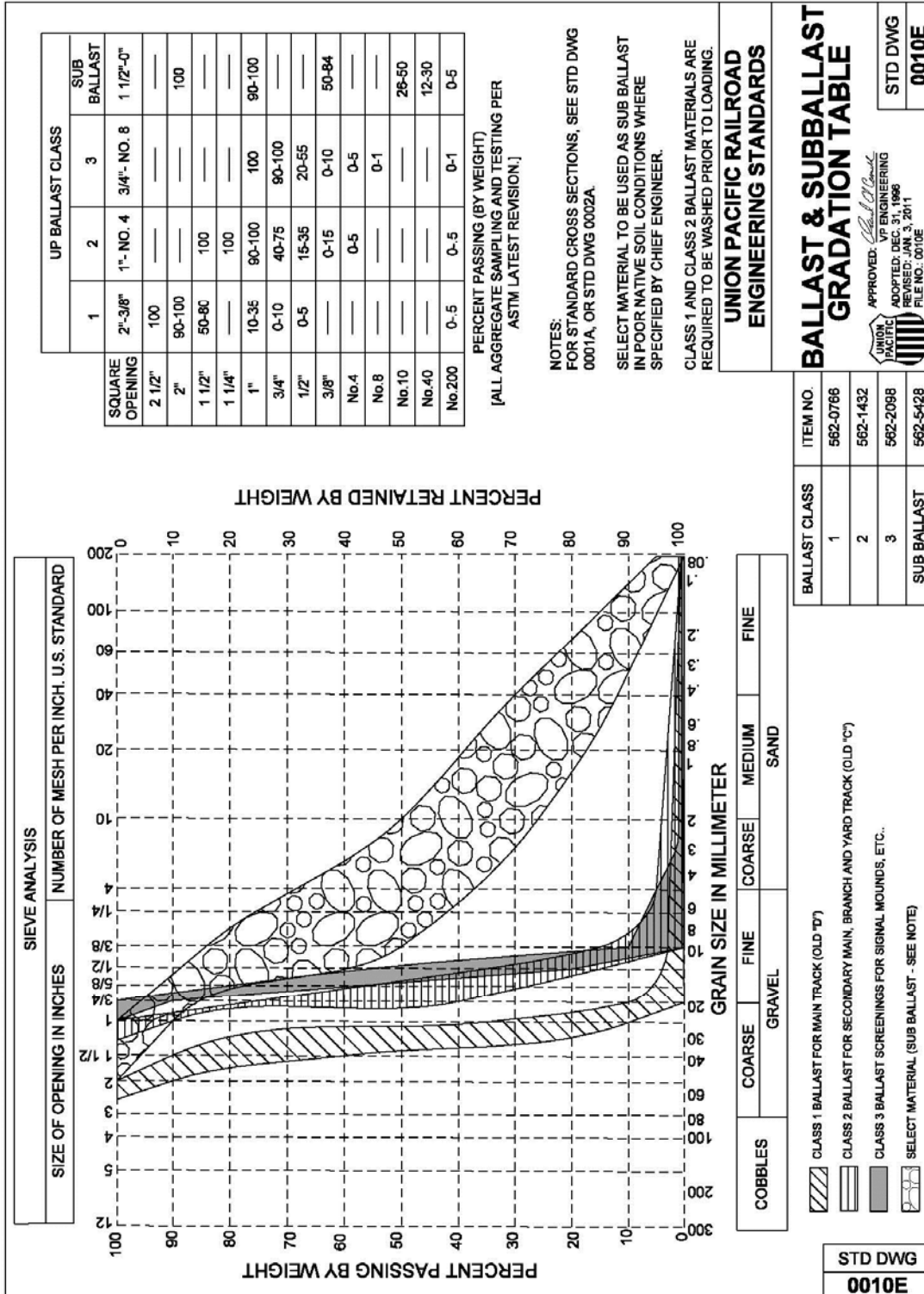
E (IN.)	L MIN.
0	13'-6"
1	14'-0"
2	14'-6"
3	15'-0"
4	15'-6"
5 OR OVER	16'-0"

- NOTES
- SLOPES SHOWN FOR BANKS IN CUTS AND ON FILLS SHALL BE CONSIDERED STANDARD AND GENERALLY USED, BUT MAY BE MODIFIED AS REQUIRED BY LOCAL CONDITIONS AND CHARACTER OF MATERIAL.
 - BALLAST MUST BE EQUALIZED IN ADVANCE OF DRESSING SO THAT FINAL SECTION WILL CONFORM TO SLOPE REQUIREMENTS AND CHARACTER OF MATERIAL.

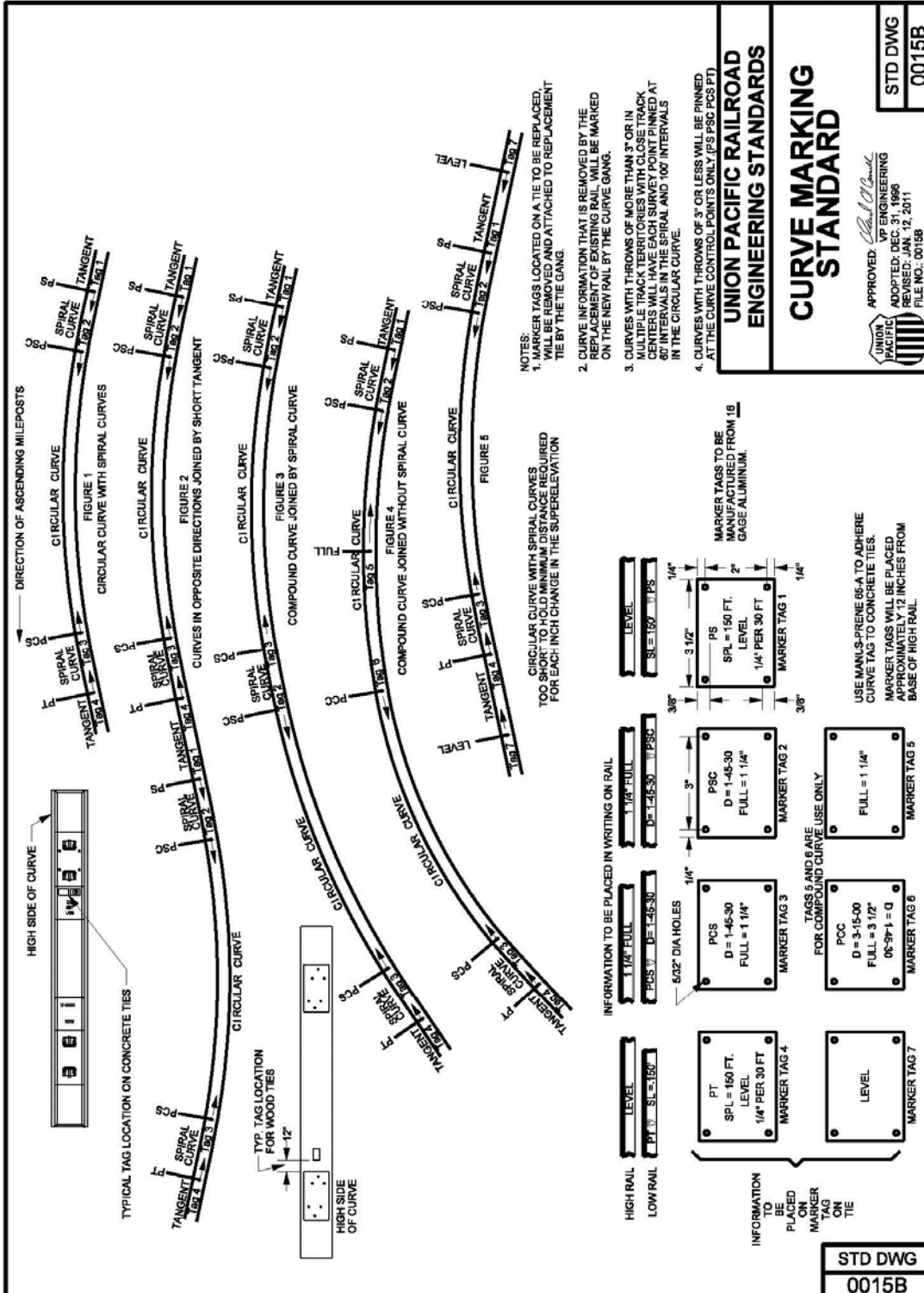
UNION PACIFIC RAILROAD ENGINEERING STANDARDS ROADBED SECTION FOR WOOD TIE TRACK CONSTRUCTION	APPROVED: <i>[Signature]</i> UNION PACIFIC ENGINEERING ADOPTED: JAN 1977 REVISED: DEC 28, 2016 FILE NO.: 0001C
	STD DWG 0001C
	PAGE 2 OF 2

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IDOT Contract 60K80



DECIMAL DEGREE OF CURVE	DEGREE OF CURVE IN DEGREE/ MINISECS	SPEED IN MILES PER HOUR																	
		10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
0.5°	0°-30'																		
1.0°	1°-00'								3/4"										
1.5°	1°-30'								3/4"	1 1/4"									
2.0°	2°-00'								3/4"	1 1/4"	1 3/4"								
2.5°	2°-30'								3/4"	1 1/4"	1 3/4"	2 1/2"							
3.0°	3°-00'								3/4"	1 1/4"	2 1/2"	3 1/4"	4 1/4"						
3.5°	3°-30'								3/4"	1 1/4"	2"	3"	4"						
4.0°	4°-00'								3/4"	1 1/2"	2 1/2"	3 1/2"	4 3/4"						
4.5°	4°-30'								3/4"	1 3/4"	2 3/4"	4"							
5.0°	5°-00'								3/4"	1 1/4"	2 1/4"	3 1/4"	4 1/2"						
5.5°	5°-30'								3/4"	1 1/2"	2 1/2"	3 3/4"							
6.0°	6°-00'								3/4"	1 3/4"	2 3/4"	4 1/4"							
6.5°	6°-30'								3/4"	1 3/4"	3"	4 1/2"							
7.0°	7°-00'								1"	2"	3 1/2"	5"							
7.5°	7°-30'								3/4"	1"	2 1/4"	3 3/4"							
8.0°	8°-00'								3/4"	1 1/4"	2 1/2"	4"							
9.0°	9°-00'								3/4"	1 1/2"	3"	4 1/4"							
10.0°	10°-00'								3/4"	1 3/4"	3 1/2"								
11.0°	11°-00'								3/4"	2"	3 3/4"								
12.0°	12°-00'								1"	2 1/4"	4 1/4"								

NOTES:
 THESE REQUIREMENTS DO NOT REPRESENT MAINTENANCE STANDARDS, THEREFORE, DO NOT USE THEM TO DETERMINE APPROVED ELEVATION WHEN SURFACING AND LINING EXISTING CURVES. FOR EXISTING CURVES, USE CURVE DATA INFORMATION IN THE CURVE DATA HANDBOOK OR IN THE ON-LINE INTRANET ENGINEERING PLANNING AND BUDGETING SITE.
<http://home.uprr.com/depts/engineering/apps/ks/mst/curves/curvesreporting.cfm>
 NO SUPERELEVATION (E) GREATER THAN 5" SHALL BE INSTALLED.

E = ELEVATION OF THE OUTSIDE RAIL IN INCHES
 D = DEGREE OF CURVE IN DECIMAL DEGREE FORMAT
 S = SPEED IN MILES PER HOUR

CONVERSIONS ARE AS FOLLOWS:

$$E = S(0.0007SD) - 1"$$

$$R = \text{RADIUS OF CURVE IN FEET}$$

$$D = \frac{5729.578}{R}$$

$$S(\text{max.}) = \sqrt{\frac{E + 1}{(0.0007)D}}$$

REFERENCE STD DWG 0019.

UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS

**SUPERELEVATION
 OF CURVES
 1" UNBALANCE**



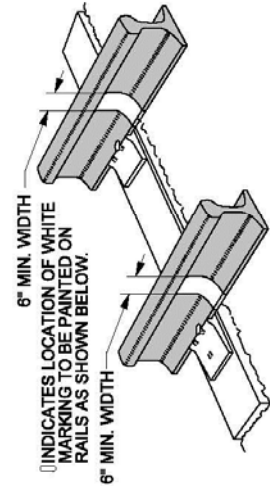
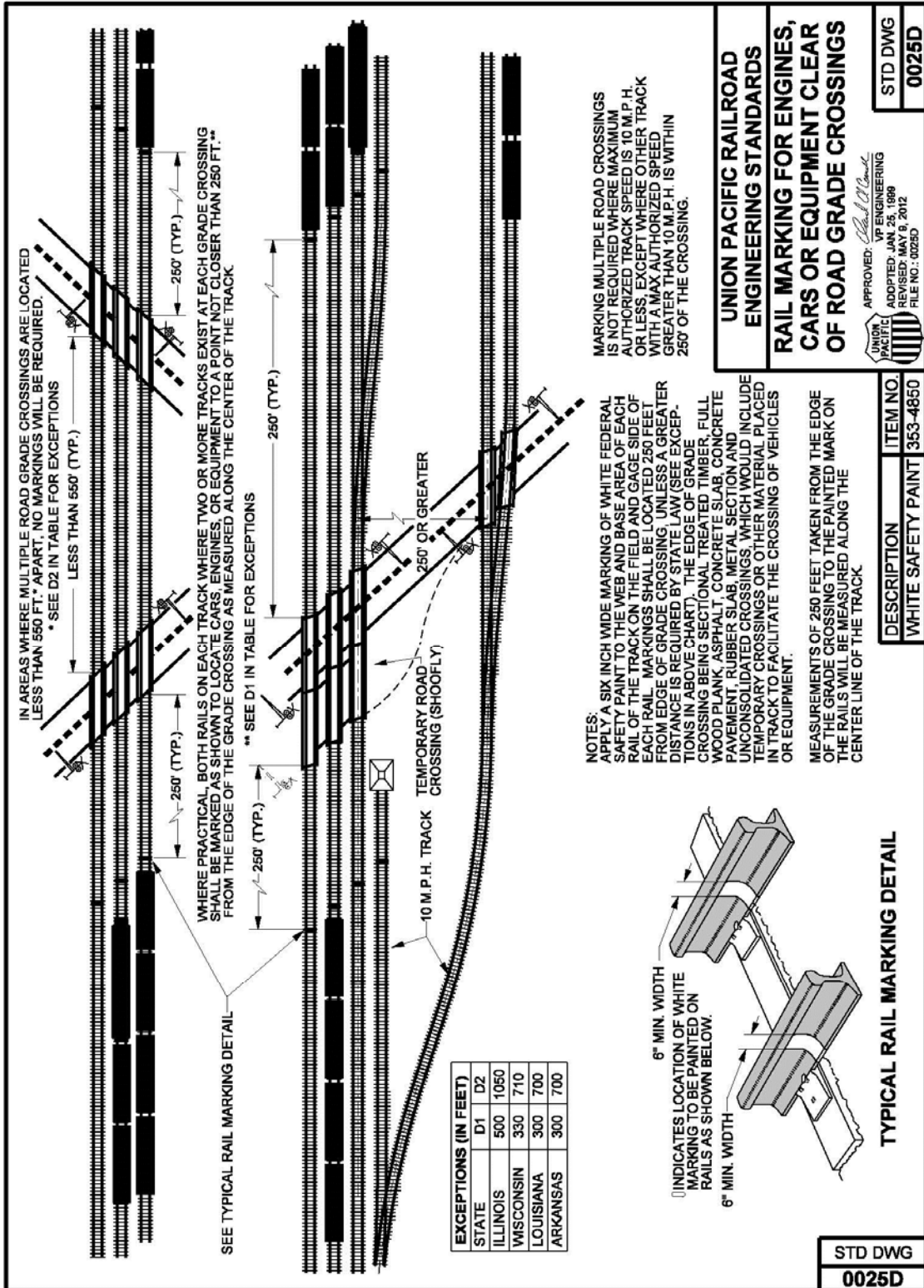
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 REVISED: FEB. 3, 2014
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 0021E

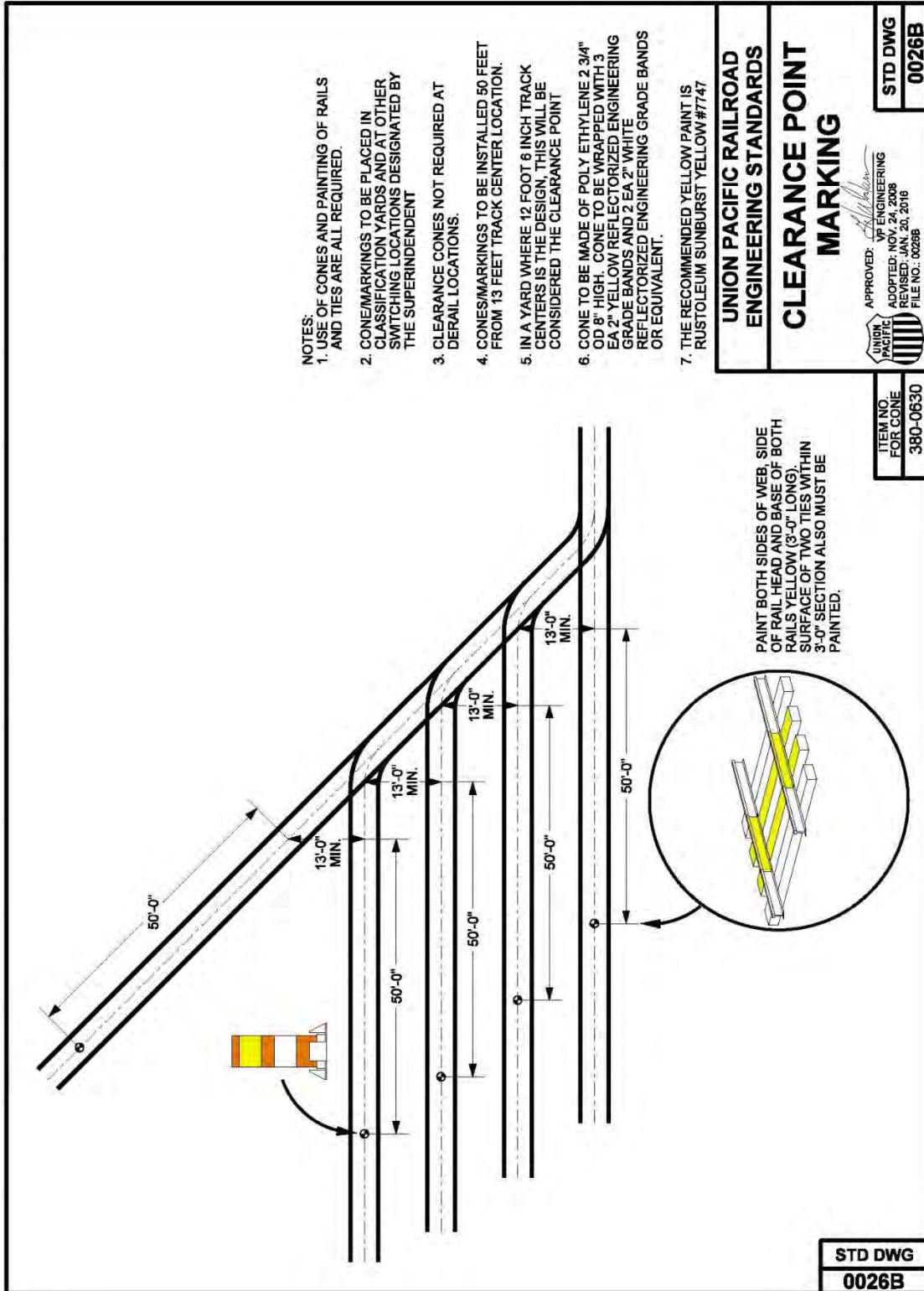
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IDOT Contract 60K80



IDOT Contract 60K80

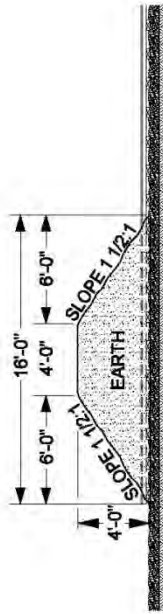
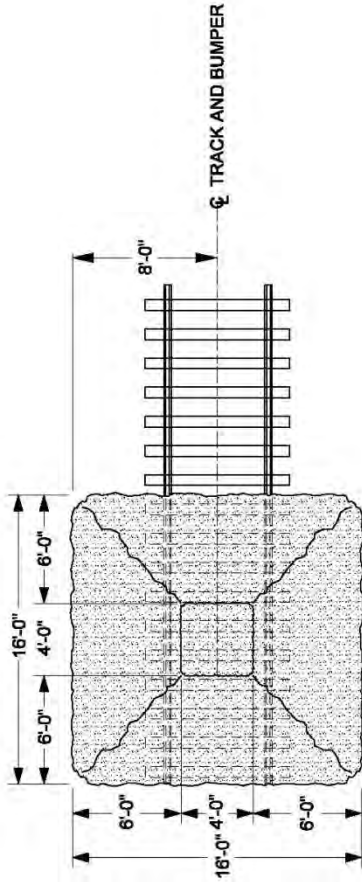
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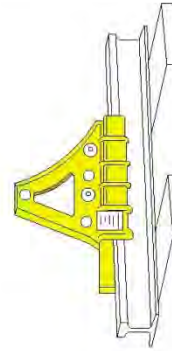
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IDOT Contract 60K80

8



EARTH BUMPER



WHEEL STOP
 ITEM NO. 559-7880

- NOTES:**
1. SIZE OF BASE MAY BE REDUCED IN CASES WHERE WIDTH OF ROADBED WILL NOT PERMIT PLAN TO BE FOLLOWED.
 2. BUMPER TO BE 4'-0" TALL FROM BASE OF TIE.
 3. IF TRACK CLEARANCE DOES NOTE ALLOW, BOTTOMS MAY BE SQUARED OFF.
 4. EARTHEN BUMPER AS SHOWN HERE ON SHALL BE USED AT ALL LOCATIONS WHERE BUMPER IS REQUIRED EXCEPT ON THE AUTHORITY OF THE CHIEF ENGINEER OF MAINTENANCE TO USE A BUMPER OF SOME OTHER DESIGN.

**UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS**

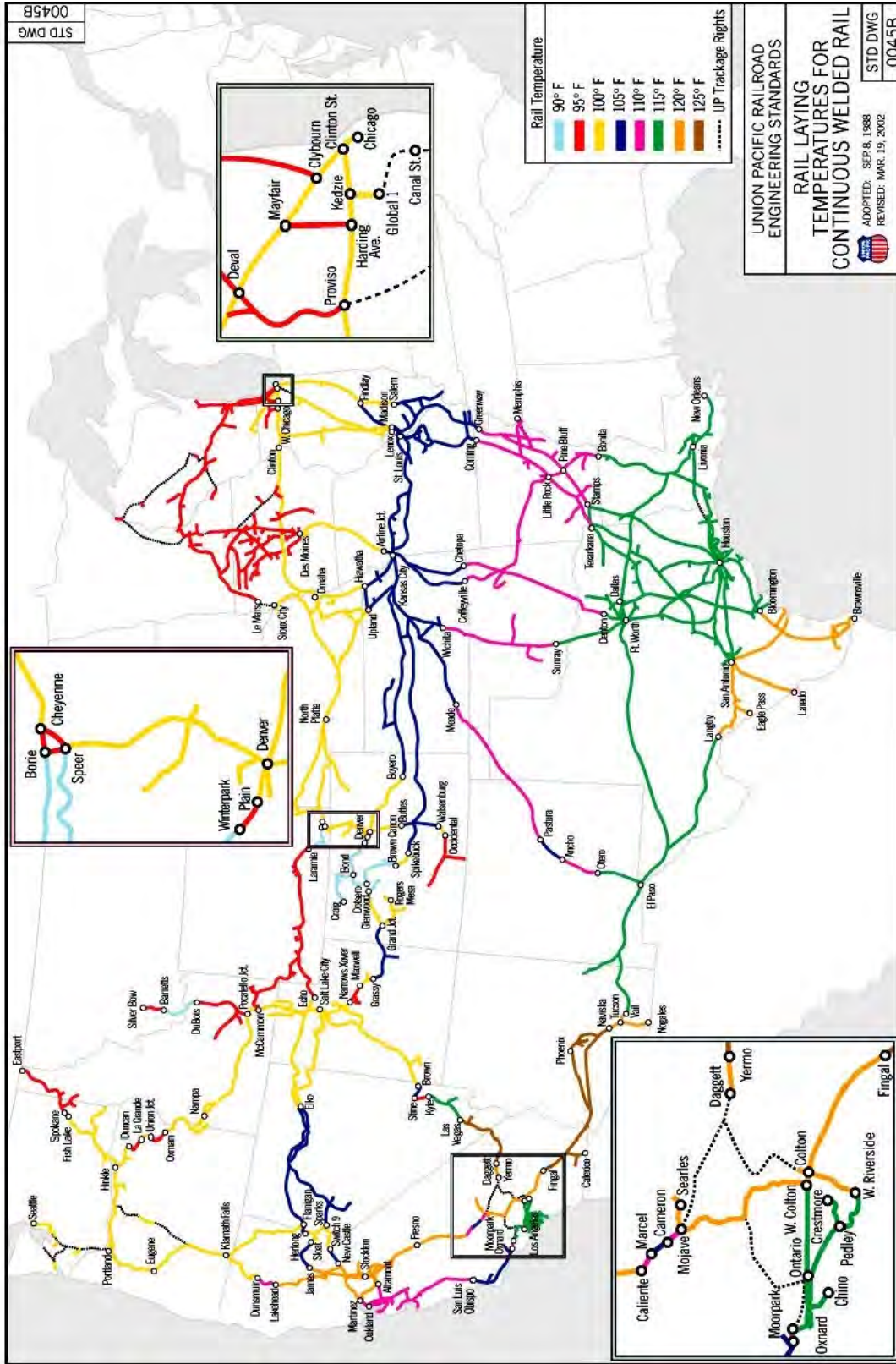
**STANDARD TREATMENT
 FOR END OF TRACK**



STD DWG
0030C

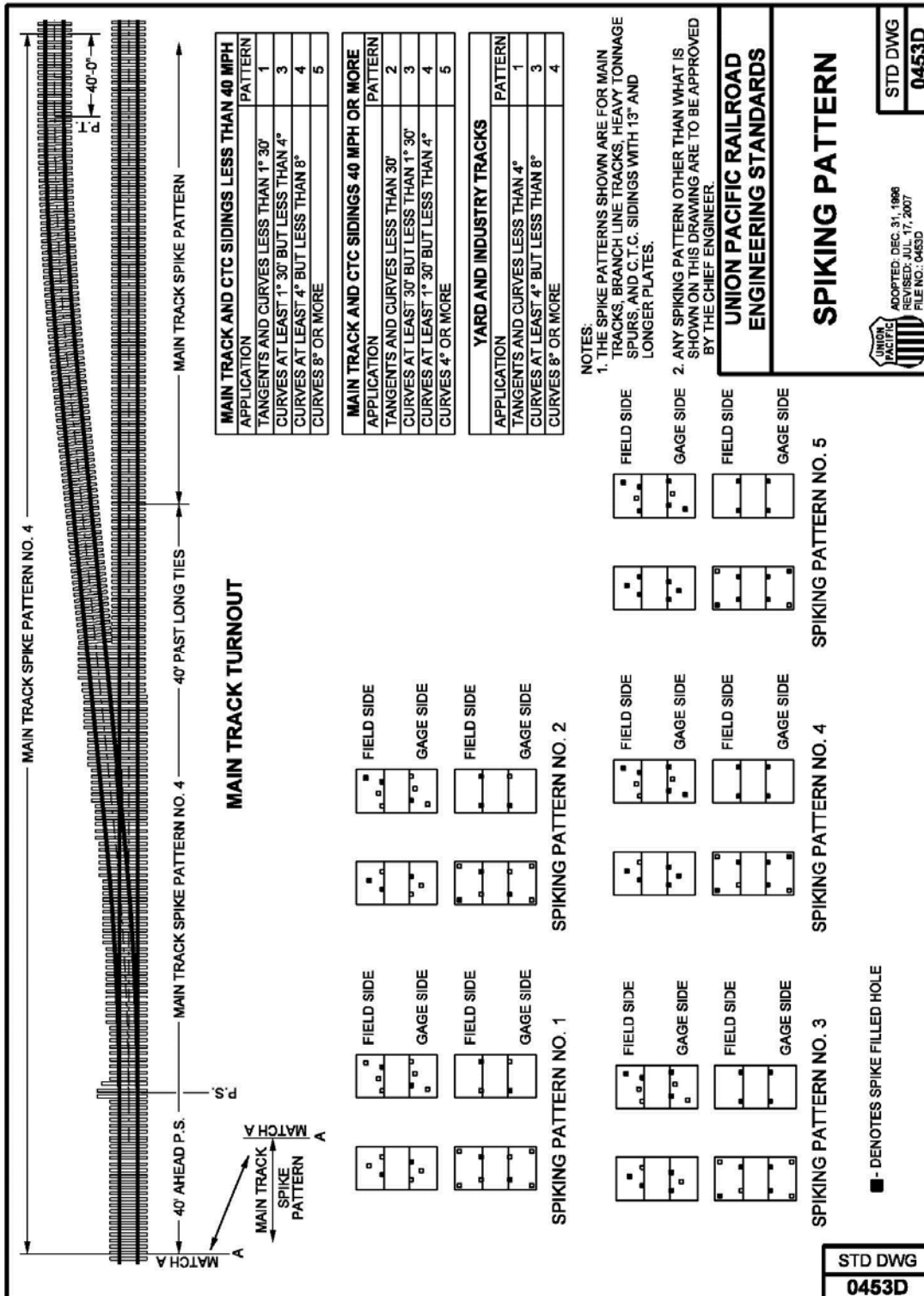
STD DWG
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10

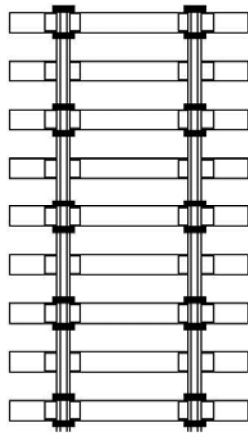
IDOT Contract 60K80



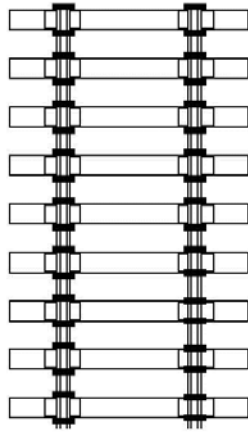
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IDOT Contract 60K80

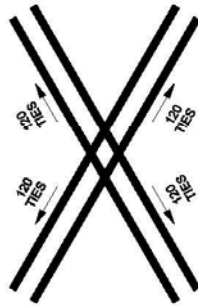
CONTINUOUS WELDED RAIL (NEW INSTALLATION):
 1) BOX ANCHOR EVERY OTHER TIE (USE PATTERN #1). ANCHORING NOT REQUIRED ON TIES WITH ELASTIC FASTENERS.
 2) CHIEF ENGINEER MAY AUTHORIZE ADDITIONAL ANCHORS TO BE INSTALLED ON CONCRETE OR WOOD TIES WHERE INCREASED RAIL RESTRAINT IS DESIRED. SUCH LOCATIONS MAY BE SUBDIVISIONS EXPECTED TO HANDLE 68MGT OR MORE ANNUALLY, OPEN JOINTS IN CHRY TERRITORY, HEAVY TRAIN BRAGGING GRADES, ETC.



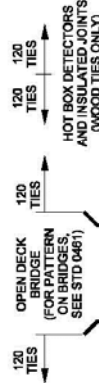
JOINTED RAIL (NEW INSTALLATION):
 BOX ANCHOR EVERY OTHER TIE (USE PATTERN #1)
JOINTED RAIL TURNOUTS (NEW INSTALLATION):
 1) BOX ANCHOR EVERY TIE IN TURNOUT (USE PATTERN #2).
 2) BOX ANCHOR EVERY TIE 48 TIES AHEAD OF POINT OF SWITCH AND 48 TIES BEHIND LAST TURNOUT TIE (USE PATTERN #2).



TURNOUTS (NEW INSTALLATION):
 1) BOX ANCHOR EVERY TIE 120 TIES AWAY FROM THE POINT OF SWITCH AND 120 TIES BEHIND LAST TURNOUT TIE (USE PATTERN #2).
OPEN DECK BRIDGES:
 BOX ANCHOR EVERY TIE 120 TIES AWAY IN BOTH DIRECTIONS ON CONCRETE AND WOOD TIES (USE PATTERN #2).
HOT BOX / DRAGGING EQUIPMENT DETECTORS:
 BOX ANCHOR 120 TIES AWAY IN BOTH DIRECTIONS ON WOOD TIES ONLY (USE PATTERN #2). ANCHORING NOT REQUIRED ON TIES WITH ELASTIC FASTENERS.
INSULATED JOINTS
 BOX ANCHOR EVERY TIE 120 TIES AWAY FROM THE INSULATED JOINT IN BOTH DIRECTIONS ON WOOD TIES ONLY (USE PATTERN #2). ANCHORING NOT REQUIRED ON TIES WITH ELASTIC FASTENERS.
CROSSING FROGS
 BOX ANCHOR EVERY TIE 120 TIES AWAY FROM THE CROSSING FROG IN ALL DIRECTIONS ON CONCRETE AND WOOD TIES (USE PATTERN #2).
ROAD CROSSINGS
 BOX ANCHOR EVERY TIE THROUGH THE CROSSING LIMITS ON WOOD TIES ONLY (USE PATTERN #2). ANCHORING NOT REQUIRED ON TIES WITH ELASTIC FASTENERS.



CROSSING FROGS



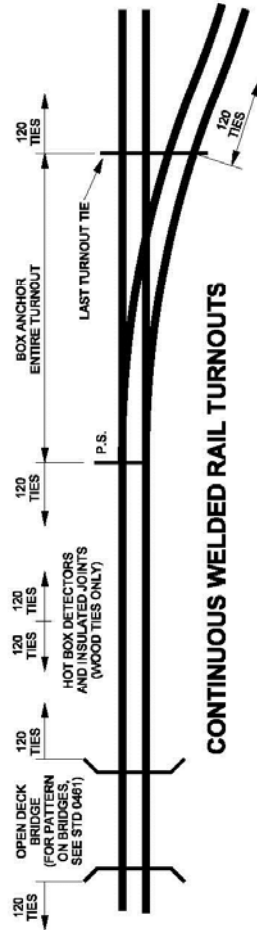
STD DWG
 0460G

ANCHOR PATTERN #2



JOINTED RAIL TURNOUTS

- NOTES:
 1. ANCHOR PATTERN #1 WILL BE USED FOR ALL RAIL RELAYS. EXISTING ANCHOR PATTERNS MAY REMAIN UNTIL A RAIL RELAY IS DONE.
 2. WHERE ELASTIC FASTENERS FAIL TO PROPERLY RESTRAIN THE RAIL FROM MOVING LONGITUDINALLY, INSTALL ADDITIONAL ANCHORS AS REQUIRED.
 3. WHERE PRACTICAL, ANCHOR TO BE INSTALLED FROM GAGE SIDE OF RAIL.
 4. USE AN ANCHOR WITH AN ISOLATOR ON CONCRETE TIE APPLICATIONS (ITEM NO. 550-1652).
 5. IN A CURVE IF THERE ARE ELASTIC FASTENERS ON ONE RAIL, BUT NOT BOTH, USE ANCHOR PATTERN #1 ON THE RAIL WITHOUT ELASTIC FASTENERS.



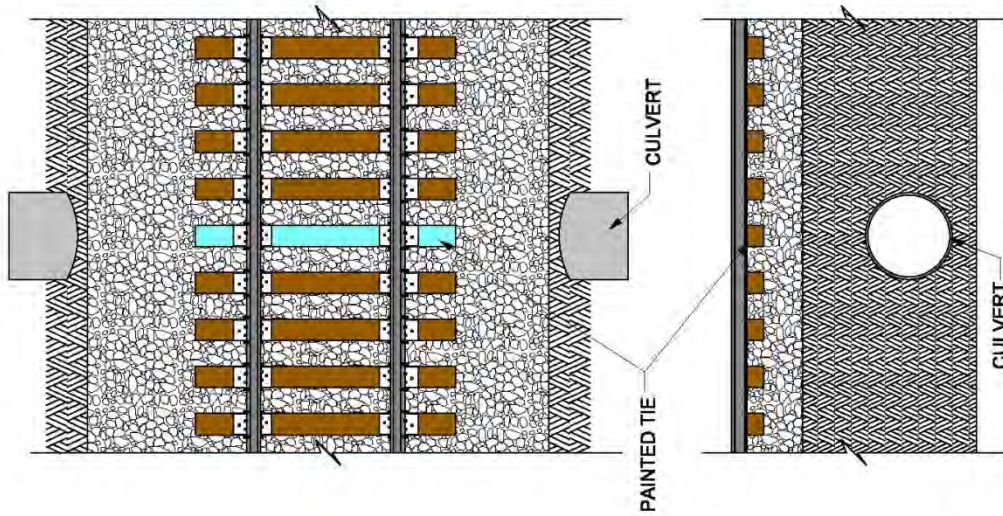
CONTINUOUS WELDED RAIL TURNOUTS

**UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS
 RAIL ANCHOR PATTERNS
 FOR NEW RAIL
 INSTALLATIONS**

UNION PACIFIC
 ADOPTED: DEC. 31, 1986
 REVISED: JAN. 17, 2014
 FILE NO.: 0460G

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STD DWG
 0460G



- NOTES:**
1. ALL CULVERTS ON MAIN TRACKS OR INDUSTRIAL LEADS SMALLER THAN 48" IN DIAMETER WILL BE IDENTIFIED BY MARKING A TIE.
 2. TIE CLOSEST TO THE CENTER OF A CULVERT LOCATION TO BE PAINTED BLUE. IN LOCATIONS WITH MULTIPLE CULVERTS, TIE CLOSEST TO CENTER OF CULVERT GROUP TO BE PAINTED.
 3. KRYLON QSHA BLUE PAINT TO BE UTILIZED. PAINT CAN BE ORDERED IN SPRAY CANS OR IN 1 GALLON BUCKETS USING THE E-PROCUREMENT NUMBERS PROVIDED.
 4. ENTIRE EXPOSED TOP SURFACE OF THE TIE ITSELF TO BE PAINTED. DO NOT PAINT TIE PLATES OR RAIL.

**UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS**

**CULVERT LOCATION
 TIE MARKING**

DESCRIPTION	ITEM NO.
BLUE PAINT - GALLON CAN	353-1450
BLUE PAINT - SPRAY CAN	353-1451
BLUE PAINT - INVERTED SPRAY CAN	353-9232

STD DWG	0519B
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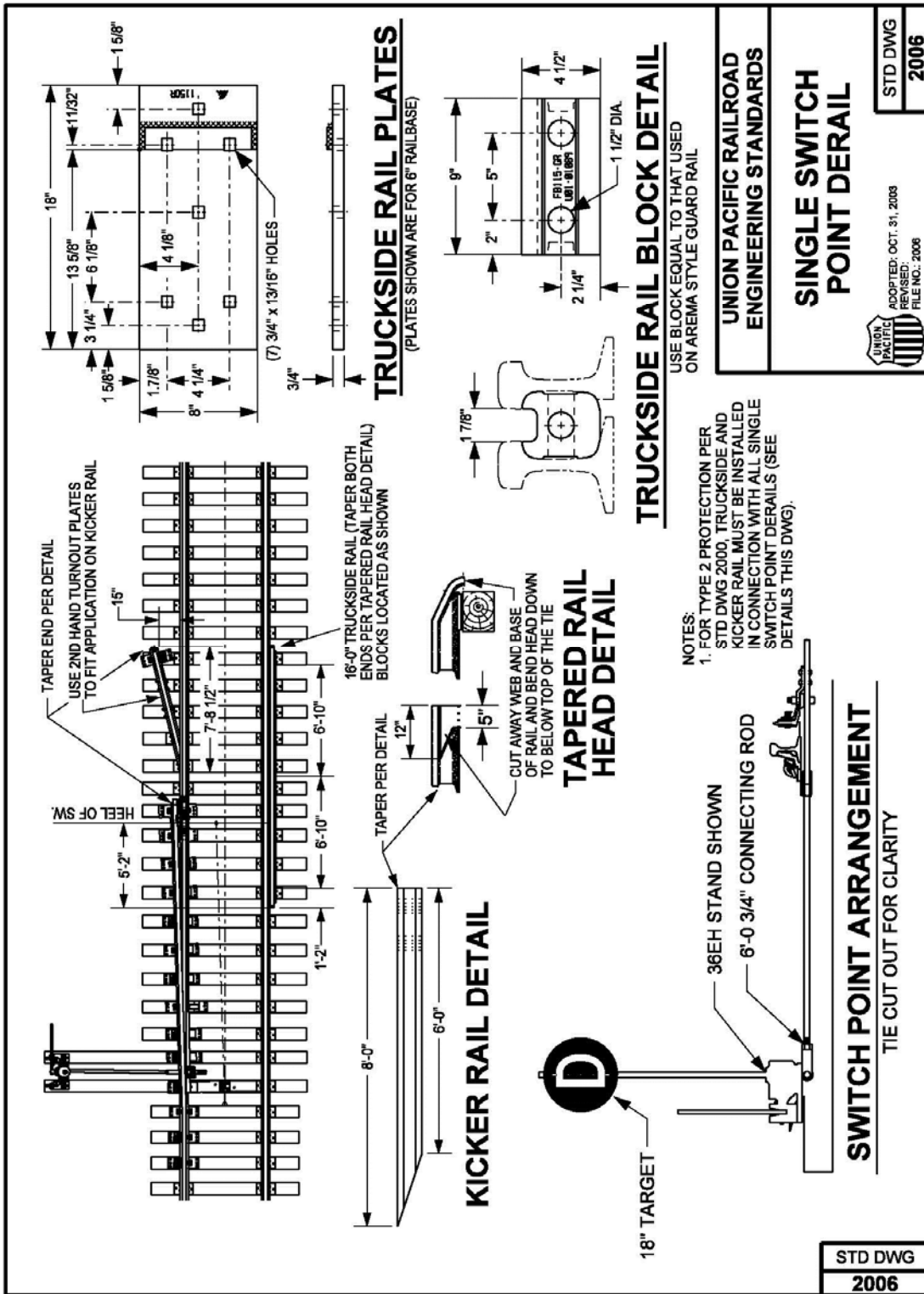
UNION PACIFIC
 ADOPTED: JUNE 18, 2010
 REVISED: JULY 2, 2013
 FILE NO.: 0519B

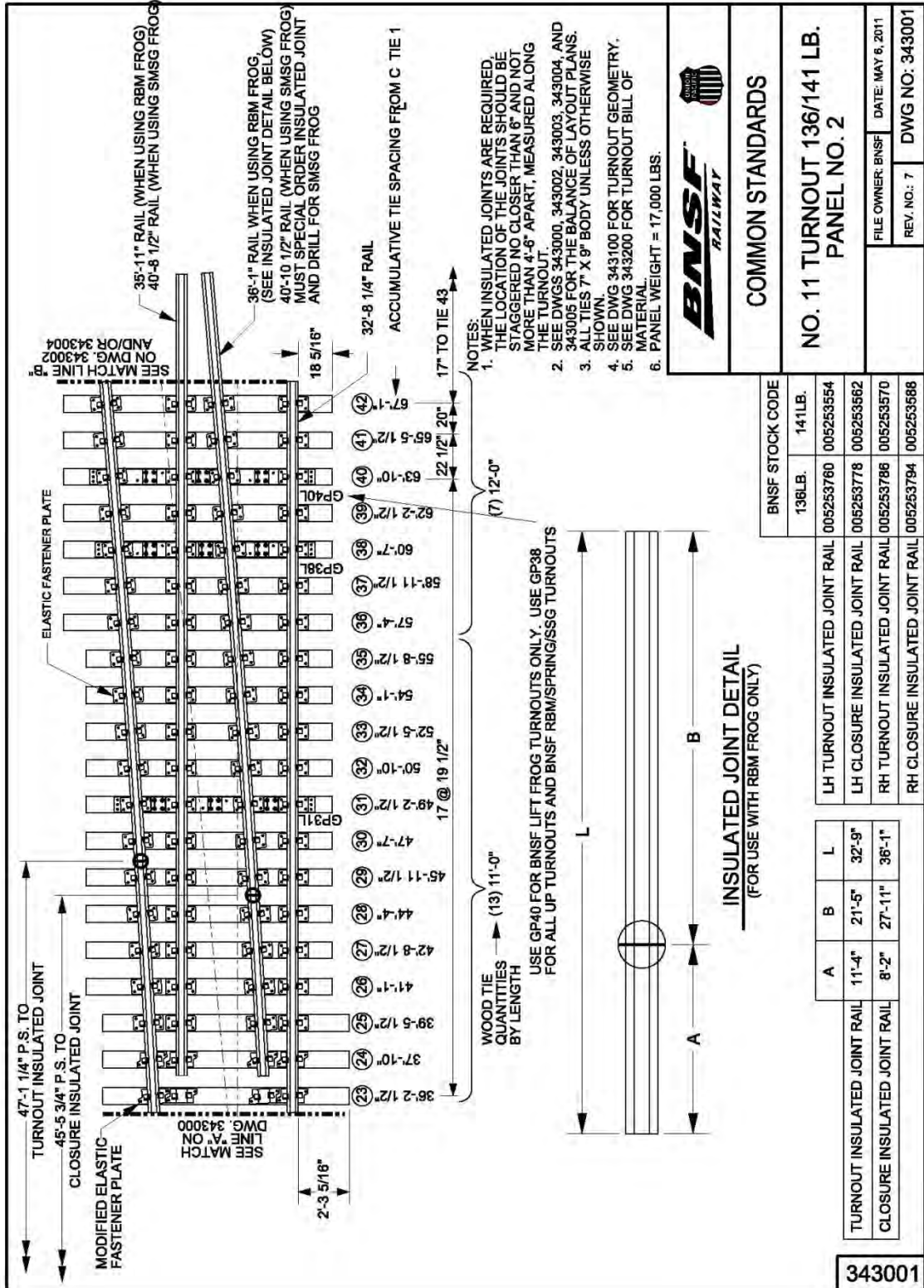
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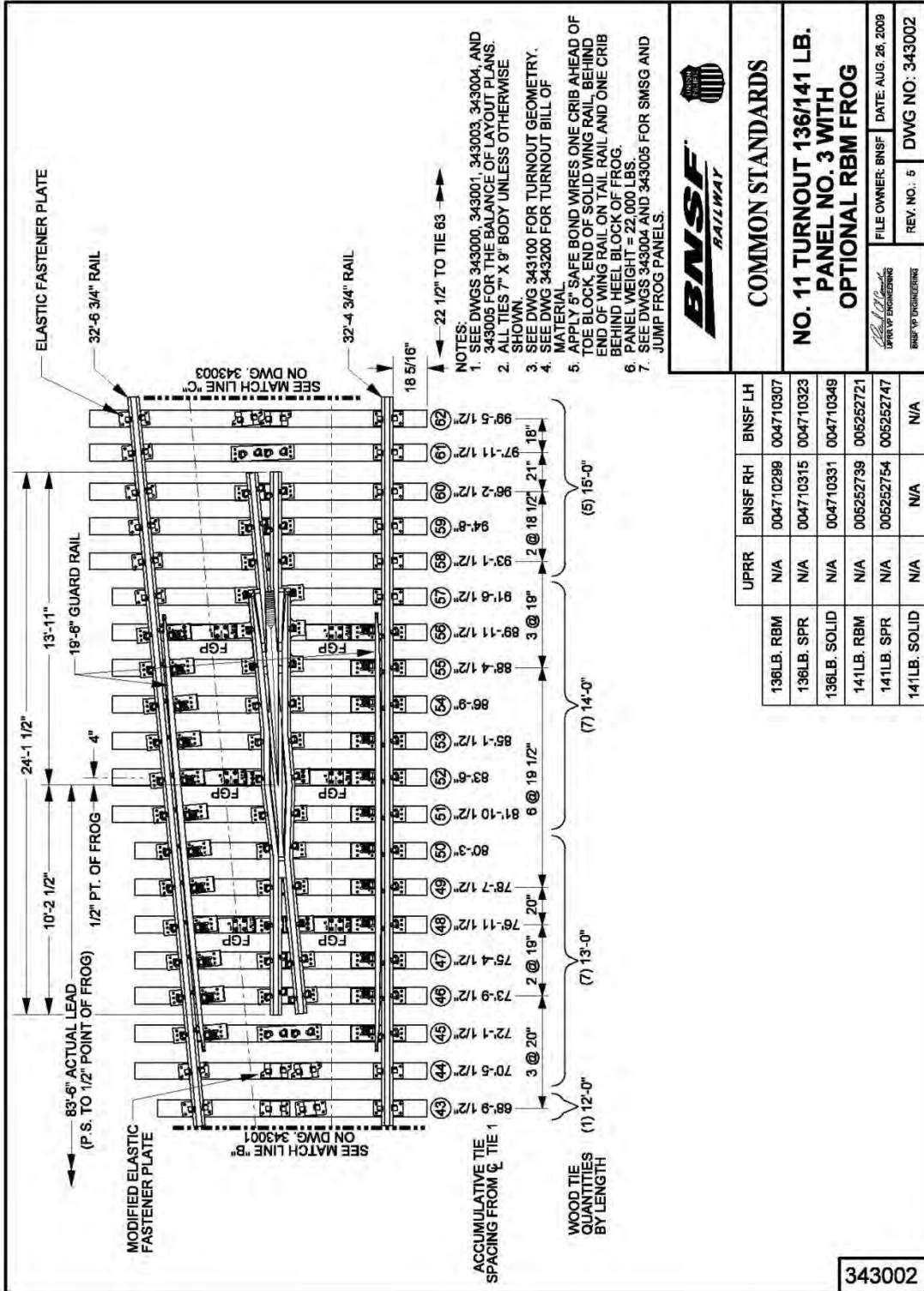
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13

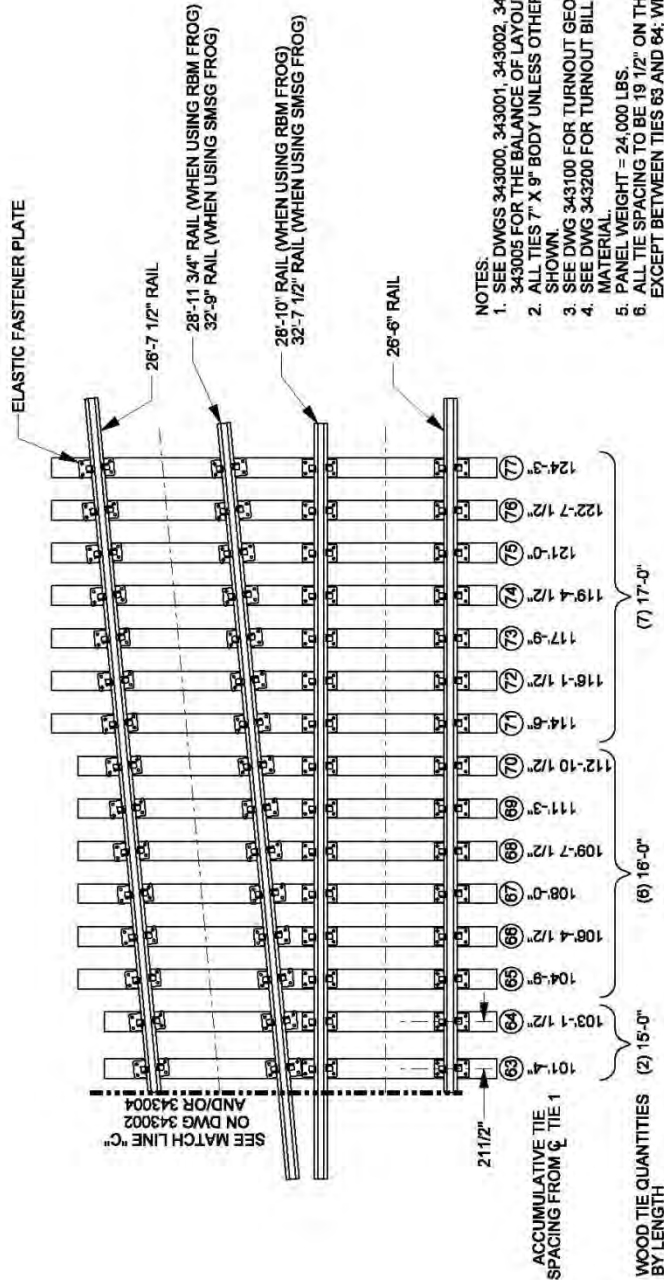
IDOT Contract 60K80







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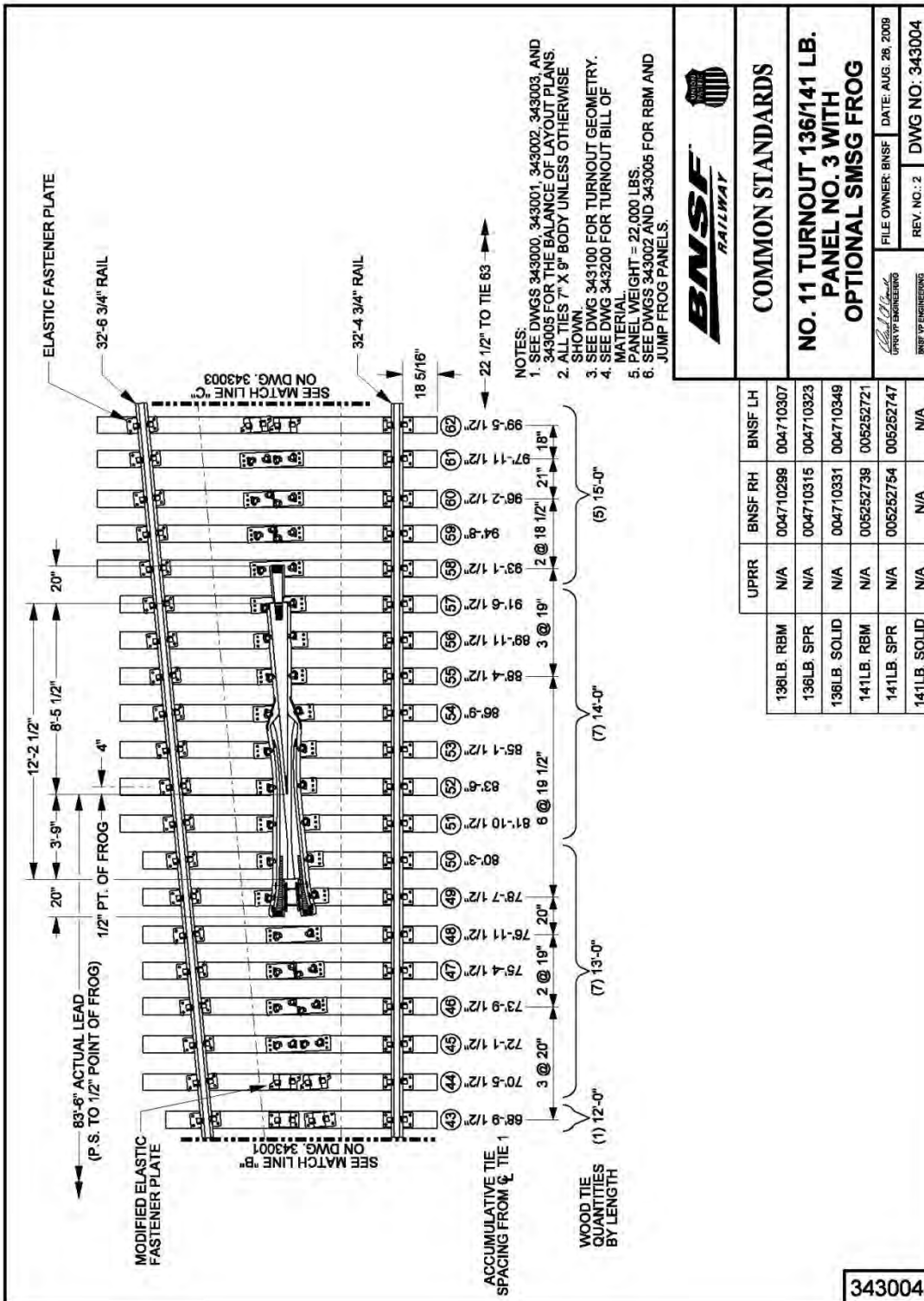


COMMON STANDARDS

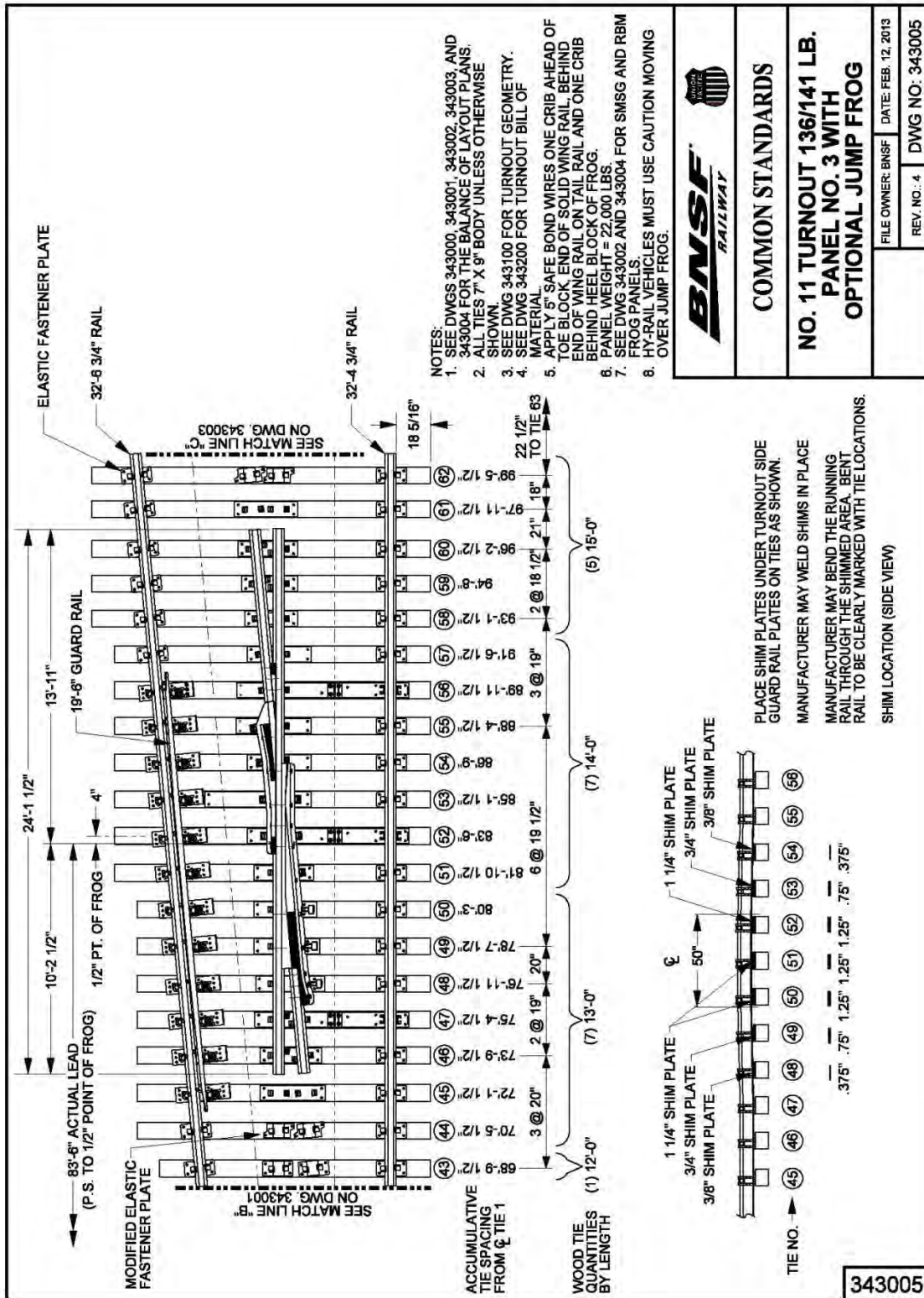
NO. 11 TURNOUT 136/141 LB.
 PANEL NO. 4

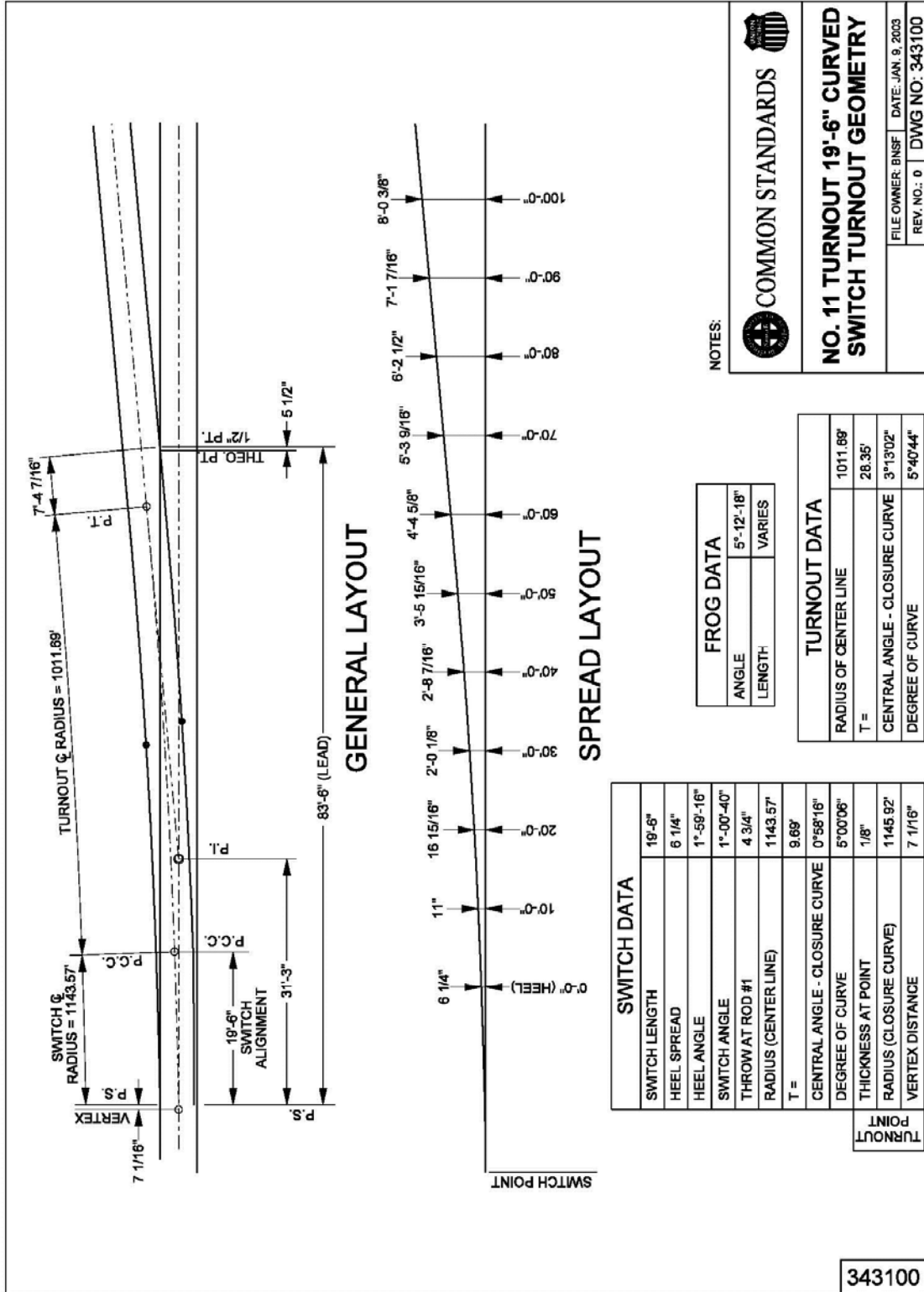
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343003



343004

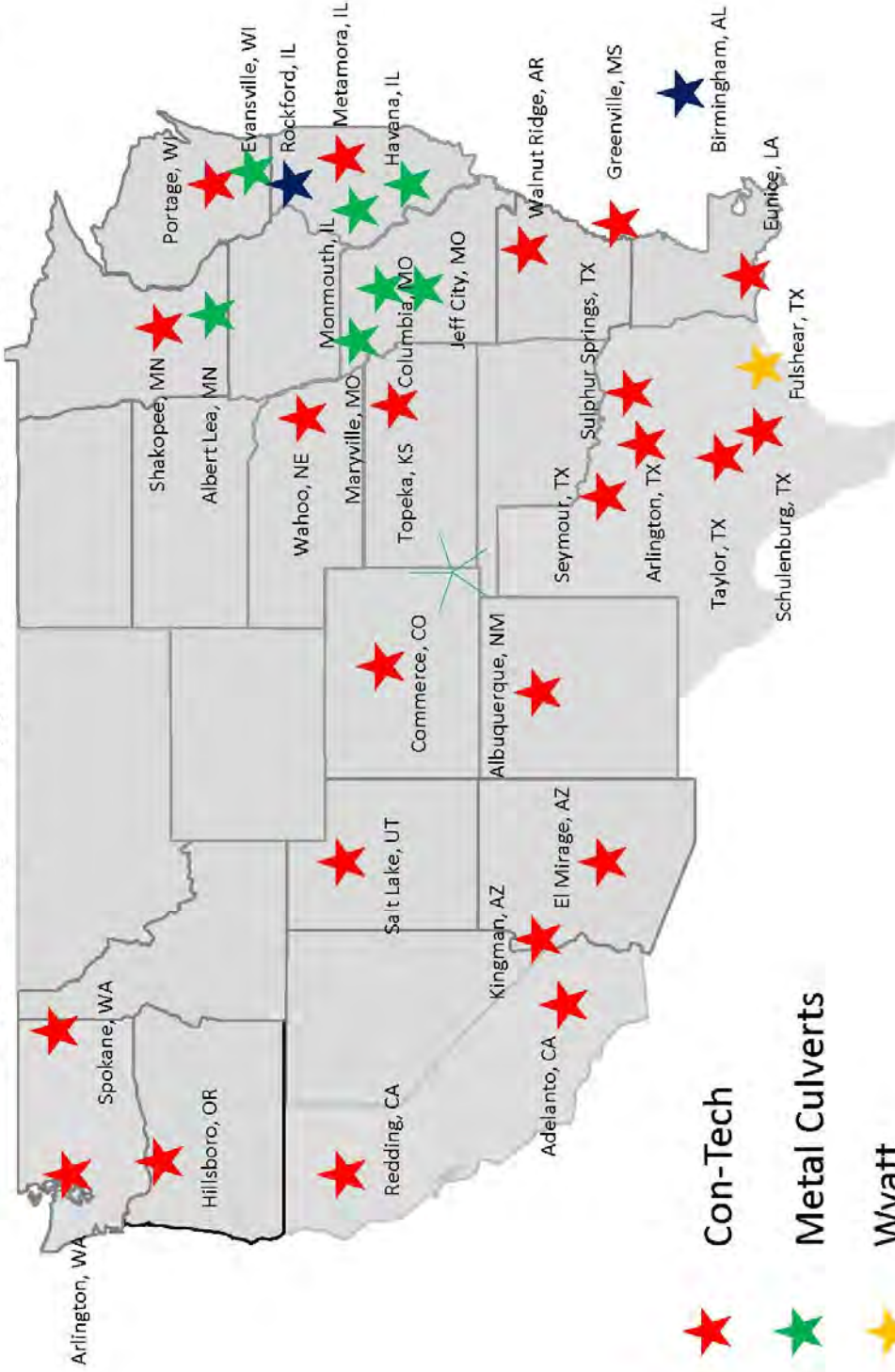




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Culvert Pipe Suppliers Map of Locations

22



- ★ Con-Tech
- ★ Metal Culverts
- ★ Wyatt
- ★ Precision Pipe

1

Con-Tech Plant Locations and Contact

23

Supplier	State	Plant Location	Regional Description	Max Size
Con-Tech	AR	Walnut Ridge, AR	125 mi northeast of Little Rock, AR	144"
	AZ	El Mirage, AZ	Phoenix metro area	144"
	AZ	Kingman, AZ	105 mi southeast of Las Vegas, NV	144"
	CA	Adelanto, CA	45 mi north of West Colton, CA	144"
	CA	Redding, CA	175 mi north of Roseville, CA	144"
	CO	Commerce, CO	Denver metro area	144"
	IL	Metamora, IL	15 mi east of Peoria, IL	144"
	KS	Topeka, KS	60 mi west of Kansas City, KS	144"
	LA	Eunice, LA	210 mi east of Houston, TX	144"
	MN	Shakopee, MN	25 mi southwest of Minneapolis, MN	144"
	MS	Greenville, MS	150 mi southeast of Little Rock, AR	144"
	NE	Wahoo, NE	40 mi west of Omaha, NE	144"
	NM	Albuquerque, NM	Albuquerque metro area	144"
	OR	Hillsboro, OR	20 mi west of Portland, OR	144"
	TX	Arlington, TX	20 mi east of Ft Worth, TX	144"
	TX	Schulenburg, TX	100 mi east of San Antonio, TX	144"
	TX	Seymour, TX	140 mi northwest of Ft Worth, TX	144"
	TX	Sulphur Springs, TX	110 mi east of Ft Worth, TX	144"
	TX	Taylor, TX	150 mi northwest of Houston, TX	144"
	UT	Salt Lake City, UT	Salt Lake City metro area	144"
	WA	Arlington, WA	45 mi north of Seattle, WA	144"
	WA	Spokane, WA	Spokane metro area	144"
	WI	Portage, WI	180 mi northwest of Chicago, IL	144"

Supplier	Name	Office Phone	Cell Phone	E-mail
Con-Tech	Wayne Wendel	402-484-5289	402-618-1124	wendelw@contech-cpi.com

Metal Culverts Plant Locations and Contact

24

Supplier	State	Plant Location	Regional Description	Max Size
Metal Culverts	MO	Maryville, MO	90 miles north of Kansas City, MO	144"
		Columbia, MO	125 mi east of Kansas City, MO	96"
		Jefferson City, MO	160 mi east of Kansas City, MO	54"
		Albert Lea, MN	100 mi south of Minneapolis, MN	54"
		Evansville, WI	125 mi northwest of Chicago, IL	96"
		Havana, IL	45 mi southwest of Peoria, IL	96"
		Monmouth, IL	65 mi west of Peoria, IL	54"

Supplier	Name	Office Phone	Cell Phone	E-mail
Metal Culverts	Mike Rackers	573-681-2701	573-821-2432	mike.rackers@metalculverts.com

Wyatt Resources Plant Location and Contact

25

Supplier	State	Plant Location	Regional Description	Max Size
Wyatt	TX	Fulshear, TX	40 mi west of Houston, TX	96"

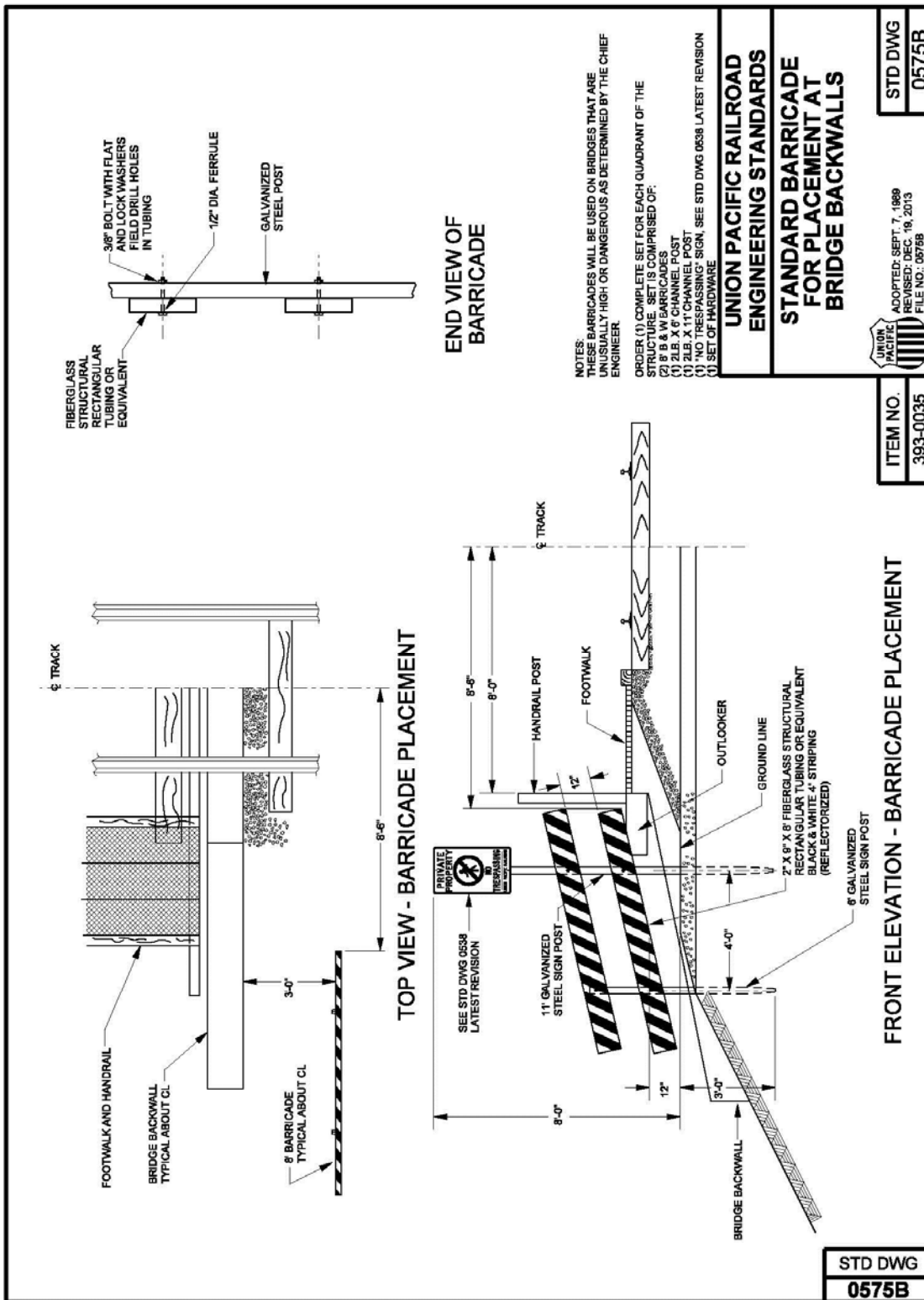
Supplier	Name	Office Phone	Cell Phone	E-mail
Wyatt Resources	Jerry Miller	281-346-6110	713-516-1502	jfmiller@wyattresources.com

Precision Pipe Plant Location and Contact

26

Supplier	State	Plant Location	Regional Description
Precision Pipe	AL	Birmingham, AL	250 mi southwest of Memphis, TN
	IL	Rockford, IL	90 mi west of Chicago, IL

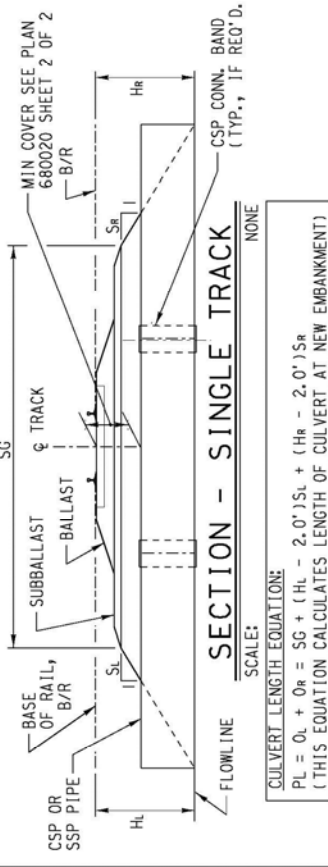
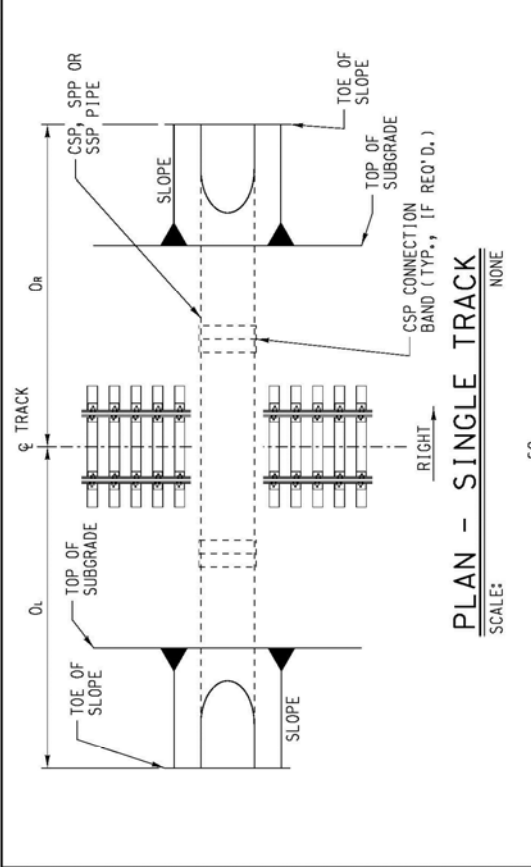
Supplier	Name	Office Phone	Cell Phone	E-mail
Precision Pipe	Bobby Chandler	205-327-8171	205-807-1360	precisionpipebc@yahoo.com



CULVERT PIPE LENGTH (PL) FOR STANDARD CROSS SECTIONS

H - B/R TO FLOWLINE (FT.)	SINGLE TRACK SLOPE			1.3' TRACK CENTERS SLOPE			20' TRACK CENTERS SLOPE		
	SLOPE			SLOPE			SLOPE		
	1.5:1	2:1	3:1	1.5:1	2:1	3:1	1.5:1	2:1	3:1
4	36	38	42	50	52	56	60	64	64
5	40	42	48	56	58	62	66	70	70
6	42	46	54	60	62	66	70	74	74
7	46	50	60	66	68	72	76	80	80
8	48	54	66	72	74	78	82	86	86
9	52	58	72	80	82	86	90	94	94
10	54	62	78	86	88	92	96	100	100
11	58	66	84	92	94	98	102	106	106
12	60	70	90	100	102	106	110	114	114
13	64	74	96	108	110	114	118	122	122
14	66	78	102	114	116	120	124	128	128
15	70	82	108	122	124	128	132	136	136
16	72	86	114	128	130	134	138	142	142
17	76	90	120	134	136	140	144	148	148
18	78	94	126	140	142	146	150	154	154
19	82	98	132	146	148	152	156	160	160
20	84	102	138	152	154	158	162	166	166
21	88	106	144	160	162	166	170	174	174
22	90	110	150	166	168	172	176	180	180
23	94	114	156	172	174	178	182	186	186
24	96	118	162	178	180	184	188	192	192
25	100	122	168	184	186	190	194	198	198
26	102	126	174	190	192	196	200	204	204

LENGTHS ARE ROUNDED TO THE NEAREST EVEN NUMBER OF FEET
 TABLE ASSUMES 15'-0" SHOULDER FOR SINGLE TRACK AND 13' CENTERS,
 15'-6" SHOULDER FOR 20' TRACK CENTERS,
 ADD 10' FOR EACH ACCESS ROAD.
 LENGTHS SHOWN ARE FOR STANDARD CROSS SECTIONS FOR TANGENT TRACK,
 ADD 2' TO PIPE LENGTH (TO OUTSIDE OF CURVE) IF SUPER ELEVATION IS 2" OR GREATER.



CULVERT LENGTH EQUATION:
 $PL = O_L + O_R = SG + (H_L - 2.0')S_L + (H_R - 2.0')S_R$
 (THIS EQUATION CALCULATES LENGTH OF CULVERT AT NEW EMBANKMENT)

- KEY:**
- H = AVERAGE HEIGHT - BASE OF RAIL TO FLOWLINE
 - H_L = HEIGHT - BASE OF RAIL TO FLOWLINE LEFT OF TRACK
 - H_R = HEIGHT - BASE OF RAIL TO FLOWLINE RIGHT OF TRACK
 - SG = WIDTH OF SUBGRADE = 2 SHOULDER + TRACK CENTER SPACING
 - S_L = SLOPE LEFT OF TRACK
 - S_R = SLOPE RIGHT OF TRACK
 - PL = PIPE LENGTH
 - O_L = OFFSET LEFT
 - O_R = OFFSET RIGHT
- Assume SG = 30'

BRIDGE STANDARDS

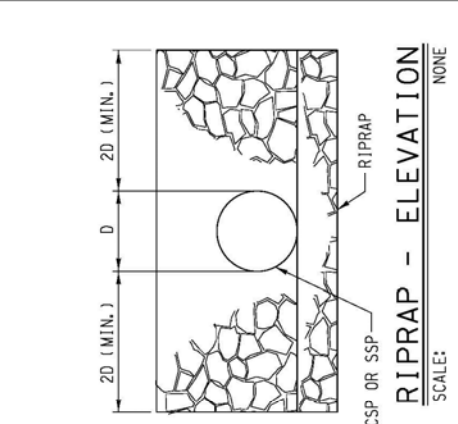
GENERAL NOTES AND DETAILS FOR ROUND STEEL PIPE CULVERTS

FILE OWNER: UPRR
 PLAN NO.: 680000
 DATE: 4/14/08
 UPRR - NORTH SPECIFIC PROJECTS STRUCTURES DESIGN

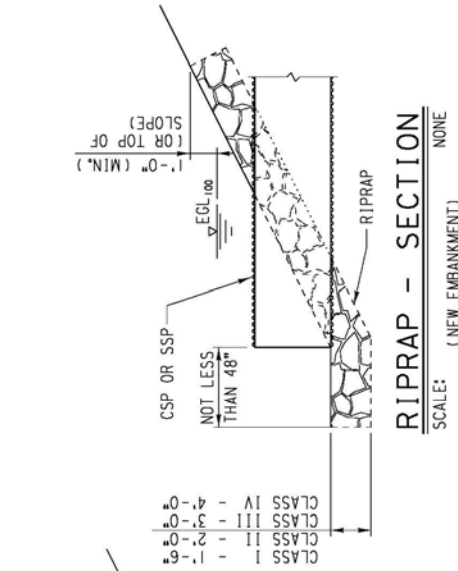
DESIGN BY: CLJ | DRAWN BY: KOM | CHECKED BY: CLJ
 APPROVED: *George J. Meyer* 4/14/08

DATE	DESCRIPTION	REVISIONS
02/12	A	ADDED NOTE TO CULV. LENGTH EQ.
/	/	/
/	/	/
/	/	/

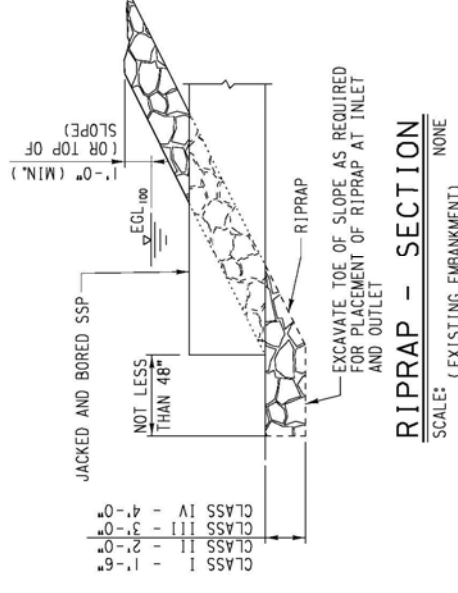
Copyright © 2005 by Union Pacific Railroad
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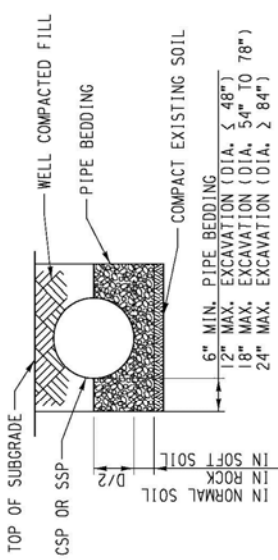
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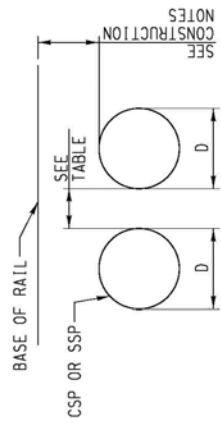
RIPRAP - SECTION
 (NEW EMBANKMENT)
 SCALE: NONE



RIPRAP - SECTION
 (EXISTING EMBANKMENT)
 SCALE: NONE



EXCAVATION AND FILL LIMITS
 SCALE: NONE



MINIMUM PIPE SPACING AND COVER
 SCALE: NONE

PIPE DIAMETER	MIN. SPACING BETWEEN PIPES
12" TO 24"	12"
24" TO 36"	D/2
36" OR MORE	48"

BRIDGE STANDARDS

DETAILS FOR ROUND STEEL PIPE CULVERTS

FILE OWNER: UPRR
 PLAN NO.: 680000
 DATE: 4/14/08

UPRR - HIGH SPECIAL PROJECTS STRUCTURES DESIGN
 DATE: 7/21/2014 11:06:43 AM
 SHEET: 2 OF 3

DATE	DESCRIPTION	DESIGN BY: CLJ	DRAWN BY: KOM	CHECKED BY: CLJ
02/12	A			

APPROVED: *George J. Meyer* 4/14/08

UPRR - HIGH SPECIAL PROJECTS STRUCTURES DESIGN

GENERAL NOTES

CORROSION PROTECTION:

The engineer shall obtain site specific information on corrosiveness of soil and measure an increase in material thickness or protective coating based on local experience.

WELL COMPACTED FILL:

Well compacted fill shall be well graded granular soil free of any lumps of clay, silt, cinders, or other deleterious materials. If aggregate or excessive moisture, fill shall be compacted to 100% of maximum dry density as defined in ASTM International D1557 (Modified Proctor), if 100% compaction cannot be achieved in proximity of existing structures, compaction may be accepted. Fill shall be placed simultaneously on both sides of the pipe and between multiple pipes. CLSM may be used in lieu of well compacted fill.

CONTROLLED LOW-STRENGTH MATERIAL (CLSM) FILL:

Controlled Low-Strength Material is a self-compacting, cementitious fill material with an unconfined compressive strength of 50 to 300 psi. The mixture shall consist of water, Portland cement, fly ash, and sand fine or coarse aggregate or both. The mix design shall be approved by the engineer. The curing time shall be 28 days. Hardening time is of prime importance and CLSM should develop 50 psi in about one hour. The maximum layer of thickness for CLSM shall be 3 feet. Additional layers shall not be placed until the CLSM has lost sufficient moisture to be walked on without indenting more than two inches. Pipe spacing may be reduced with CLSM.

PIPE BEDDING:

Pipe bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, or crushed slag. Pipe bedding shall be compacted to 100% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). If 100% compaction cannot be achieved in proximity of existing structure, 95% compaction may be accepted. Recommended gradation is as follows:

SCREEN SIZE

1. In. or less	3. PASSING LBY WEIGHT
100	
42.5	
20-20	
No. 4	less than 5%
No. 200	

Union Pacific sealant ballast, Item no. 552-5428, may be used.

FIBER OPTIC CABLE:

Contact the Union Pacific "Call Before You Dig" number 90 days (no less than 30 days) prior to the proposed construction start date. The project shall be completed. The CATD number is 1-800-338-9193.

RIPRAP:


Class II riprap shall be specified by the engineer. Riprap shall be used in such a manner as to avoid separation of various sizes of rock, and distributed so that there will be no large accumulation of either the larger or smaller sizes of stone. Individual rocks shall be placed in tight contact with one another in such a way to produce a continuous surface. Riprap shall be placed on unfractured rock or concrete, bulky in shape with sharp angular edges.

Individual rocks shall vary as shown:

RIPRAP CLASS	AVERAGE WEIGHT PER STONE (LBS.)	DIMENSION (INCHES)	UNIT OF MEASURE	ITEM NO.	TYPICAL VELOCITIES (FPS)
I	50 to 200	9 to 14	Ton	562-7164	6 - 8
II	1,000 to 4,000	24 to 38	Ton	562-7090	3'-6"
III	1,000 to 4,000	24 to 38	Ton	562-7162	3'-0"
IV	> 4,000	> 38	Ton		4'-0"

The entire mass of riprap shall well distributed within the limits to produce the required riprap protection. The percentages shall be acceptable to

Riprap Class I	- No allowances are permitted
Riprap Class II	- 5% of Riprap Class I, and 15% of Riprap Class II.
Riprap Class III	- 15% of Riprap Class I, 15% of Riprap Class II, and 15% of Riprap Class III.



BRIDGE STANDARDS

GENERAL NOTES FOR ROUND STEEL PIPE CULVERTS

FILE OWNER: UPRR | DATE: _____
 PLAN NO.: 680000 | SHEET: 3 OF 3

DESIGN BY: CLJ | DRAWN BY: KOM | CHECKED BY: CLJ

APPROVED:

George J. Meyer 4/14/08
 UPRR - HIGH SPECIAL PROJECTS STRUCTURES DESIGN

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DATE	DESCRIPTION	REVISIONS
02/02	A	RELOCATED GENERAL NOTES
09/13	B	CHANGED FILL REQUIREMENTS
7/14	C	CHANGED FILL REQUIREMENTS
/	/	/
/	/	/

CONSTRUCTION NOTES

GENERAL:
 These structures are designed for Cooper E80 Live Load with impact, and cover as shown in Table 1.

Table 1 indicates the minimum required thickness.

INSTALLATION:

Installation of Smooth Steel Pipe (SSP) shall conform to the specifications in the Manual for Railway Engineering, Chapter 1, Part 4. Culvert lengths are to be based on standard mainline roadbed sections.

JACKING:

Where indicated, pipe to be bored and jacked into place. Bore hole diameter shall be essentially the same as the outside diameter of the pipe. The contractor shall develop the jacking plan. If the contractor is to be jacking the pipe, they shall notify the Office of AEP Engineering Design. Boring operations shall not be stopped if such a stoppage would be detrimental to the railroad. A survey crew shall continually monitor the elevation and alignment of the railroad tracks above during the jacking procedure. If track movement or loss occurs, the contractor shall stop the jacking. The Railroad may take any action necessary to ensure safe passage of trains. The contractor must immediately submit a corrective plan of action to the Railroad for review and approval. The Railroad must review and approve the proposed repair procedure. The finished structure shall be placed back into service, and the construction proceed.

BORED AND JACKED TOLERANCES:

The permitted tolerance of a true line is $\pm 1/8"$. Adjustment to the line and level should be gradual to ensure that the pipe manufacturer's stated angular deflection is not exceeded at any joint.

FIELD WELDING:

Welders must possess valid certification.

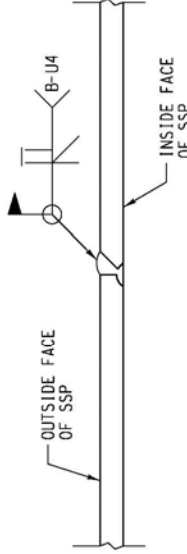
MATERIALS:

Pipe shall be in accordance with ASTM International A139. Pipe to be Grade B and steel shall have a minimum yield strength of 35 ksi. A hydrostatic test is not required. Smooth steel pipe shall have a welded straight longitudinal seam. The ends of each section of pipe shall be square cut. One end shall be suitably beveled for field welding sections together.

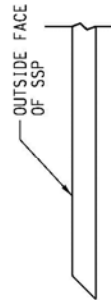
TABLE 1 - ROUND SMOOTH STEEL PIPE (SSP)

OUTSIDE PIPE DIAMETER	THICKNESS (IN.)	WEIGHT (LB./FT.)	COVER * (FT.)		20'-0" LENGTH STORE ITEM NUMBERS	WEIGHT (LB.)
			MIN.	MAX.		
12"	3/8	24	1'-6"	18'-0"	-	480
18"	1/4	48	1'-6"	18'-0"	-	960
21"	5/8	69	1'-6"	18'-0"	-	1,380
24"	5/8	80	1'-6"	18'-0"	-	1,600
30"	3/8	119	1'-6"	18'-0"	-	2,380
36"	1/2	190	1'-6"	18'-0"	510-3285	3,800
42"	1/2	222	1'-6"	18'-0"	-	4,440
48"	5/8	317	1'-6"	18'-0"	510-3293	6,340
60"	3/4	475	1'-6"	18'-0"	-	9,500
72"	7/8	666	1'-6"	18'-0"	-	13,320
84"	1	888	1'-6"	18'-0"	-	17,760
96"	1 1/4	1,267	1'-6"	18'-0"	-	25,340

* COVER TO BE MEASURED FROM BASE OF RAIL TO TOP OF PIPE



PIPE END WELD DETAIL



PIPE END BEVEL DETAIL

DESIGN BY: CLJ		DRAWN BY: KOM		CHECKED BY: CLJ	
APPROVED:					
BRIDGE STANDARDS					
CONSTRUCTION NOTES AND TABLE FOR SMOOTH STEEL PIPE CULVERTS					
FILE OWNER: UPRR	DATE:	PLAN NO.: 680010	DATE:	SHEET: 1 OF 1	
<i>George J. Meyer</i> 4/14/08 UPRR - HIGH SPECIAL PROJECTS STRUCTURES DESIGN Copyright © 2005 by Union Pacific Railroad PLOTTED: 6/18/2013 4:21:58 PM					

CONSTRUCTION NOTES

GENERAL:

These structures are designed for Cooper E80 live load with impact, and cover as shown in Table 1.
 Generally, 30 inch diameter and larger Corrugated Steel Pipe (CSP) is preferred for mainline culverts. Smaller pipes are to be used for local drainage.

Table 1 indicates the minimum required gage thickness for structural stability.

INSTALLATION:

1. Installation of CSP shall conform to the current American Railway Engineering and Maintenance Association (AREMA) Manual for Railway Engineering, Chapter 1, Part 4, Culvert lengths are to be based on standard mainline roadbed sections. These standards are for installation in soil with a pH of 5-9 and resistivity 2,100 ohm-cm. Pipes located in soils outside these limits shall have additional corrosion protection as specified by the engineer.
2. Wire or timber strutting used during installation must be removed immediately after installation and backfill are complete.
3. Pipe culverts will generally be joined using 2 foot wide locking corrugated metal connecting bands. The inside of culverts to be joined by corrugated connecting bands shall be kept clean and free of oil, rust, dirt or gravel. The corrugations on the connecting bands and the pipe culvert shall fit snugly as the connecting bands are tightened.
4. Corrugated steel pipe culverts must be placed with the inside circumferential laps pointing downstream.
5. Culverts resting on rock foundation need not be cambered. Culverts resting on embankment shall be cambered with the following:
 - A. Embankments up to 8 feet high (measured base of rail to flowline) require a 1/2 inch camber.
 - B. Embankments 8 feet to 12 feet high require a 2/2 inch camber.
 - C. Embankments 12 feet to 18 feet high require a 4 inch camber.

In no case shall the culvert be cambered so high in the center that water will be pocketed at the inlet and end of the pipe.

PIPE MATERIAL SPECIFICATIONS, FABRICATION AND TOLERANCE:

1. CSP material shall be in accordance with the current AREMA Manual for Railway Engineering, Chapter 1, Part 4, Section 3.
2. The pipe shall be fabricated, assembled into sections and furnished as follows:
 - 12", 18", 21", and 24" DIAMETER ONLY:
 Class 1 with 2 2/3" x 1/2" annular corrugations.
 Shape 1, vertical elongation is not required.
 Single riveted longitudinal seams.
 - 30" DIAMETER AND GREATER:
 Class 1 with 3" x 1/2" annular corrugations (30 inch pipes may have 2 2/3" x 1/2" annular corrugations).
 Shape 1, vertical elongation is not required.
 Single riveted longitudinal seams.
 Double riveted seams.

ALL CSP DIAMETERS:

- Square out ends.
- Two lifting lugs per preassembled section.
- Lifting hardware for erection and installation.
- Minimum 1/2 inch diameter bolts for State Highway and Transportation Officials (ASHTO) M274 (36 inch diameter pipes shall be galvanized).

3. Permanently attach an identification plate inside the pipe near the end of the segment. The plate is to contain the following information:
 - Name of manufacturer and plant location
 - Date assembled
 - Gage
 - Diameter
 - Length

The same information plus the lifting weight shall be stenciled on the outside face of the pipe.

4. The inside diameter of the circular pipe shall not vary more than 1/2 inch from the nominal diameter when measured 48 inches inside the corrugations. The corrugations through 48 inches end to end for diameters less than 48 inches in any case shall be the difference in the diameter of the abutting pipe ends be more than 1/2 inch.
5. The minimum width of the longitudinal lap is 1/2 inches for pipes with nominal inside diameter of 12 or 24 inches, 2 inches for pipes with nominal inside diameter of 30 inches or 36 inches, and 3 inches for all pipes with nominal inside diameter of 36 inches or greater.

6. Riveted Seams:
 - A. All 14 gage pipe shall have at least 3/8 inch diameter rivets, 12 gage and thicker pipe shall have at least 1/2 inch diameter rivets.
 - B. Longitudinal seams shall be riveted with one rivet in each corrugation valley for all pipes 24 inches in diameter and smaller. Longitudinal seams shall be riveted with two rivets in each valley for all pipes 30 inches in diameter and thicker. Circumferential seams shall be riveted with a maximum rivet spacing of six inches.
 - C. All rivets shall be cold driven in such a manner that the metal shall be drawn tightly together throughout the length of the seam. Rivets shall be spaced at a distance less than two rivet diameters from the edge of the sheet.
 - D. All rivets shall have full hemispherical heads or heads of a form acceptable to the engineer. They shall be driven in a workmanlike manner to completely fill the hole without bending.
7. Pipes shall be joined with locking coupling bands in accordance with the provisions of the AREMA Manual for Railway Engineering Chapter 1, Part 4, Section 4.3.4. Coupling bands shall be of the same base metal and finish as the pipes. Coupling bands shall be 24 inches wide for pipes 30 inch diameter and larger. Smaller pipes may use 7 inch wide bands. Coupling band thickness is shown in Table 1.

**BRIDGE
STANDARDS**

**CONSTRUCTION NOTES AND
TABLE FOR CORRUGATED
STEEL PIPE CULVERTS**

FILE OWNER: UPRR DATE: _____
 PLAN NO.: 680200 SHEET: 1 OF 2

DESIGN BY: CJJ DRAWN BY: KOM CHECKED BY: CJJ

APPROVED:

George J. Meyer 4/14/08
 UPRR - MAIN SPECIAL PROJECTS STRUCTURES DESIGN

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REVISIONS	
DATE	DESCRIPTION

TABLE 1 - ROUND CORRUGATED STEEL PIPE (CSP)

INSIDE PIPE DIAMETER	GAGE	THICKNESS (IN.)	WEIGHT (LB./FT.)	COVER *		10'-0" ITEM NO.	10'-0" LENGTH (L.B.)	12'-0" ITEM NO.	12'-0" LENGTH (L.B.)	14'-0" ITEM NO.	14'-0" LENGTH (L.B.)	16'-0" ITEM NO.	16'-0" LENGTH (L.B.)	18'-0" ITEM NO.	18'-0" LENGTH (L.B.)	20'-0" ITEM NO.	20'-0" LENGTH (L.B.)	22'-0" ITEM NO.	22'-0" LENGTH (L.B.)	24'-0" ITEM NO.	24'-0" LENGTH (L.B.)	CONNECTING BANDS		
				MIN. (FT.)	MAX. (FT.)																	ITEM NO.	WEIGHT (L.B.)	ITEM NO.
12"	14	0.079	12	1'-6"	18'-0"	510-2975	120	510-2976	144	-	168	-	192	-	216	510-2977	240	-	264	510-2978	288	-	-	-
18"	14	0.079	18	1'-6"	18'-0"	510-2979	180	510-2980	216	-	252	-	288	-	324	510-2981	360	-	396	510-2982	432	-	-	-
24"	14	0.079	24	1'-6"	18'-0"	510-2983	240	510-2984	252	-	294	-	336	-	378	510-2985	420	-	462	510-2986	504	-	-	-
30"	14	0.079	30	1'-6"	18'-0"	-	300	-	360	510-3045	420	510-3046	480	510-3047	540	510-3048	600	510-3049	660	510-3045	720	510-3124	16	16
36"	14	0.079	41	2'-6"	18'-0"	-	410	-	492	510-3055	574	510-3056	656	510-3057	738	510-3057	820	510-3068	902	510-3069	984	510-3130	16	16
42"	14	0.079	47	2'-6"	18'-0"	-	470	-	564	510-3073	658	510-3074	752	510-3075	846	510-3077	940	510-3078	1,034	510-3079	1,128	510-3132	16	16
48"	12	0.109	74	2'-6"	18'-0"	-	740	-	888	510-3081	1,036	510-3082	1,184	510-3083	1,332	510-3084	1,480	510-3085	1,628	510-3086	1,776	510-3138	14	14
60"	12	0.138	92	2'-6"	18'-0"	-	920	-	1,104	510-3087	1,288	510-3088	1,472	510-3089	1,656	510-3091	1,840	510-3092	2,024	510-3093	2,208	510-3150	12	12
72"	10	0.138	140	3'-6"	18'-0"	-	1,400	-	1,680	510-3100	1,960	510-3101	2,240	510-3102	2,520	510-3103	2,800	510-3104	3,080	510-3105	3,360	510-3158	12	12
84"	8	0.138	164	3'-6"	18'-0"	-	1,640	-	1,968	510-3114	2,296	510-3115	2,624	510-3116	2,952	510-3117	3,280	510-3118	3,608	510-3113	3,936	510-3176	12	12
96"	8	0.168	228	3'-6"	18'-0"	-	2,280	-	2,736	510-3181	3,192	510-3182	3,648	510-3183	4,104	510-3184	4,560	510-3185	5,016	510-3186	5,472	510-3188	10	10

* COVER TO BE MEASURED FROM BASE OF RAIL TO TOP OF PIPE

BRIDGE STANDARDS

CONSTRUCTION NOTES AND TABLE FOR CORRUGATED STEEL PIPE CULVERTS

FILE OWNER: UPRR
 PLAN NO.: 680200
 SHEET: 2 OF 2

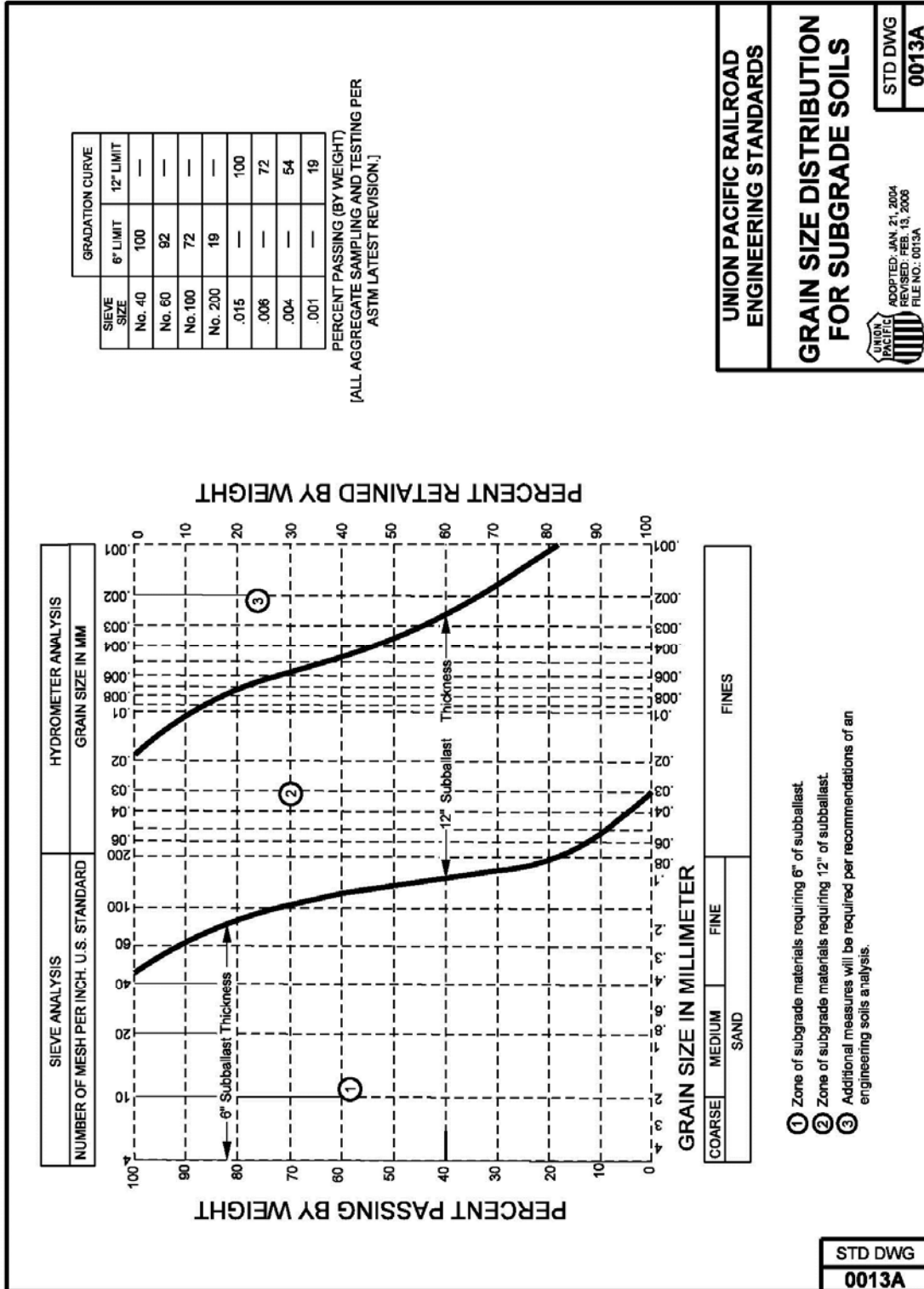
DESIGN BY: CLJ | DRAWN BY: KOM | CHECKED BY: CLJ

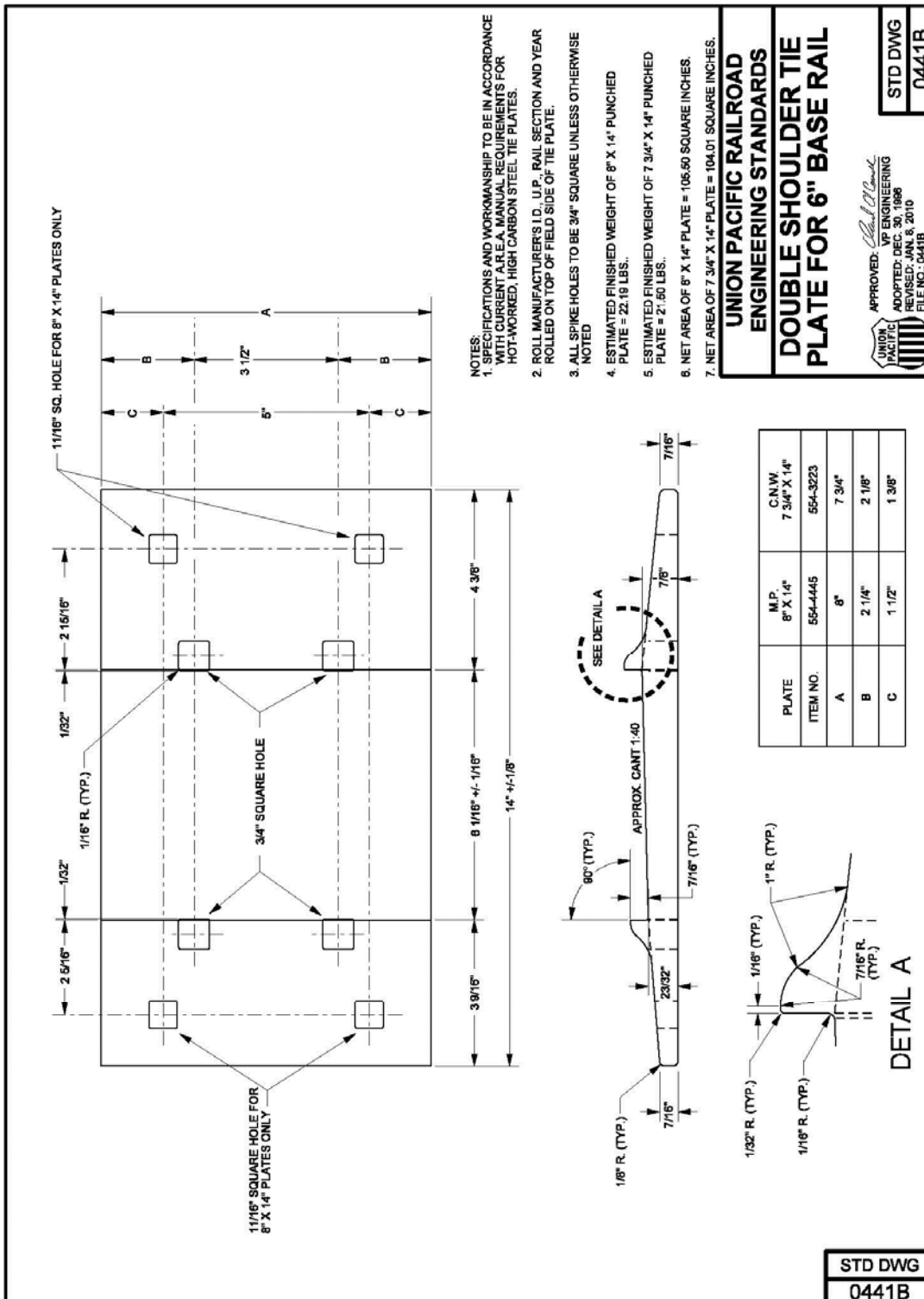
APPROVED:

George J. Meyer 4/14/08
 UPRR - MGR SPECIAL PROJECTS DESIGN

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REVISIONS		
DATE	DESCRIPTION	CORRECTED ITEM NUMBER
/	/	/
/	/	/
/	/	/
/	/	/





STD DWG
 0441B

DETAIL A

BNSF ITEM NUMBERS			CSX ITEM NUMBERS		
ITEM NO.	WT	SPIKES/KG	ITEM NO.	WT	SPIKES/KG
527570005	200	241	013.8250325.1	100	120
527570014	-	BULK	013.8250327.1	-	BULK

CN ITEM NUMBERS			NS ITEM NUMBERS		
ITEM NO.	WT	SPIKES/KG	ITEM NO.	WT	SPIKES/KG
01-03-303	200	241	640-903705	200	241

CP ITEM NUMBERS			UPRR ITEM NUMBERS		
ITEM NO.	WT	SPIKES/KG	ITEM NO.	WT	SPIKES/KG
002840231	50	62	550-6707	150	180
002840266	-	BULK	550-6710	-	BULK

- NOTES:
- MATERIAL AND WORKMANSHIP TO BE IN ACCORDANCE WITH CURRENT AREMA MANUAL REQUIREMENTS FOR MEDIUM CARBON SPIKES.
 - PERMISSIBLE SHANK STRAIGHTNESS VARIATION, MEASURED IN EITHER PLANE, SHALL NOT EXCEED 0.0313".
 - MANUFACTURER'S I.D. AND THE LETTERS "MC" SHALL BE PRESSED ON THE HEAD OF EACH SPIKE WHILE BEING FORMED.
 - WEIGHT = APPROXIMATELY 0.83 LBS. EACH.









COMMON STANDARDS

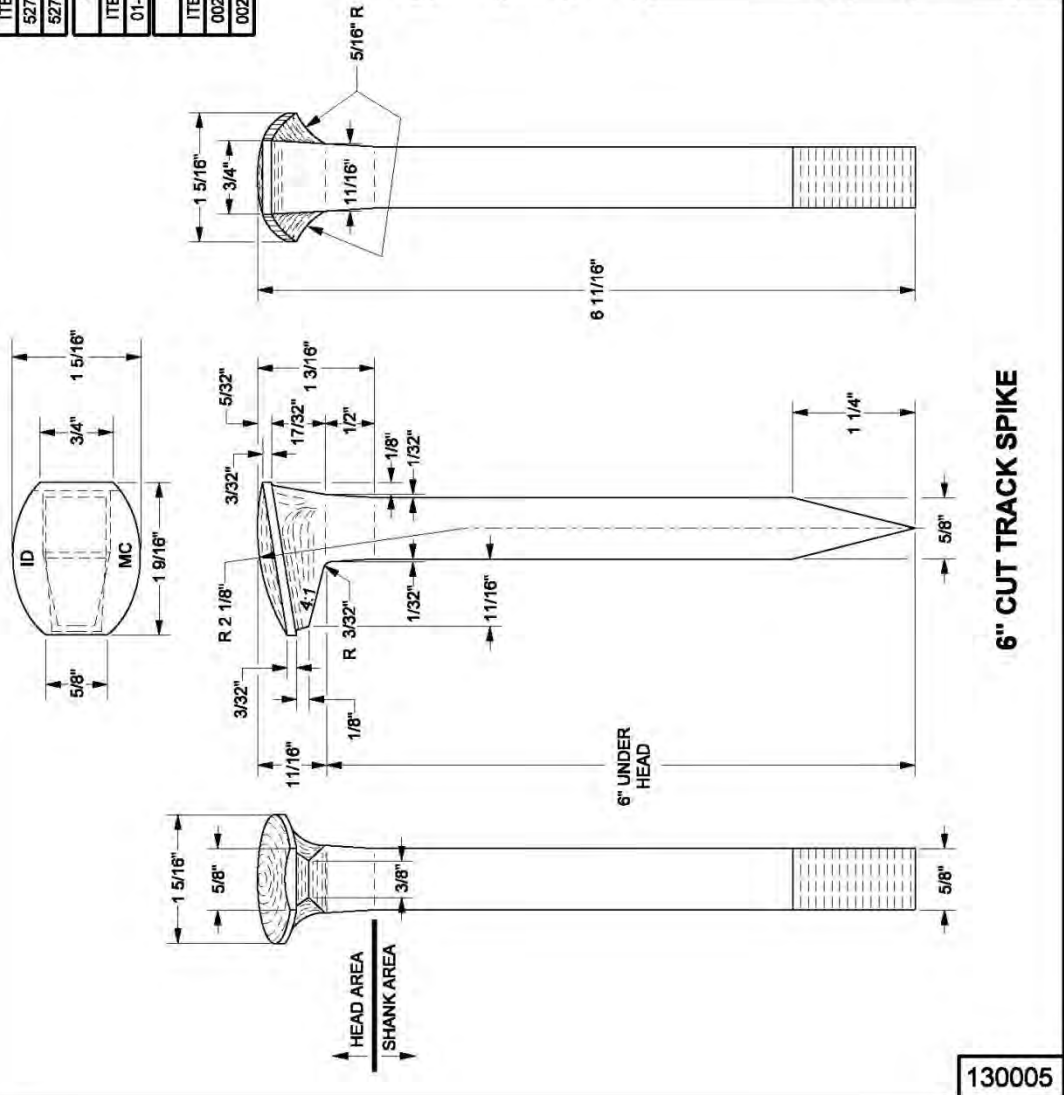
6" TRACK SPIKE

FILE OWNER: UPRR

DATE: JULY 16, 2012

REV. NO.: 3

DWG NO.: 130005



130005

<p>TRACKWORK</p> <ul style="list-style-type: none"> -VOESTALPINE NORTRAK -ALL TURNOUT SIZES AND ALL MATERIAL THAT COMPRISES A TURNOUT -SMSG, RBM, ALL SPRING, JUMP, MPFF FROGS -MACHINED AND FORGED TRANSITION RAILS -HOLLOW STEEL TIE (FOR CHEYENNE, WY COMPLES WITH ALL UPPER UNION REQUIREMENTS) -PROGRESS RAIL -TURNOUT SIZES NO. 20 AND LESS AND ALL MATERIAL THAT COMPRISES TURNOUTS NO. 20 AND LESS -SMSG, RBM, ALL SPRING, JUMP, MPFF FROGS -MACHINED AND FORGED TRANSITION RAILS -ROBOTIC PREPLATING OPERATING COMPLES WITH ALL UPPER UNION REQUIREMENTS -CLEVELAND TRACK -TURNOUT SIZES NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS AND ALL MATERIAL THAT COMPRISES TURNOUTS NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS -SMSG, RBM FROGS -PRE-PLATED TURNOUTS CAN ONLY BE SHIPPED TO FORMER MOPAC AND CNW TERRITORIES -A&K RAILROAD MATERIALS -TURNOUT SIZES NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS AND ALL MATERIAL THAT COMPRISES TURNOUTS NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS -SMSG, RBM FROGS -PRE-PLATED TURNOUTS CAN ONLY BE SHIPPED TO FORMER MOPAC AND CNW TERRITORIES -ATLANTIC TRACK -TURNOUT SIZES NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS AND ALL MATERIAL THAT COMPRISES TURNOUTS NO. 11 AND LESS FOR NON-MANLINE APPLICATIONS -SMSG, RBM FROGS -MACHINED AND FORGED TRANSITION RAILS -PRE-PLATED TURNOUTS CAN ONLY BE SHIPPED TO FORMER MOPAC AND CNW TERRITORIES 	<p>FROG BOLTS</p> <ul style="list-style-type: none"> -LEWIS BOLT -COPPER STATE <p>SELF-CENTERING BOLT SYSTEM</p> <ul style="list-style-type: none"> -SELF-CENTERED BOLT AND NUT -LEWIS BOLT & NUT -SELF-CENTERING WASHER -LEWIS BOLT NUT -HOWARD STEEL COMPANY <p>TRACK WASHERS</p> <ul style="list-style-type: none"> -ITW SHAKEPROOF <p>LOCKNUTS</p> <ul style="list-style-type: none"> -LEWIS BOLT & NUT -COPPER STATE -SECURITY LOCKNUT <p>CEDAR TIE PLUGS</p> <ul style="list-style-type: none"> -ATLANTIC AND PACIFIC RAIL SUPPLY -TRANS CANADA WOOD PRODUCTS LTD. -BSP MANUFACTURING INC. <p>BONDED INSULATED JOINTS</p> <ul style="list-style-type: none"> -KOPPERS (FORMERLY PORTEC, HUNTINGTON, WV PLANT ONLY) -A&K RAILROAD MATERIALS <p>INSULATED JOINT BARS</p> <ul style="list-style-type: none"> -A&K RAILROAD MATERIALS -SENECA RAILROAD & MINING -KOPPERS (FORMERLY PORTEC, HUNTINGTON, WV PLANT ONLY) <p>PRECAST CONCRETE CROSSING PANELS</p> <ul style="list-style-type: none"> -AMERICAN CONCRETE -OMEGA INDUSTRIES -MAGNUM <p>PREFAB WOOD CROSSING PANELS</p> <ul style="list-style-type: none"> -KOPPERS -GARLAND GASTON LUMBER <p>FROG RETARDER KITS</p> <ul style="list-style-type: none"> -NORTRAK SPRING WING CONTROLLER 	<p>RAIL (STANDARD STRENGTH)</p> <ul style="list-style-type: none"> -EVRAZ -STEEL DYNAMIC INC. (FORT WAYNE, IN) -MITTAL <p>RAIL (INTERMEDIATE STRENGTH HEAD HARDENED)</p> <ul style="list-style-type: none"> -EVRAZ -MITTAL -JFE -STEEL DYNAMIC INC. (FORT WAYNE, IN) -NIPPON STEEL CO <p>RAIL (HIGH CARBON HEAD HARDENED)</p> <ul style="list-style-type: none"> -EVRAZ -NIPPON STEEL CO <p>TIES (WOOD)</p> <ul style="list-style-type: none"> -STELLA-JONES (FULTON, KY, ALEXANDRIA, LA, MONTEVALLO, AL, WNSLOW, IN, BANGOR, WI, ELOY, AZ AND RUSSELLVILLE, AR) -AMERTIES (THE DALLES, OR AND HOPE, AR) -KOPPERS DENVER, CO, GUTHRIE, KY AND N. LITTLE ROCK, AR) <p>TIES (CONCRETE)</p> <ul style="list-style-type: none"> -ROCLA (AMARILLO, TX AND PUEBLO, CO) -VOESTALPINE NORTRAK (TURNOUT & SPECIALTY TIES) -RAIL ONE (CLINTON, IA) <p>ANCHORS</p> <ul style="list-style-type: none"> -AMSTED RPS <p>LEWIS BOLT AND NUT (FOR NEW TURNOUTS ONLY)</p>	<p>FIELD WELD MATERIALS</p> <ul style="list-style-type: none"> -RAILTECH BOUTIET -ORGO THERMIT <p>TRACK SPIKES</p> <ul style="list-style-type: none"> -AMERISTEEL (ALL FACILITIES) -BIRMINGHAM RAIL AND LOCOMOTIVE <p>TIMBER SCREW SPIKES</p> <ul style="list-style-type: none"> -LEWIS BOLT & NUT COMPANY (STANDARD AND EVERGRIP) <p>BALLAST</p> <ul style="list-style-type: none"> -VULCAN MATERIALS - TABLE MOUNTAIN (KROVILLE, GA) -RCL ROCKS - SIERRA BLANCA (SIERRA BLANCA, TX) -CERTAIN TEED - GADS HILL (GADS HILL, MO) -MARTIN - MARIETTA - JONES MILL (MALVERN, AR) -L.G. EVERIST - DELL RAPIDS (DELL RAPIDS, SD) -HARNEY ROCK & PAVING - HANEY ROCK (N. POWDER, OR) -MARTIN - MARIETTA - TWIN MOUNTAIN (MILFORD, UT) -MARTIN - MARIETTA - MILL CREEK (MILL CREEK, OK) -VULCAN MATERIALS CO. - KNIPPA (UVALDE, TX) -MERIDIAN AGGREGATES - GRANITE CANYON (GRAND CANYON, WV) -GRANITE MOUNTAIN - GRANITE MOUNTAIN (SWEETHOME, AR) -MARTIN - MARIETTA - BLACK SPUR (UVALDE, TX) -FRED WEBER, INC. - IRON MOUNTAIN (IRON MOUNTAIN, MO) 		
<p>UNION PACIFIC RAILROAD ENGINEERING DRAWINGS</p> <p>APPROVED TRACKWORK SUPPLIERS</p> <p>APPROVED: <i>Richard D. Combs</i> VP ENGINEERING ADOPTED: JAN. 10, 2005 REVISED: AUG. 13, 2016 FILE NO.: 6010L</p> <p>Copyright © 2016 by Union Pacific Railroad</p>		<p>TRACK BARS (NEW)</p> <ul style="list-style-type: none"> -CLEVELAND TRACK (CHINA AND DOMESTIC) -A&K RAILROAD MATERIALS (CHINA) <p>TRACK BOLTS (BOLTS, NUTS & WASHERS)</p> <ul style="list-style-type: none"> -PROTTSA (MEXICO) -TAICONG ZHONGBO -VIA PACIFIC (CHINA) -LEWIS BOLT & NUT -A&K RAILROAD 	<p>EXPANSION JOINTS</p> <ul style="list-style-type: none"> -ATLANTIC TRACK -CMI PROMEX 	<p>ABRASIVE WHEELS</p> <ul style="list-style-type: none"> -NORTON / NORZON -GEISMAR -ALLISON 	<p>MISC DWG 6010L PAGE 1 OF 2</p>

APPROVED ELASTIC FASTENING SYSTEM COMPONENTS

SAFELOK I			SAFELOK III		
ITEM NUMBER	ITEM DESCRIPTION	APPROVED SUPPLIER	ITEM NUMBER	ITEM DESCRIPTION	APPROVED SUPPLIER
503 - 5100	SAFELOK I SPRING CLIP. STANDARD DWG 132000.	AMSTED RPS / PANDROL	503 - 6161	SAFELOK III STANDARD CLIP WITH 2 TOE INSULATORS INSTALLED.	PANDROL
503 - 5150	GALVANIZED SAFELOK I SPRING CLIP.	AMSTED RPS / PANDROL	503 - 6164	GALVANIZED SAFELOK III STANDARD CLIP WITH 2 TOE INSULATORS INSTALLED.	PANDROL
503 - 5250	STANDARD SAFELOK I INSULATOR. STANDARD DWG 0415.	AMSTED RPS / PANDROL	503 - 6167	TWIN STEM SHOULDER FOR SAFELOK III FASTENING SYSTEM.	PANDROL
503 - 5246	SAFELOK I NARROW INSULATOR. FOR USE IN CORRECTING WIDE GAGE. STANDARD DWG 0415.	PANDROL	503 - 6171	SAFELOK III CLIP TOE INSULATOR.	PANDROL
503 - 5390	SAFELOK I HEAVY DUTY INSULATOR. STANDARD DWG 0415.	AMSTED RPS / PANDROL	503 - 6182	SAFELOK III SIDE POST INSULATOR.	PANDROL
503 - 6178	SAFELOK I WIDE INSULATOR. FOR USE IN CORRECTING WIDE GAGE. STANDARD DWG 0415.	PANDROL	503 - 6166	SAFELOK III INTEGRAL ABRASION ASSEMBLY. THE PAD INCLUDES 2 SUBPOST INSULATORS, RAIL PAD AND ABRASION PLATE.	PANDROL
503 - 5460	ABRASION PAD ASSEMBLY FOR SAFELOK I.	VOESTALPINE NORTRAK / PANDROL / AMSTED RPS	503 - 6169	NYLON INSULATOR FOR USE AT INSULATED JOINT LOCATION ON SAFELOK III FASTENING SYSTEM. STANDARD DWG 0427.	PANDROL
410 - 5460	LEVER TYPE RAIL CLIP APPLICATOR FOR INSTALLING SAFELOK I SPRING CLIPS.	AMSTED RPS	503 - 6172	JOINT CLIP FOR USE AT INSULATED JOINT LOCATION ON SAFELOK III FASTENING SYSTEM. STANDARD DWG 0427.	PANDROL
410 - 5464	UNIVERSAL RAIL CLIP REMOVAL TOOL. SCISSOR TYPE FOR REMOVING SAFELOK I CLIPS FROM CONCRETE AND STEEL TIES.	AMSTED RPS	410 - 5456	SAFELOK III RAIL CLIP REMOVAL TOOL. SCISSOR TYPE.	PANDROL
410 - 5467	LEVER ACTION RAIL MANIPULATOR TO ALLOW CLEARANCE FOR INSULATORS.	AMSTED RPS	410 - 7437 AND 410 - 7438	SAFELOK III THE NIPPING TOOL. HOOK AND BAR.	INDUSTRIAL RAILWAY SUPPLY

FASTCLIP		
ITEM NUMBER	ITEM DESCRIPTION	APPROVED SUPPLIER
503 - 6186	FASTCLIP ASSEMBLY. TWO CLIPS WITH TWO INSULATORS ATTACHED.	PANDROL

E-CLIP		
ITEM NUMBER	ITEM DESCRIPTION	APPROVED SUPPLIER
503 - 6100	E-2066 STANDARD RIGHT HAND PANDROL E-CLIP FOR WOOD AND CONCRETE TIE APPLICATIONS.	PANDROL / UNITED STEEL AND FASTENERS
503 - 6101	ECL-2066 GALVANIZED RIGHT HAND PANDROL E-CLIP FOR WOOD AND CONCRETE TIE APPLICATIONS FOR TUNNELS AND GRADE CROSSINGS.	PANDROL
503 - 6125	E-2056 LEFT HAND PANDROL E-CLIP FOR WOOD AND CONCRETE TIE APPLICATIONS.	PANDROL
503 - 6150	E-2063 MODIFIED PANDROL E-CLIP FOR JOINT BAR LOCATIONS (INSULATED AND STANDARD). CLIP FOR WOOD AND CONCRETE TIE APPLICATIONS.	PANDROL
503 - 6202	TWO PART PAD ASSEMBLY FOR E-CLIP FASTENING SYSTEM. 8 M.M.	PANDROL
503 - 6240	WIDE POST E-CLIP INSULATOR WITH .56" WIDE POST FOR USE WITH E-CLIP FASTENING SYSTEM ON CONCRETE TIES. TO CORRECT GAGE ISSUES. STANDARD DWG 0418.	PANDROL
503 - 6246	NARROW POST E-CLIP INSULATOR WITH .215" POST FOR USE WITH E-CLIP FASTENING SYSTEM ON CONCRETE TIES. TO CORRECT GAGE ISSUES. STANDARD DWG 0418.	PANDROL
503 - 6250	HEAVY DUTY STANDARD INSULATOR E-CLIP. FOR USE ON FIELD SIDE APPLICATIONS IN CURVES GREAT THAN 1 DEGREE 30 MINUTES. STANDARD DWG 0418.	AMSTED RPS / PANDROL
503 - 6280	STANDARD DUTY INSULATOR E-CLIP. FOR USE IN TANGENT TRACK AND CURVES LESS THAN 1 DEGREE 30 MINUTES. STANDARD DWG 0418.	AMSTED RPS / PANDROL
503 - 6502	FORGED STEEL WELD ON SHOULDER FOR E-2065 CLIP. FOR SPECIAL PLATE WORK.	AMSTED RPS / PANDROL VOESTALPINE NORTRAK / PROGRESS RAIL

**UNION PACIFIC RAILROAD
 ENGINEERING DRAWINGS**

**APPROVED TRACKWORK
 SUPPLIERS**

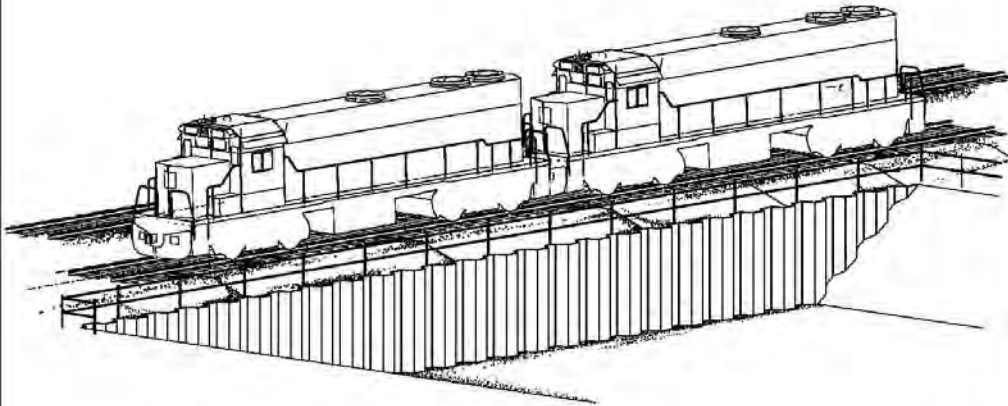
APPROVED: *Richard J. Leland*
 VP ENGINEERING
 ADOPTED: JAN 9, 2006
 REVISED: AUG. 13, 2015
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GUIDELINES FOR TEMPORARY SHORING



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GUIDELINES FOR TEMPORARY SHORING

1. SCOPE

The scope of these guidelines is to inform public agencies, design engineers, contractors and inspectors of current Railroad standards and requirements concerning design and construction of temporary shoring.

1. The term **Railroad** refers to the Burlington Northern & Santa Fe Railway (BNSF) and/or the Union Pacific Railroad (UPRR). The term **Contractor** is defined as any party gaining access to work on Railroad right-of-way or other Railroad operating locations.
2. These guidelines are provided as a reference and may not be taken as authority to construct without prior review and written approval of the Railroad. These guidelines supersede all previous guidelines for temporary shoring and are subject to revision without notice.
3. These guidelines supplement the current, American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual of Recommended Practice. The 2002 AREMA Manual was utilized in developing this guideline. The AREMA Manual is available from:

American Railway Engineering and Maintenance-of-Way Association
8201 Corporate Drive, Suite 1125
Landover, MD 20785-2230
Phone: (301) 459-3200
FAX: (301) 459-8077
www.arena.org
4. The specific requirements for temporary shoring addressed in this document shall be followed for all locations where the Railroad operates, regardless of track ownership.
5. Any items not covered specifically herein shall be in accordance with the AREMA Manual and subject to the review and approval of the Railroad. Where conflicts exist, the most stringent specification should be applied.
6. All excavations shall also be governed by Railroad requirements, Federal, State and Local laws, rules, and regulations concerning construction safety.
7. Safe rail operations shall be required for the duration of the project. All personnel, railroad tracks and property shall be protected at all times.
8. To expedite the review process of the temporary shoring plans, drawings submitted by the Contractors are required to adhere to the project specifications, AREMA and other Railroad requirements.

2. GENERAL CRITERIA

The Contractor must not begin construction of any component of the shoring system affecting the Railroad right-of-way until written Railroad approval has been received.

1. All excavations shall be in compliance with applicable OSHA regulations and shall be shored where there is any danger to tracks, structures or personnel regardless of depth.

2. The Contractor is responsible for planning and executing all procedures necessary to construct, maintain and remove the temporary shoring system in a safe and controlled manner.
3. Emergency Railroad phone numbers are to be obtained from the Railroad representative in charge of the project prior to the start of any work and shall be posted at the job site.
4. The Contractor must obtain a valid right of entry permit from the Railroad and comply with all Railroad requirements when working on Railroad property.
5. The Contractor is required to meet minimum safety standards as defined by the Railroad.
6. All temporary shoring systems that support or impact the Railroad's tracks or operations shall be designed and constructed to provide safe and adequate rigidity.
7. The Railroad requirements, construction submittal review times and review criteria should be discussed at the pre-construction meeting with the Contractor.
8. A flagman is required when any work is performed within 25 feet of track centerline. If the Railroad provides flagging or other services, the Contractor shall not be relieved of any responsibilities or liabilities as set forth in any document authorizing the work. No work is allowed within 50 feet of track centerline when a train passes the work site and all personnel must clear the area within 25 feet of track centerline and secure all equipment when trains are present.
9. Appropriate measures for the installation and protection of fiber optic cables shall be addressed in the plans and contract documents. For specific Railroad requirements and additional information refer to:

www.bnsf.com or call 1-800-533-2891.

www.uprr.com, call 1-800-336-9193 or refer to UPRR Fiber Optic Engineering, Construction and Maintenance Standards.
10. Relocation of utilities or communication lines not owned by the Railroad shall be coordinated with the utility owners. The utility relocation plans must then be submitted to the Railroad utility representative for approval. The shoring plans must include the correct contact for the Railroad, State or Local utility locating service provider. The Railroad will not be responsible for cost associated with any utility, signal, or communication line relocation or adjustments.

3. CONTRACTOR RESPONSIBILITIES

The Contractor shall be solely responsible for the design, construction and performance of the temporary structure. (AREMA 8.28.1.3)

1. The Contractor's work shall in no way impede the train operations of the Railroad and must be coordinated with the local Railroad operating department.
2. The Contractor shall develop a work plan that enables the track(s) to remain open to train traffic at all times.
3. The Contractor shall comply with all State and Federal Laws, county or municipal ordinances and regulations which in any manner affect the work.
4. All removed soils will become the responsibility of the Contractor and shall be disposed of outside the Railroad right-of-way according to the applicable Federal, State and Local regulations.
5. The Project Engineer and the Contractor shall evaluate the quality of materials furnished and work performed.

6. The Contractor is responsible to protect the Railroad ballast and subballast from contamination.
7. The Contractor must monitor and record top of rail elevations and track alignment for the duration of the project. The movement shall be within the limits defined in **Table 1, Deflection Criteria** on page 10. Displacements exceeding the limits defined in **Table 1** must be immediately reported to the Railroad. All work on the project must stop and the Railroad may take any action necessary to ensure safe passage of trains. The Contractor must immediately submit a corrective action plan to the Railroad for review and approval. The Railroad must review and approve the proposed repair procedure. The repair must be inspected by the Railroad before the track can be placed back in service.
8. Any damage to Railroad property such as track, signal equipment or structure could result in a train derailment. All damage must be reported immediately to the Railroad representative in charge of the project and to the Railroad Manager of Track Maintenance (MTM).

4. INFORMATION REQUIRED

Plans and calculations shall be submitted, signed and stamped by a Registered Professional Engineer familiar with Railroad loadings and who is licensed in the state where the shoring system is intended for use. Shoring design plans and calculations shall be in English units. If Metric units are used, all controlling dimensions, elevations, design criteria assumptions, and material stresses shall be expressed in dual units, with English units to be in parentheses. Information shall be assembled concerning right-of-way boundary, clearances, proposed grades of tracks and roads, and all other factors that may influence the controlling dimensions of the proposed shoring system. See section 10 for additional requirements.

1. Field Survey.

Sufficient information shall be shown on the plans in the form of profiles, cross sections and topographical maps to determine general design and structural requirements. Field survey information of critical or key dimensions shall be referenced to the centerline of track(s) and top of rail elevations. Existing and proposed grades and alignment of tracks and roads shall be indicated together with a record of controlling elevation of water surfaces or ground water. Show the location of existing/proposed utilities and construction history of the area which might hamper proper installation of the piling, soldier beams, or ground anchors.

2. Geotechnical Report shall provide:

- a. Elevation and location of soil boring in reference to the track(s) centerline and top of rail elevations.
- b. Classification of all soils encountered.
- c. Internal angle of soil friction.
- d. Dry and wet unit weights of soil.
- e. Active and passive soil coefficients, pressure diagram for multiple soil strata.
- f. Bearing capacity and unconfined compression strength of soil.
- g. Backfill and compaction recommendations.
- h. Optimum moisture content of fill material.
- i. Maximum density of fill material.
- j. Minimum recommended factor of safety.
- k. Water table elevation on both sides of the shoring system.
- l. Dewatering wells and proposed flownets or zones of influence.
- m. In seismic areas, evaluation of liquefaction potential of various soil strata.

3. Loads.

All design criteria, temporary and permanent loading must be clearly stated in the design calculations and on the contract and record plans. Temporary loads include, but are not limited to: construction equipment, construction materials and lower water levels adjoining the bulkhead causing unbalanced hydrostatic pressure. Permanent loads include, but are not limited to: future grading and paving, Railroads or highways, structures, material storage piles, snow and earthquake. The allowable live load after construction should be clearly shown in the plans and painted on the pavements behind the bulkheads or shown on signs at the site and also recorded on the record plans. Some of the loads are:

- a. Live load pressure due to E80 loading for track parallel to shoring system.
- b. Live load pressure due to E80 loading for track at right angle to shoring system.
- c. Other live loads.
- d. Active earth pressure due to soil.
- e. Passive earth pressure due to soil.
- f. Active earth pressure due to surcharge loads.
- g. Active pressure due to sloped embankment.
- h. Dead load.
- i. Buoyancy.
- j. Longitudinal force from live load.
- k. Centrifugal forces.
- l. Shrinkage.
- m. Temperature.
- n. Earthquake.
- o. Stream flow pressure.
- p. Ice pressure.

4. Drainage. (AREMA 8.20.2.4)

- a. The drainage pattern of the site before and after construction should be analyzed and adequate drainage provisions should be incorporated into the plans and specifications. Consideration should be given to groundwater as well as surface drainage.
- b. Drainage provisions for backfill should be compatible with the assumed water conditions in design.

5. Structural design calculations.

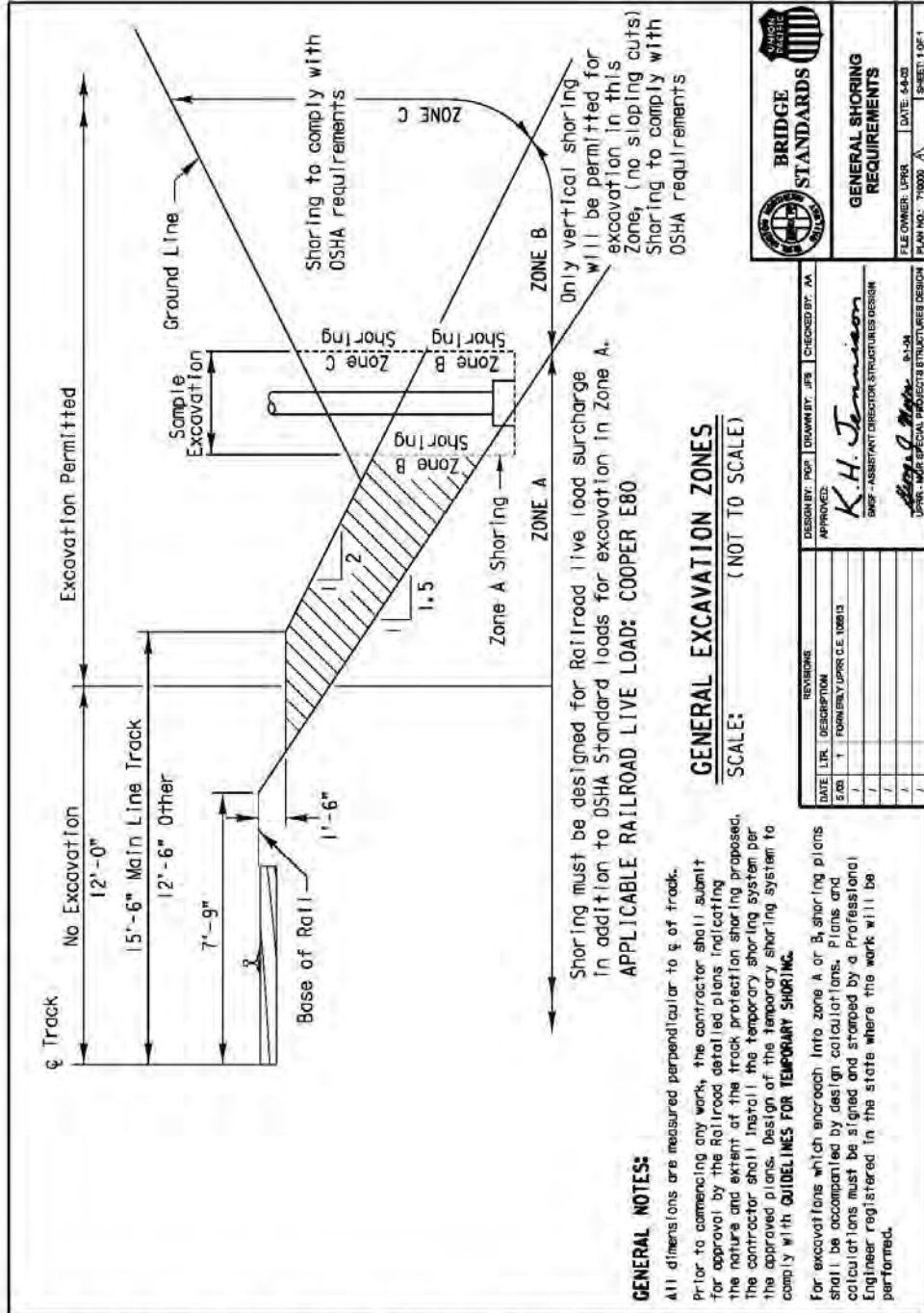
- a. List all assumptions used to design the temporary shoring system.
- b. Determine E80 live load lateral pressure using the Boussinesq strip load equation. See Figure 2 which illustrates Plan Number 710001 "LIVE LOAD PRESSURE DUE TO COOPER E80".
- c. Computerized calculations and programs must clearly indicate the input and output data. List all equations used in determining the output.
- d. Example calculations with values must be provided to support computerized output and match the calculated computer result.
- e. Provide a simple free body diagram showing all controlling dimensions and applied loads on the temporary shoring system.
- f. Calculated lateral deflections of the shoring and effects to the rail system must be included. See section 8, Part 6. Include the elastic deflection of the wall as well as the deflection due to the passive deflection of the resisting soil mass.
- g. Documents and manufacturer's recommendations which support the design assumptions must be included with the calculations.

5. TYPES OF TEMPORARY SHORING

1. A shoring box is a prefabricated shoring system which is installed as the excavation progresses. This shoring system is not accepted by the Railroad. This system is allowed in special applications only, typically where Railroad live load surcharge is not present. The shoring box is moved down into the excavation by gravity or by applying vertical loading from excavation equipment.
2. Anchored systems with tiebacks are discouraged. The tiebacks will be an obstruction to future utility installations and may also damage existing utilities. Tiebacks must be removed per Railroad direction. Removal of tieback assemblies is problematic.
3. An anchored sheet pile wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded and the tensile resistance of the anchors.
 - a. For purposes of these guidelines, ground anchors shall be cement-grouted tiebacks designed, furnished, installed, tested and stressed in accordance with the project specifications and AREMA requirements.
4. An anchored soldier beam with lagging wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the soldier beam is embedded and from the tensile resistance of the ground anchors.
 - a. Anchored soldier beam with lagging walls are generally designed as flexible structures which have sufficient lateral movement to mobilize active earth pressures and a portion of the passive pressure.
 - b. For purposes of these specifications, soldier beams include steel H-piles, wide flange sections or other fabricated sections that are driven or set in drilled holes. Lagging refers to the members spanning between soldier beams.
5. A cantilever sheet pile wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded. If cantilever sheet pile is used for shoring adjacent to an operating track, the shoring system shall be at least 12'-0" away from the centerline of track. Cantilever sheet pile walls shall be used only in granular soils or stiff clays.
6. A cantilever soldier beam with lagging wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the soldier beam is embedded.
7. A braced excavation is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the vertical members are embedded and from the structural capacity of the bracing members.
 - a. For purposes of these guidelines, the vertical members of the braced excavation system include steel sheet piling or soldier beams comprised of steel H-piles, wide flange sections, or other fabricated sections that are driven or installed in drilled holes. Wales are horizontal structural members designed to transfer lateral loads from the vertical members to the struts. Struts are structural compression members that support the lateral loads from the wales.
8. A cofferdam is an enclosed temporary structure used to keep water and soil out of an excavation for a permanent structure such as a bridge pier or abutment or similar structure. Cofferdams may be constructed of timber, steel, concrete or a combination of these. These guidelines consider cofferdams primarily constructed with steel sheet piles.

6. GENERAL SHORING REQUIREMENTS

For general shoring requirements and specific applications of the following items refer to **Figure 1** on the next page which illustrates Plan Number 710000 "GENERAL SHORING REQUIREMENTS".

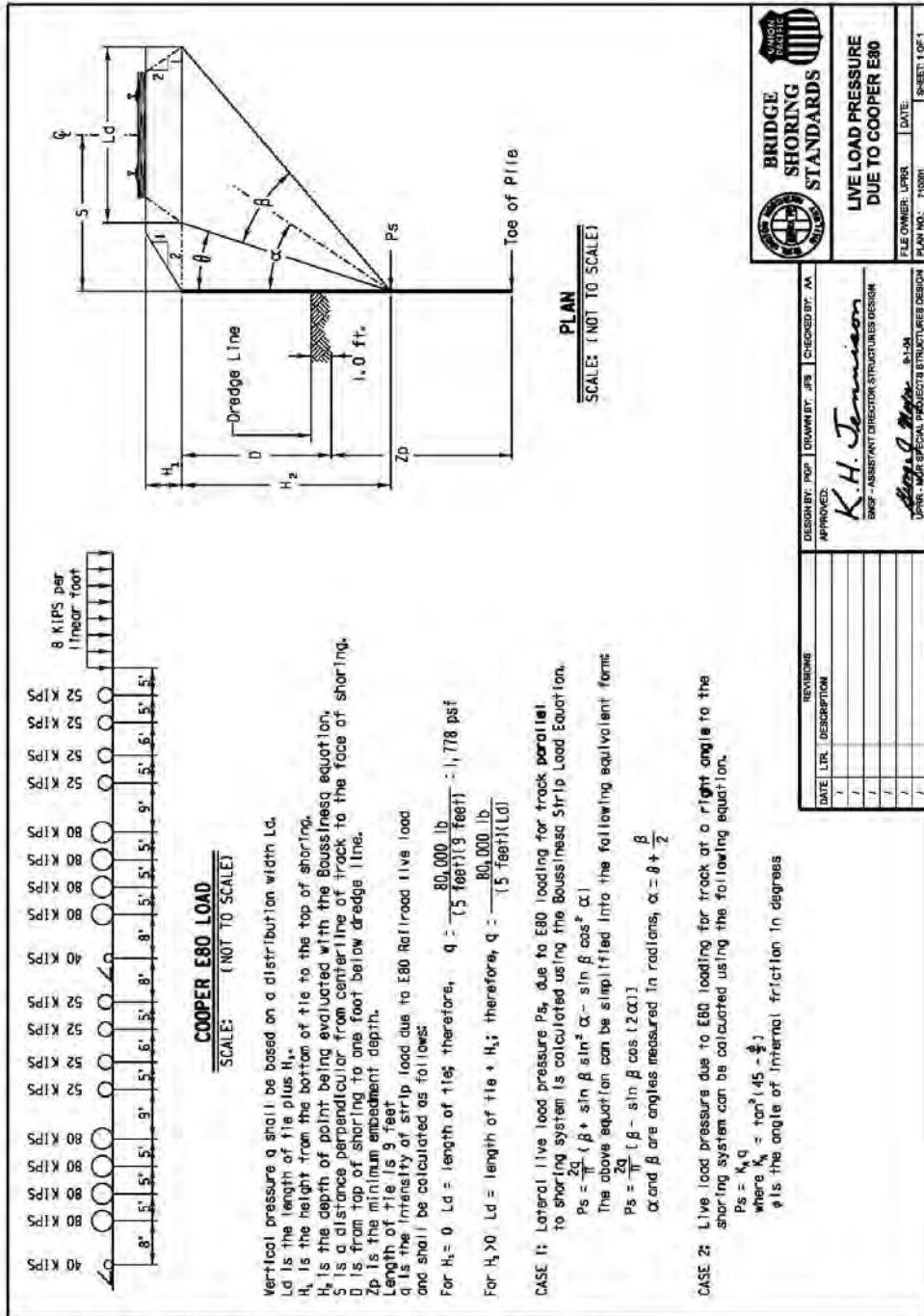


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1. No excavation shall be permitted closer than 12'-0" measured at a right angle from the centerline of track to the trackside of shoring system. If existing conditions preclude the installation of shoring at the required minimum distance, the shifting of tracks or temporary removal of tracks shall be investigated prior to any approval. All costs associated with track shifting or traffic interruption shall be at Contractor's expense.
2. Evaluate slope and stability conditions to ensure the Railroad embankment will not be adversely affected. Local and global stability conditions must also be evaluated.
3. All shoring within the limits of Zone A or Zone B must be placed prior to the start of excavation.
4. Lateral clearances must provide sufficient space for construction of the required ditches parallel to the standard roadbed section. The size of ditches will vary depending upon the flow and terrain and should be designed accordingly.
5. The shoring system must be designed to support the theoretical embankment shown for zones A and B.
6. Any excavation, holes or trenches on the Railroad property shall be covered, guarded and/or protected. Handrails, fence, or other barrier methods must meet OSHA and FRA requirements. Temporary lighting may also be required by the Railroad to identify tripping hazards to train crewmen and other Railroad personnel.
7. The most stringent project specifications of the Public Utilities Commission Orders, Department of Industrial Safety, OSHA, FRA, AREMA, BNSF, UPRR or other governmental agencies shall be used.
8. Secondhand material is not acceptable unless the Engineer of Record submits a full inspection report which verifies the material properties and condition of the secondhand material. The report must be signed and sealed by the Engineer of Record.
9. All components of the shoring system are to be removed when the shoring is no longer needed. All voids must be filled and drainage facilities restored. See compaction requirements section 9, Part 4.
10. Slurry type materials are not acceptable as fill for soldier piles in drilled holes. Concrete and flowable backfill may prevent removal of the shoring system. Use compacted peagravel material.

7. COMPUTATION OF APPLIED FORCES

1. Railroad live load and lateral forces.
 - a. For specific applications of the Coopers E80 live load refer to **Figure 2** on the next page which illustrates Plan Number 710001 "LIVE LOAD PRESSURE DUE TO COOPER E80". Supplemental information and sample calculations are provided in the Appendix pages A-1 through A-4.
2. Dead load.
 - a. Spoil pile: must be included assuming a minimum height of two feet of soil adjacent to the excavation.
 - b. Track: use 200 lbs/linear ft for rails, inside guardrails and fasteners.
 - c. Roadbed: ballast, including track ties, use 120 lb per cubic foot.



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Figure 2

3. Active earth pressure.
 - a. The active earth pressure due to the soil may be computed by the Coulomb Theory or other approved method.
 - b. The active earth pressure at depth " z_a " is:
$$P_A = K_A \gamma z_a$$
, where $K_A = \tan^2(45 - \frac{\phi}{2})$
 z_a = depth of soil influencing the active pressure.
4. Active earth pressure due to unbalanced water pressure.
 - a. When bulkheads are used for waterfront construction, the bulkhead is subjected to a maximum earth pressure at the low water stage. During a rainstorm or a rapidly receding high water, the water level behind the bulkhead may be several feet higher than in front of the bulkhead.
 - b. Drained conditions in backfill apply when clean sand or clean sand and gravel are used and adequate permanent drainage outlets are provided. Where drained conditions exist, the design water level may be assumed at the drainage outlet elevation.
5. Active earth pressure due to surcharge load.

The active earth pressure due to surcharge load q :

$$P_U = K_A q$$
, where $K_A = \tan^2(45 - \frac{\phi}{2})$
6. Passive earth pressure.

The passive earth pressure, P_p , in front of the bulkhead may also be computed by the Coulomb Theory.

$$P_p = K_p \gamma z_p$$
, where $K_p = \tan^2(45 + \frac{\phi}{2})$
 z_p = vertical distance beginning one foot below dredge line but not to exceed embedment depth
7. Pressure due to embankment surcharges.

Conventional analysis (Rankine, Coulomb, or Log-Spiral) should be used to determine the additional surcharge from embankment slopes.
8. Additional analysis for centrifugal force calculations as described in **AREMA Chapter 15, Part 1, Section 1.3, Article 1.3.6** Centrifugal Loads are required where track curvature exceeds three degrees.
9. Include and compute all other loads that are impacting the shoring system such as a typical Railroad service vehicle (HS-20 truck).

8. STRUCTURAL INTEGRITY

Structures and structural members shall be designed to have design strengths at all sections at least equal to the required strengths calculated for the loads and forces in such combinations as stipulated in **AREMA Chapter 8 Part 2 Article 2.2.4b**, which represents various combinations of loads and forces to which a structure may be subjected. Each part of the structure shall be proportioned for the group loads that are applicable, and the maximum design required shall be used.

1. Embedment depth.
 - a. Calculated depth of embedment is the embedment depth required to maintain static equilibrium.

- b. Minimum depth of embedment is the total depth of embedment required to provide static equilibrium plus additional embedment due to the minimum factor of safety.
 - 1. Embedment depth factor of safety for well-defined loading conditions and thoroughly determined soil parameters is generally 1.3 for most temporary shoring systems. (See AREMA 8.20.4.1.c)
 - 2. All anchored shoring systems require a minimum embedment depth of 1.5 times the calculated depth of embedment. Shallow penetration into strong soil layers is not acceptable. (See AREMA 8.20.5.1)
- 2. The allowable stresses based on AREMA requirements are as follows:
 - Structural Steel: 0.55Fy for Compression in extreme fiber. (AREMA Ch.15 Table 1-11)
 - Structural Steel: 0.35Fy for Shear. (AREMA Ch.15 Table 1-11)
 - Sheet Pile Sections: 2/3 of yield strength for steel. (AREMA 8.20.5.7)
 - Concrete: 1/3 of Compressive strength. (AREMA 8.20.5.7)
 - Anchor Rods: 1/2 of yield strength for steel. (AREMA 8.20.5.7)
- 3. AISC allowances for increasing allowable stress due to temporary loading conditions are not acceptable.
- 4. Gravity type temporary shoring systems must also be analyzed for overturning, sliding and global stability.
- 5. The contractor is responsible for providing an approved test method to verify the capacity of anchored or tieback systems. The manufacturers recommendations for testing must be satisfied. Systems which support the Railroad embankment will be considered high risk in determining the percentage of elements to be proof tested.
- 6. Calculated deflections of temporary shoring system and top of rail elevation shall not exceed the criteria outlined in Table 1 Deflection Criteria.

Table 1 Deflection Criteria

Horizontal distance from shoring to track C/L measured at a right angle from track	Maximum horizontal movement of shoring system	Maximum acceptable horizontal or vertical movement of rail
12' < S < 18'	3/8"	1/4"
18' < S < 24'	1/2"	1/4"

9. SOIL CHARACTERISTICS

- 1. Subsurface Exploration. (AREMA 8.5.2.2)
 - a. Sufficient borings shall be made along the length of the structure to determine, with a reasonable degree of certainty, the subsurface conditions. Irregularities found during the initial soil boring program may dictate that additional borings be taken.
 - b. The subsurface investigation shall be made in accordance with the provisions of AREMA Chapter 8 Part 22, Geotechnical Subsurface Investigation.
- 2. Type of backfill.
 - a. Backfill is defined as material behind the wall, whether undisturbed ground or fill, that contributes to the pressure against the wall.

- b. The backfill shall be investigated and classified with reference to the soil types described in AREMA Table 8-5-1.
- c. Types 4 and 5 backfill shall be used only with the permission of the Engineer. In all cases the wall design shall be based on the type of backfill used.

Table 8-5-1 (AREMA) Types of Backfill for Retaining Walls

Backfill Type	Backfill Description
1	Coarse-grained soil without admixture of fine soil particles, very free-draining (clean sand, gravel or broken stone).
2	Coarse-grained soil of low permeability due to admixture of particles of silt size.
3	Fine silty sand; granular materials with conspicuous clay content; or residual soil with stones.
4	Soft or very soft clay, organic silt; or soft silty clay.
5	Medium or stiff clay that may be placed in such a way that a negligible amount of water will enter the spaces between the chunks during floods or heavy rains.

3. Computation of backfill pressure. (AREMA 8.5.3.2a)

- a. Values of the unit weight, cohesion, and angle of internal friction of the backfill material shall be determined directly by means of soil tests or, if the expense of such tests is not justifiable, by means of AREMA Table 8-5-2 referring to the soil types defined in AREMA Table 8-5-1. Unless the minimum cohesive strength of the backfill material can be evaluated reliably, the cohesion shall be neglected and only the internal friction considered. See Appendix page A-6 for AREMA generic soil properties.

Table 8-5-2 (AREMA) Properties of Backfill Materials

Type of Backfill	Unit Weight Lb. Per Cu. Ft.	Cohesion "c"	Angle of Internal Friction
1	105	0	33°-42° (38° for broken stone)
2	110	0	30°
3	125	0	28°
4	100	0	0°
5	120	240	0°

4. Compaction.

- a. The backfill shall preferably be placed in loose layers not to exceed 8 inches in thickness. Each layer shall be compacted before placing the next, but over compaction shall be avoided.
- b. It is required that backfill be compacted to no less than 95% of maximum dry density at a moisture content within 2% of optimum and tested using Modified Proctor ASTM D1557.
- c. Fill within 100 feet of bridge ends or 20 feet outside culverts shall be placed and compacted to not less than 100% of maximum.
- d. No dumping of backfill material shall be permitted in such a way that the successive layers slope downward toward the wall. The layers shall be horizontal or shall slope downward away from the wall.

10. PLANS

The shoring plans must completely identify the site constraints and the shoring system. Use the design templates provided in the appendix as an example to show the required information, specifications and drawings. The specific requirements of the plan submittals are as follows:

1. General plan view should show:
 - a. Railroad right-of-way and North arrow.
 - b. Position of all Railroad tracks and identify each track as mainline, siding, spur, etc.
 - c. Spacing between all existing tracks.
 - d. Location of all access roadways, drainage ditches and direction of flow.
 - e. Footprint of proposed structure, proposed shoring system and any existing structures if applicable.
 - f. Proposed horizontal construction clearances. The minimum allowable is 12 feet measured at a right angle from centerline of track.
 - g. Location of existing and proposed utilities.
 - h. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
 - i. Railroad and other "CALL BEFORE YOU DIG" numbers.
 - j. Detailed view of shoring along with controlling elevations and dimensions.
2. Typical section and elevation should show:
 - a. Top of rail elevations for all tracks.
 - b. Offset from the face of shoring system to the centerline of all tracks at all changes in horizontal alignment.
 - c. All structural components, controlling elevations and dimensions of shoring system.
 - d. All drainage ditches and controlling dimensions.
 - e. All slopes, existing structures and other facilities which may surcharge the shoring system.
 - f. Location of all existing and proposed utilities.
 - g. Total depth of shoring system.
3. General criteria
 - a. Design loads to be based on the AREMA manual and Cooper E80 loading.
 - b. Pressure due to embankment surcharges.
 - c. ASTM designation and yield strength for each material.
 - d. Maximum allowable bending stress for structural steel is $0.55F_y$.
 - e. Temporary overstress allowances are not acceptable.
 - f. All timber members shall be Douglas Fir grade 2 or better.
 - g. Insitu soil classification.
 - h. Backfill soil classification.
 - i. Internal angle of friction and unit weight of the soil.
 - j. Active and passive soil coefficients.
 - k. Fill within 100 feet of bridge ends or 20 feet outside culverts shall be placed and compacted to a minimum of 100% of maximum dry density tested per Modified Proctor ASTM D1557.
 - l. Slopes without shoring shall not be steeper than 2 horizontal to 1 vertical

- m. Dredge line elevation.
 - n. Shoring deflection to be calculated and meet Railroad requirements.
4. Miscellaneous:
- a. Project name, location, GPS coordinates, track owner, Railroad line segment, milepost and subdivision in the title block.
 - b. Procedure outlining the installation and removal of the temporary shoring system.
 - c. General notes specifying material requirements, design data, details, dimensions, cross-sections, sequence of construction etc.
 - d. A description of the tieback installation including drilling, grouting, stressing information and testing procedures, anchor capacity, type of tendon, anchorage hardware, minimum unbonded lengths, minimum anchor lengths, angle of installation, tieback locations and spacing.
 - e. All details for construction of drainage facilities associated with the shoring system shall be clearly indicated.
 - f. Details and descriptions of all shoring system members and connection details.
 - g. Settlement and displacement calculations.
 - h. Handrail and protective fence details along the excavation.
 - i. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
 - j. Call before you dig number.
 - k. Construction clearance diagram.

11. SUBMITTALS

The Contractor will be responsible for any and all cost associated with the review of plans by the Railroad. Review of design submittals by the Railroad will require a minimum of four (4) weeks. To avoid impacting the construction schedule, the Contractor must schedule submittals well in advance. Partial, incomplete or inadequate designs will be rejected, thus delaying the approval. Revised submittals will follow the same procedure as the initial submittal until all issues are resolved. Submit a minimum of three sets of shoring plans and two sets of calculations with manufacturers' specifications. Drawings and calculations must be signed and stamped by a Registered Professional Engineer familiar with Railway loadings and who is licensed in the state where the shoring system is intended for use. Drawings accompanying the shoring plans shall be submitted on 11" x 17" or 8½" x 11" sized paper.

1. Contractor review.

The Contractor must review the temporary shoring plans to ensure that the proposed method of construction is compatible with the existing site and soil conditions. The Contractor's work plan must be developed to allow train traffic to remain in service. Removal of the shoring system must also be addressed.

2. Applicant and or Engineer of Record review.

The applicant and or Engineer of Record must review and approve the submittal for compliance with the project specifications, AREMA Manual, these guidelines and structural capacity before forwarding the submittal to the Railroad.

3. Review process.

All design submittals shall be forwarded to the Railroad Representative who will send them to the Structures Design Department. The Structures Design Department shall review or have an outside consultant review said submittals. If a Railroad consultant performs said review, the consultant may reply directly to the applicant or their representative after consultation with the Structures Design Department. A copy of the reply will be mailed to the Railroad Representative. During the review process the Railroad Representative is the point of contact to resolve outstanding issues.

12. APPENDIX

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GENERAL PLAN VIEW	A-8
TYPICAL SECTION & ELEVATION VIEW	A-9

13. BIBLIOGRAPHY

The following list of references used in these guidelines are placed here in alphabetical order for your convenience.

1. *Manual for Railway Engineering*, 2002 American Railway Engineering and Maintenance-of-Way Association.
2. *TRENCHING AND SHORING MANUAL*, January 1990, Revision 11/12/96. State of California Department of Transportation, Office of Structures Construction.

IDOT Contract 60K80
 SAMPLE PROBLEM

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Point in question: $S = 12$ ft $H = 6$ ft

$$q = \frac{80,000 \text{ lbs}}{(5 \text{ ft})(9 \text{ ft})} = 1778 \text{ psf for E80 loading, axle spacing} = 5 \text{ ft, tie length } b = 9 \text{ ft}$$

$$\text{Solve for } X_1 = S - b/2 = 7.5 \text{ ft}$$

$$\text{Solve for } X_2 = S + b/2 = 16.5 \text{ ft}$$

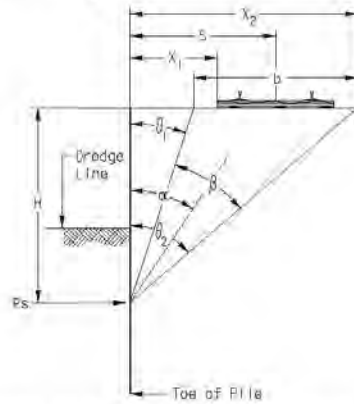
$$\text{Solve for } \theta_1 = \arctan\left(\frac{X_1}{H}\right) = 0.896 \text{ radians}$$

$$\text{Solve for } \theta_2 = \arctan\left(\frac{X_2}{H}\right) = 1.222 \text{ radians}$$

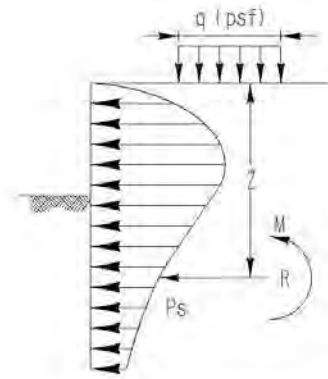
$$\text{Solve for } \beta = \theta_2 - \theta_1 = 0.326 \text{ radians}$$

$$\text{Solve for } \alpha = \frac{\theta_1 + \theta_2}{2} = 1.059 \text{ radians}$$

Note: $\tan \alpha \neq \frac{S}{H}$



PRESSURE DISTRIBUTION FOR STRIP LOAD



EQUIVALENT LOADING

- Pressure, P_s due to E80 liveload at the above-identified point:

$$P_s = \frac{2q}{\pi}(\beta - \sin \beta \cos 2\alpha) = \frac{2 * 1778}{\pi}(0.326 - \sin(0.326) \cos(2 * 1.059)) = 558 \text{ psf}$$

- Shear due to E80 liveload at the above-identified point:

$$R_s = \frac{2qH\beta}{\pi} = \frac{2 * 1778 * 6 * 0.326}{\pi} = 2214 \text{ lbs/ft}$$

- Depth \bar{z} from base of tie:

$$\bar{z} = \frac{H^2\beta - bH + X_2^2\left(\frac{\pi}{2} - \theta_2\right) - X_1^2\left(\frac{\pi}{2} - \theta_1\right)}{2H\beta} = \frac{6^2 * 0.326 - 9 * 6 + 165^2\left(\frac{\pi}{2} - 1.222\right) - 75^2\left(\frac{\pi}{2} - 0.896\right)}{2 * 6 * 0.326} = 3.77 \text{ ft}$$

IDOT Contract 60K80
SAMPLE PROBLEM (CONTINUED)

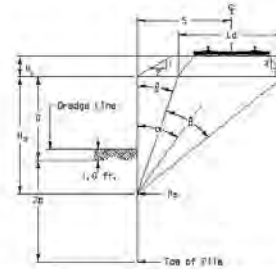
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- Moment due to E80 liveload at the above identified point:

$$M = R_x(H - \bar{z}) = 2214 * (6 - 3.77) = 4940 \text{ ft-lbs/ft}$$

Use the above equations to determine P_s , M , R_x & \bar{z} due to the E80 liveload along the entire depth of the shoring system. Typically the equations are evaluated on 6" increments to determine the maximum values along the depth of the shoring system. The resultants must be combined with other applicable pressures and loads to evaluate the total loading on the shoring system for the entire depth of the system. Determine the minimum embedment depth required and the minimum cross sectional properties of the shoring system based on the allowable stresses and the required factors of safety.

- This chart identifies the active pressure and resulting forces due to E80 liveload. See "SAMPLE PROBLEM" sheet for definitions of variables and equations.
1. Select distance S from track centerline to face of shoring.
 2. Select depth H₂ below base of tie.
 3. Read P_s, M, R and \bar{z} from the table.
 4. Use the procedure outlined in the sample problem to determine values at non-tabulated points.



$$P_s = \frac{2q}{\pi} [\beta - \sin \beta \cos(2\alpha)]$$

where q = 1778 psf

Boussinesq surcharge pressure E80 live load for H₁=0

Depth below top of shoring H ₂ (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle									
		12	14	16	18	20	22	24	26	28	30
2	P _s (psf)	305	220	168	130	105	86	72	61	53	46
	α (radians)	1.38	1.41	1.44	1.45	1.47	1.48	1.48	1.49	1.50	1.50
	β (radians)	0.14	0.10	0.07	0.06	0.05	0.04	0.03	0.03	0.02	0.02
	\bar{z} (ft)	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	M (ft-lbs/ft)	215	152	114	89	71	58	49	41	36	31
	R (lbs/ft)	317	226	170	132	106	87	73	62	53	46
4	P _s (psf)	496	381	299	240	197	164	138	118	102	89
	α (radians)	1.21	1.27	1.31	1.34	1.36	1.38	1.40	1.41	1.43	1.44
	β (radians)	0.25	0.19	0.14	0.11	0.09	0.07	0.06	0.05	0.05	0.04
	\bar{z} (ft)	2.59	2.61	2.63	2.64	2.64	2.65	2.65	2.65	2.65	2.66
	M (ft-lbs/ft)	1,609	1,165	882	692	557	459	384	327	281	244
	R (lbs/ft)	1,141	840	643	508	411	339	285	242	209	182
6	P _s (psf)	558	461	381	317	266	225	193	167	146	128
	α (radians)	1.06	1.13	1.19	1.23	1.27	1.29	1.32	1.34	1.35	1.37
	β (radians)	0.33	0.26	0.20	0.16	0.13	0.11	0.09	0.08	0.07	0.06
	\bar{z} (ft)	3.77	3.83	3.88	3.90	3.92	3.94	3.95	3.96	3.96	3.97
	M (ft-lbs/ft)	4,944	3,674	2,830	2,244	1,822	1,508	1,269	1,082	933	813
	R (lbs/ft)	2,214	1,696	1,332	1,070	877	731	618	529	458	400
8	P _s (psf)	535	476	414	358	309	268	234	205	181	160
	α (radians)	0.94	1.02	1.08	1.13	1.17	1.21	1.24	1.26	1.29	1.30
	β (radians)	0.37	0.29	0.24	0.19	0.16	0.14	0.12	0.10	0.09	0.08
	\bar{z} (ft)	4.84	4.97	5.06	5.11	5.16	5.19	5.21	5.23	5.24	5.26
	M (ft-lbs/ft)	10,481	8,006	6,286	5,051	4,141	3,452	2,920	2,501	2,165	1,892
	R (lbs/ft)	3,316	2,641	2,134	1,751	1,456	1,228	1,047	903	786	689
10	P _s (psf)	474	449	411	370	329	293	260	232	207	186
	α (radians)	0.83	0.92	0.99	1.04	1.09	1.13	1.17	1.19	1.22	1.24
	β (radians)	0.38	0.32	0.26	0.22	0.19	0.16	0.14	0.12	0.10	0.09
	\bar{z} (ft)	5.81	6.02	6.16	6.26	6.34	6.39	6.44	6.47	6.50	6.52
	M (ft-lbs/ft)	18,145	14,227	11,385	9,280	7,689	6,463	5,502	4,736	4,117	3,610
	R (lbs/ft)	4,328	3,571	2,964	2,482	2,099	1,792	1,544	1,341	1,175	1,037
12	P _s (psf)	404	403	386	360	331	302	274	248	225	204
	α (radians)	0.75	0.83	0.90	0.96	1.01	1.06	1.10	1.13	1.16	1.18
	β (radians)	0.38	0.33	0.28	0.24	0.20	0.18	0.15	0.13	0.12	0.11
	\bar{z} (ft)	6.68	6.97	7.18	7.34	7.46	7.55	7.61	7.67	7.71	7.75
	M (ft-lbs/ft)	27,703	22,237	18,121	14,980	12,550	10,641	9,121	7,895	6,894	6,068
	R (lbs/ft)	5,207	4,424	3,763	3,214	2,762	2,389	2,080	1,823	1,608	1,427
14	P _s (psf)	338	351	349	337	319	298	276	255	234	215
	α (radians)	0.69	0.76	0.83	0.89	0.94	0.99	1.03	1.07	1.10	1.13
	β (radians)	0.38	0.33	0.28	0.25	0.22	0.19	0.17	0.15	0.13	0.12
	\bar{z} (ft)	7.46	7.85	8.13	8.35	8.51	8.64	8.74	8.82	8.89	8.94
	M (ft-lbs/ft)	38,880	31,856	26,396	22,116	18,729	16,021	13,831	12,043	10,568	9,339
	R (lbs/ft)	5,948	5,178	4,499	3,913	3,414	2,990	2,631	2,327	2,088	1,847
16	P _s (psf)	280	301	310	308	300	286	271	254	237	220
	α (radians)	0.62	0.70	0.77	0.83	0.88	0.93	0.97	1.01	1.04	1.07
	β (radians)	0.38	0.32	0.28	0.25	0.22	0.20	0.18	0.16	0.14	0.13
	\bar{z} (ft)	8.17	8.64	9.01	9.29	9.51	9.68	9.82	9.93	10.03	10.10
	M (ft-lbs/ft)	51,411	42,880	36,066	30,598	26,183	22,590	19,644	17,207	15,175	13,488
	R (lbs/ft)	6,563	5,829	5,158	4,560	4,034	3,576	3,179	2,837	2,540	2,284

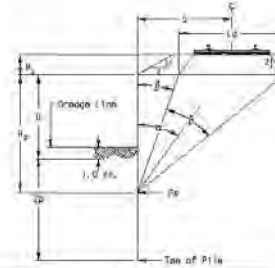
GUIDELINES FOR TEMPORARY SHORING, Published October 25, 2004

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CHART A continued

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- This chart identifies the active pressure and resulting forces due to E80 live load. See "SAMPLE PROBLEM" sheet for definitions of variables and equations.
1. Select distance S from track centerline to face of shoring.
 2. Select depth H₂ below base of tie.
 3. Read P_s, M, R and \bar{z} from the table.
 4. Use the procedure outlined in the sample problem to determine values at non-tabulated points.



$$P_s = \frac{2q}{\pi} [\beta - \sin \beta \cos(2\alpha)]$$

where q = 1778 psf

Boussinesq surcharge pressure E80 live load for H₁=0

Depth below top of shoring H ₂ (ft)	Variables	Horizontal distance (S) from shoring to track CL measured at a right angle									
		12	14	16	18	20	22	24	26	28	30
18	P _s (psf)	231	256	271	277	276	269	259	247	234	220
	α (radians)	0.57	0.64	0.71	0.77	0.82	0.87	0.92	0.96	0.99	1.02
	β (radians)	0.35	0.31	0.28	0.25	0.23	0.20	0.18	0.16	0.15	0.13
	\bar{z} (ft)	8.80	9.37	9.81	10.16	10.44	10.67	10.85	11.00	11.12	11.22
	M (ft-lbs/ft)	65,062	55,110	46,976	40,313	34,834	30,304	26,536	23,384	20,728	18,477
	R (lbs/ft)	7,072	6,386	5,739	5,145	4,609	4,132	3,710	3,338	3,012	2,725
20	P _s (psf)	191	217	236	246	250	249	244	237	227	217
	α (radians)	0.52	0.59	0.66	0.72	0.77	0.82	0.87	0.91	0.94	0.98
	β (radians)	0.33	0.30	0.28	0.25	0.23	0.21	0.19	0.17	0.15	0.14
	\bar{z} (ft)	9.37	10.03	10.56	10.98	11.32	11.59	11.82	12.01	12.16	12.30
	M (ft-lbs/ft)	79,641	68,368	58,973	51,137	44,586	39,093	34,465	30,548	27,216	24,367
	R (lbs/ft)	7,493	6,859	6,245	5,668	5,135	4,651	4,214	3,822	3,474	3,163
22	P _s (psf)	159	184	204	217	225	228	227	223	217	210
	α (radians)	0.49	0.55	0.62	0.67	0.73	0.77	0.82	0.86	0.90	0.93
	β (radians)	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.17	0.16	0.14
	\bar{z} (ft)	9.89	10.64	11.24	11.73	12.14	12.47	12.74	12.97	13.17	13.33
	M (ft-lbs/ft)	94,986	82,497	71,913	62,945	55,341	48,878	43,370	38,658	34,611	31,122
	R (lbs/ft)	7,842	7,260	6,684	6,131	5,611	5,128	4,685	4,283	3,918	3,590
24	P _s (psf)	133	157	176	191	202	207	210	209	206	201
	α (radians)	0.45	0.52	0.58	0.63	0.68	0.73	0.78	0.82	0.85	0.89
	β (radians)	0.30	0.28	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.15
	\bar{z} (ft)	10.35	11.19	11.87	12.44	12.90	13.29	13.62	13.89	14.13	14.32
	M (ft-lbs/ft)	110,969	97,366	85,670	75,625	66,997	59,577	53,183	47,661	42,876	38,716
	R (lbs/ft)	8,132	7,600	7,064	6,540	6,037	5,564	5,122	4,715	4,342	4,001
26	P _s (psf)	112	134	153	168	180	188	192	194	193	191
	α (radians)	0.42	0.48	0.54	0.60	0.65	0.69	0.74	0.78	0.82	0.85
	β (radians)	0.28	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.16	0.15
	\bar{z} (ft)	10.78	11.69	12.45	13.09	13.62	14.07	14.44	14.77	15.04	15.28
	M (ft-lbs/ft)	127,485	112,863	100,135	89,071	79,460	71,105	63,836	57,499	51,963	47,113
	R (lbs/ft)	8,376	7,890	7,393	6,899	6,418	5,959	5,524	5,118	4,741	4,393
28	P _s (psf)	94	114	132	148	160	169	175	179	180	180
	α (radians)	0.40	0.46	0.51	0.56	0.61	0.66	0.70	0.74	0.78	0.81
	β (radians)	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15
	\bar{z} (ft)	11.17	12.16	12.99	13.70	14.29	14.80	15.23	15.60	15.91	16.19
	M (ft-lbs/ft)	144,448	128,896	115,211	103,191	92,642	83,385	75,258	68,113	61,823	56,274
	R (lbs/ft)	8,581	8,137	7,677	7,214	6,758	6,315	5,892	5,491	5,115	4,764
30	P _s (psf)	80	98	115	130	142	152	160	165	167	168
	α (radians)	0.37	0.43	0.48	0.53	0.58	0.63	0.67	0.71	0.74	0.78
	β (radians)	0.26	0.25	0.23	0.22	0.21	0.20	0.18	0.17	0.16	0.15
	\bar{z} (ft)	11.52	12.59	13.49	14.26	14.92	15.48	15.97	16.38	16.75	17.06
	M (ft-lbs/ft)	161,789	145,388	130,819	117,903	106,466	96,343	87,381	79,443	72,404	66,153
	R (lbs/ft)	8,755	8,349	7,925	7,492	7,060	6,636	6,227	5,834	5,462	5,112
32	P _s (psf)	69	85	101	115	127	137	145	151	155	157
	α (radians)	0.35	0.41	0.46	0.51	0.55	0.60	0.64	0.68	0.71	0.75
	β (radians)	0.25	0.24	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.15
	\bar{z} (ft)	11.85	12.98	13.95	14.79	15.51	16.13	16.67	17.13	17.54	17.89
	M (ft-lbs/ft)	179,452	162,274	146,888	133,136	120,859	109,909	100,144	91,432	83,655	76,708
	R (lbs/ft)	8,904	8,532	8,140	7,736	7,329	6,925	6,531	6,150	5,785	5,438

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IDOT Contract 60K80
GUIDELINE & WEBSITE DIRECTORY

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BNSF guidelines are as follows:

- a. Guidelines for Design and Construction of Grade Separation Structures.

UPRR guidelines are as follows:

- a. **Underpass Structures** – "Guidelines for Design and Construction of Grade Separation Underpass Structures."
- b. **Overhead Grade Separation** – "Guidelines for Design of Highway Separation Structures Over Railroad (Overhead Grade Separation)."
- c. **Demolition** – "Guidelines for Preparation of a Bridge Demolition and Removal Plan for Structures Over Railroad."
- d. **Shoofly** – "Guidelines for Design and Construction of Shoofly (Detour) Tracks."
- e. **Fiber Optic** – "UPRR Fiber Optic Engineering, Construction And Maintenance Standards." 1/1/2002
- f. **Pipeline** – "Pipeline Installation" available at www.uprr.com.
- g. **Industry Track** – "Technical Specification for Construction of Industrial Tracks"

WEBSITE DIRECTORY:

1. www.astm.org
2. www.arena.org
3. www.bnsf.com
4. www.pilespecs.com
5. www.uprr.com

IDOT Contract 60K80
 AREMA Table 8-20-1. Granular Soils

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Descriptive Term for Relative Density	Standard Penetration Test Blows per Foot "N"
Very Loose	0 - 4
Loose	4 - 10
Medium	10 - 30
Dense	30 - 50
Very Dense	Over 50

AREMA Table 8-20-2. Silt and Clay Soils

Descriptive Term for Consistency	Unconfined Compressive Strength Tons per Square Foot
Very Soft	Less than 0.25
Soft	0.25 - 0.50
Medium	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	Over 4.00

AREMA Table 8-20-3. Unit Weights of Soils, and Coefficients of Earth Pressure

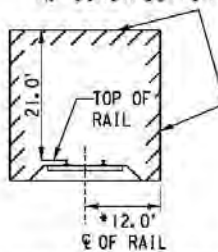
Type of Soil	Unit Weight of Moist Soil, γ (Note 1)		Unit Weight of Submerged Soil, γ' (Note 1)		Coefficient of Active Earth Pressure, K_A				Coefficient of Passive Earth Pressure, K_p		
	Minimum	Maximum	Minimum	Maximum	For Backfill	For Soils in Place	Friction Angles (Note 2)		For Soils in Place	Friction Angles (Note 2)	
							ϕ	δ		ϕ	δ
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Clean Sand:											
Dense	110	140	65	78		0.20	38	20	9.0	38	25
Medium	110	130	60	68		0.25	34	17	7.0	34	23
Loose	90	125	56	63	0.35	0.30	30	15	5.0	30	20
Silty Sand:											
Dense	110	150	70	88		0.25			7.0		
Medium	95	130	60	68		0.30			5.0		
Loose	80	125	50	63	0.50	0.35			3.0		
Silt and Clay (Note 3)	$\frac{165(1+w)}{1+2.65w}$		$\frac{103}{1+2.65w}$		1.00	$1 - \frac{q_u}{p + \gamma z}$			$1 + \frac{q_u}{p + \gamma z}$		
<p>Note 1: In pounds per cubic foot.</p> <p>Note 2: These angles, expressed in degrees, are ϕ, the angle of internal friction, and δ, the angle of wall friction, and are used in estimating the coefficients under which they are listed.</p> <p>Note 3: The symbol γ represents γ or γ', whichever is applicable; p is the effective unit pressure on the top surface of the stratum; q_u is the unconfined compressive strength; w is the natural water content, in percentage of dry weight; and z is the depth below the top surface of the stratum.</p>											

General criteria:

- a. Design loads to be based on the AREMA manual and Cooper E80 loading.
- b. Pressure due to embankment surcharges.
- c. ASTM designation and yield strength for each material.
- d. Maximum allowable bending stress for steel is $0.55F_y$.
- e. Temporary overstress allowances are not acceptable.
- f. All timber members shall be Douglas Fir Grade 2 or better.
- g. Insitu soil classification.
- h. Backfill soil classification.
- i. Internal angle of friction and unit weight of soil.
- j. Active and passive soil coefficients.
- k. Backfill compacted to a minimum of 95% Proctor density per ASTM D-1557.
- l. Slopes without shoring shall not be steeper than 2 horizontal to 1 vertical.
- m. Dredge line elevation.
- n. Shoring deflection to be calculated and meet Railroad requirements.

Miscellaneous:

- a. Project name, location, GPS coordinates, track owner, Railroad line segment, milepost and subdivision in the title block.
- b. Procedure outlining the installation and removal of the temporary shoring system.
- c. General notes specifying material requirements, design data, details, dimensions and cross-sections, sequence of construction etc.
- d. A description of tieback installation including drilling, grouting, stressing information and testing procedures, anchor capacity, type of tendon, anchorage hardware, minimum unbonded lengths, minimum anchor lengths, angle of installation, tieback locations and spacing.
- e. All details for construction of drainage facilities associated with the shoring system shall be clearly indicated.
- f. Details and descriptions of all shoring system members and connection details.
- g. Settlement and displacement calculations.
- h. Handrail and protective fence details along the excavations.
- i. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
- j. Call before you dig number.
- k. Construction clearances diagram as shown below.



NO CONSTRUCTION ACTIVITIES OR OTHER OBSTRUCTIONS MAY BE PLACED WITHIN THESE LIMITS.
 *ADD 1.5 INCHES PER DEGREE OF TRACK CURVATURE TO THE HORIZONTAL CLEARANCE DISTANCE.

MINIMUM CONSTRUCTION

CLEARANCES (NORMAL TO RAILROAD) Not to scale	DESIGN BY:	NAME & LOGO OF ENGINEERING FIRM OR PROJECT OWNER		
	DRAWN BY:	GENERAL CRITERIA AND MISCELLANEOUS		
	SCALE:	RR M.P. SUBDIVISION		
	DRAWING NO:	CITY	COUNTY	STATE
	SHEET: 1 of 3	PROJECT NAME & LOCATION		
	DOT#:			
	DATE:			

General plan view should show:

- a. Railroad right-of-way and North arrow.
- b. Position of all Railroad tracks and identify each track as mainline, siding, spur, etc.
- c. Spacing between all existing tracks.
- d. Location of all access roadways, drainage ditches and direction of flow.
- e. Footprint of proposed structure, proposed shoring system and any existing structures if applicable.
- f. Proposed horizontal construction clearances. The minimum allowable is 12 feet measured at a right angle from centerline of track.
- g. Location of existing and proposed utilities.
- h. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
- i. Railroad and other "CALL BEFORE YOU DIG" numbers.
- j. Detailed view of shoring along with controlling elevations and dimensions.

DESIGN BY:	NAME & LOGO OF ENGINEERING FIRM OR PROJECT OWNER		
DRAWN BY:			
SCALE:	GENERAL PLAN VIEW		
DRAWING NO:			
SHEET: 2 OF 3	RR M.P.	SUBDIVISION	
DOT#:	city	COUNTY	STATE
DATE:	PROJECT NAME & LOCATION		

IDOT Contract 60K80
Contractor-in-Charge Requirements

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UPRR has adopted a Contractor-In-Charge (CIC) policy exception (see attached letter dated May 8, 2009). If the contractor plans on utilizing this exception the contractor employee(s) designated as CIC(s) must be trained and the training documented prior to the work commencing. Below are guidelines to qualify individuals to perform CIC duties on construction projects:

1. Provide individual with a copy of the CIC exception letter (attached). Copy of this letter should be retained on site at location where CIC is being utilized.
2. Give the attached questions to the individual that will perform the CIC duties in advance of assuming position.
3. Have the individual answer questions.
4. Have the individual sign the answer sheet to verify that he or she answered the questions, print their name, designate the Company they represent, and show security badge number if available.
5. Provide by fax, scanned pdf file or personally deliver the completed answer sheet showing the individual's name and contracting company to the UPRR Engineering representative. The contractor should also retain a copy of the answer sheet on site at the project location.

Last Revised: June 12, 2014

IDOT Contract 60K80

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May 8, 2009

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To: Engineering Department Employees and Contractors

From: David Connell, Vice President Engineering

A handwritten signature in black ink, appearing to read "David Connell".

RE: Policy Exceptions for Engineering Department Contractors Working Near Live Tracks

Reference UP's policy on Minimum Safety Requirements for Engineering Department Contractors, section 6.1 "On-Track Safety" (page 11) which states:

"In addition to the instructions contained in FRA's Roadway Worker Protection (RWP) regulations, all contractor employees must: (first bullet only)

- Maintain a distance of at least 25 feet from any track unless the railroad's EIC (Employee in Charge) is present to authorize movements."

This letter will serve as documentation of a policy exception hereby granted to engineering department contractors. The railroad EIC must consider when this exception should **not** apply. Some situations, such as the type of work to be performed or specific work locations, may require a railroad EIC present at each work location or a physical reminder (orange construction fence or posts with white flags) placed 10 feet from the centerline of a live track.

This policy exception allows engineering department contractors to work without a railroad employee EIC present at the work site only under the following conditions:

- All contractor employees are trained on FRA's RWP regulations and UP's Minimum Safety Requirements for Engineering Department Contractors.
- A contractor employee at each work site will be assigned as the Contractor in Charge (CIC). The CIC must ensure that:
 - No personnel or equipment will get any closer than 10 feet from the centerline of any live track except to cross the tracks.

Note: If it will be necessary for personnel or equipment to work closer than 10 feet from the centerline of a live track, an **authorized**, properly qualified and documented employee must be present to provide the appropriate form of On-Track Safety.

- No equipment or vehicles will cross a live track except at a road crossing.

- All contractor employees wear orange, DOT Type II, reflective vests or similar work wear approved by the railroad's representative any time they are working within 25 feet of a live track.
- The contractor employee who will be performing the duties of a CIC must be trained, qualified, designated and equipped to provide train approach warning.
Note: This is required even though On-Track Safety by Train Approach Warning is not necessary because they will not be within 4 feet of a live track.
- A UP manager will audit all contractors performing the duties of a CIC to ensure they are qualified prior to work commencing on the job site. An audit will be performed at least once per month thereafter until the project is completed to ensure the provisions of train approach warning are being complied with.
- If the contractor work site will be within the limits of a Form B track bulletin, the CIC at the work site must be added to the contact list and acknowledge when a train is to be cleared. A working radio must be available for communication between the contractor work site and the railroad EIC of the Form B.
- If there is no Form B track bulletin in effect when contractors are working between 10 and 25 feet from centerline of a live track, the railroad representative will issue a Form C track bulletin that reads:

"CONTRACTORS ARE WORKING AT LEAST 10 FEET FROM THE TRACK AT THE FOLLOWING LOCATION(S): (IDENTIFIED AT MP ___ OR BETWEEN MP ___ AND MP ___)."

- The CIC must remain vigilant for the approach of trains and is responsible for alerting their personnel by the predetermined method of all approaching trains and ensuring personnel and equipment remain more than 10 feet from the centerline of any live track. When warned of an approaching train, all contractor ground personnel and equipment operators not in a protected cab must immediately move to a place of safety that is at least 25 feet from the live track. Operators of protected cab equipment working between 10 and 25 feet from centerline of a live track must immediately stop work until the head end of the train passes the work site.

Note: Equipment is considered to be "protected cab" when it has a solid roof and four-corner structural protection around the operator(s).

- The CIC must participate in a Job Briefing each day with the designated railroad representative prior to work. This Job Briefing may be conducted over the telephone but, at a minimum, must include a discussion of the work areas, any Form B that is in effect at that work location, speed of trains through the work site area, sight restrictions and other operating conditions. The CIC must be reminded that trains do not sound a whistle in advance of private road crossings. The CIC will then conduct a thorough Job Briefing with all contractor employees prior to work.

Should you have any questions about this policy exception, please contact Bobby Odom at 402-544-6229.

Contractor In Charge (CIC)

Questions 1 –10 Roadway Worker

- 1) A Roadway Worker is considered to be fouling the track when:
 - a) Within 25 feet of the nearest rail of any track
 - b) Within 10 feet of the nearest rail of any track
 - c) Within 4 feet of the nearest rail of any track
 - d) Operating on-track equipment only

- 2) What type of Company approved Personal Protective Equipment (PPE) identifies a Roadway worker?
 - a) Yellow Hard Hats
 - b) Fluorescent orange work wear with reflectorized striping
 - c) Safety glasses and ear plugs
 - d) All the above

- 3) On-track safety, referred to as Roadway Worker Protection by the FRA, is designed to:
 - a) Prevent deaths and injuries to Roadway Workers from being struck by trains and on-track equipment
 - b) Prevent derailments
 - c) Increase productivity
 - d) Increase the quality of track maintenance

- 4) Who is responsible for conducting job briefings for work groups?
 - a) All Railroad Employees
 - b) The gang supervisor
 - c) The lookout
 - d) The Employee-In-Charge

- 5) Before fouling any track, a Roadway Worker must:
 - a) Participate in a job briefing
 - b) Communicate with the dispatcher
 - c) Place orange cones to the right of the track
 - d) Mark the work zone with red flags

- 6) When a Lookout is providing Train Approach Warning, every Roadway Worker must:
 - a) Not foul any track until obtaining track & time
 - b) Be in a position to receive a train approach warning
 - c) Display red flags to establish working limits
 - d) Rely on a radio for train approach warning

- 7) When a good faith challenge is made to the type of on-track safety being used, the roadway worker has the right to remain clear of the track until the challenge is resolved.
 - a) True
 - b) False

- 8) What is the work zone around a machine?
- a) Only the area directly under the boom of a crane
 - b) The area that cannot be entered without contacting the operator
 - c) The operator's control compartment
 - d) The limits of the track authority
- 9) How far should the work zone extend around a machine?
- a) 5 feet in front of to 5 feet behind the machine
 - b) 15 feet in front of to 15 feet behind the machine
 - c) 20 feet in front of to 20 feet behind the machine
 - d) 25 feet in front of to 25 feet behind the machine
- 10) As a roadway worker, you must refuse any directive to violate an on-track safety rule.
- a) True
 - b) False

Questions 11–20 Lookouts

- 11) Train approach warning by lookout may be used as a means of on-track safety if the warning can be given in time to allow each roadway worker to occupy a previously arranged place of safety at least ____ before the arrival of a train.
- a) 10 seconds
 - b) 15 seconds
 - c) 30 seconds
 - d) 45 seconds
- 12) The means used by a lookout to communicate a train's approach must be distinctive and clearly understood. In what manner may this warning be given?
- a) Touching the roadway worker
 - b) Using a radio only
 - c) Verbal communication
 - d) Either verbal communication or by touching the roadway worker
- 13) Any roadway worker assigned to be a lookout must be:
- a) Trained and qualified to provide train approach warning
 - b) Designated by the railroad to be a lookout
 - c) Equipped to provide train approach warning
 - d) All of the above
- 14) When roadway workers are notified of an approaching train, they must clear the track. Where must the roadway workers clear the track?
- a) 15 feet from the live track
 - b) 25 feet from the live track
 - c) At a place of safety designated in the job briefing by the EIC
 - d) Anywhere that is at least 4 feet from the track

- 15) A lookout must devote their entire attention to detecting approaching trains in order to provide warning to roadway workers. Each lookout must:
- Perform no other duties
 - Remain at the lookout position until the EIC determines that protection is no longer necessary, or sends a relief lookout
 - Be equipped to provide train approach warning
 - All of the above
- 16) An EIC may be designated as the lookout as long as:
- The EIC is performing no other duties
 - The work is being performed on single track
 - No more trains are anticipated
 - The work group is within the limits of a Form B track bulletin
- 17) A signal maintainer needs to inspect bond wires at a control point and is unable to contact the dispatcher. Which of the following methods can be used to provide protection for the signal maintainer?
- Use a lookout to provide train approach warning (TAW)
 - The signal operations desk must issue track authority
 - Obtain permission from the yardmaster
 - Fill out the lone worker form
- 18) When working in multiple track territory, is it permissible to foul an adjacent track with a truck boom while using a lookout for protection on the adjacent track?
- Yes, provided the lookout is the EIC
 - Only if two lookouts are positioned on either side of the boom truck
 - No protection is required to perform this task
 - No, positive protection must be established to protect equipment occupying or fouling the track
- 19) Can a lookout be positioned 1500 feet from the gang being protected and use a radio to provide train approach warning (TAW)?
- Yes, provided the entire gang is within sight
 - Yes, if the radios are tested and certified
 - Only if the EIC has access to a working radio
 - A radio must not be used as the sole means to communicate TAW
- 20) Can a lookout provide train approach warning for a work group that is replacing a rail?
- Yes
 - No



BUILDING AMERICASM

Fire Prevention Plan

Engineering Department

**Created: July 13, 2002
Revised: August 20, 2013**

Fire Prevention Plan

Table of Contents

1. General Statement of Fire Safety
2. Job Briefings
3. Fire Suppression
4. Fire Risk Assessment
5. Preventive Measures
6. Fire-Sensitive Areas
7. Rule References

1 GENERAL STATEMENT OF FIRE SAFETY

The purpose of this plan is to prevent loss of life, property and natural resources and to prevent disruption of train operations as a result of fires caused by the work activities of Union Pacific's engineering employees.

All engineering personnel and contractors must be familiar and comply with the instructions contained in this plan. They must also be familiar and comply with federal, state and local fire control regulations where they are working. State or local regulations may require dedicated fire-fighting equipment, spark arrestors on work equipment or other restrictions in addition to what is required in these instructions. Specific federal, state and local (county/city) fire regulations as well as fire control agency contact information can be found by going to the UP Engineering home page and clicking on "Wildfire Regulation & Agency Inventory" under the heading of General Information. This website may also be accessed from outside the UP internet system by typing: <http://pocketdynaq.com/FireRegs>. At the login screen, type in "user" as your username and "user" again as your password.

Engineering managers must know the USFS Fire Danger Class for their territory, be aware of burn bans in effect and ensure compliance with any permitting necessary. This information must be given to their employees who perform hot work. More specific fire danger information posted by local/state fire agencies should be used if available.

Hot work is considered to be any work activity that produces sparks or open flame. This work includes, but is not limited to, cutting or grinding with abrasive wheels, open-flame rail heating, thermite welding, flash-butt welding, arc welding, cadweld bonding and using an oxy-fuel torch.

2 JOB BRIEFINGS

2.1 A Fire Risk Assessment must be performed before conducting any hot work.

This fire risk assessment will determine the specific restrictions that employees must follow. If conditions change that would affect the Fire Risk Assessment (such as a drop in humidity, an increase in wind speeds, etc.), a new Fire Risk Assessment must be completed. Be sure to document on the form the time the assessment was conducted. Where a second employee is available, he/she must verify that the risk assessment was properly completed.

2.2 A job briefing must be conducted to discuss the risk factors and fire preventive measures to be taken in accordance with these instructions and the fire suppression methods to be utilized in case of a fire. This job briefing must include a review of the Emergency Response Plan in effect for the specific work location. The Emergency Response Plan must detail the method of contacting local fire/emergency personnel, the train dispatcher and Risk Management Control Center (RMCC). The Emergency Response Plan must also include the evacuation route to be followed in case of a wildfire.

3 FIRE SUPPRESSION

3.1 All employees will respond to a fire without endangering their own safety.

3.2 If a fire gets out of control:

- Contact local fire/emergency personnel, train dispatcher and RMCC. Any fire started by engineering personnel must be reported to RMCC if the employees present cannot extinguish the fire without calling for assistance.
- Evacuate the area using the route detailed in the job briefing.
- Contact others in the immediate area to alert them to the fire danger.

3.3 Engineering personnel involved in hot work must carry the required levels of water as prescribed in section 5 for fire suppression. Any water used for saturating vegetation prior to performing hot work must be in addition to these minimum levels. Gangs must have the minimum number of pump or pressurized sprayers as prescribed in section 5 which can be refilled from the storage tanks. Pressurized sprayers must have an immediate source of compressed air in order to recharge the sprayers.

Except for work over or around waterways, water supply used for fire prevention and suppression must be treated with Class A foam. However, foam-treated water must not be applied in a manner where it will enter waterways, i.e. on bridges, over water, near shorelines, etc. It also should not be applied in areas where the residue from the foam will wash into waterways.

When fire risk is low and the temperature is below freezing or the ground is snow-covered, chemical fire extinguishers may be used in lieu of water for those operations prescribed in sections 5.2 Flash-Butt Welding; 5.3 Open Flame Rail Heating (repairing a pull-apart); 5.4 Thermite Welding, 5.5 Arc Welding, Grinding, Cutting or Using a Torch; 5.6 Applying Cadweld Bonds; and 5.8 Track Inspectors. A minimum of two 20 lbs. chemical fire extinguishers (or equivalent number of smaller extinguishers) must be available for fire suppression for flash-butt welding, open-flame rail heating to repair a pull-apart, thermite welding, arc welding, grinding, cutting or using a torch. A minimum of one 20 lbs. chemical fire extinguisher (or equivalent number of smaller extinguishers) must be available for applying cadweld bonds and inspecting track.

4 FIRE RISK ASSESSMENT

4.1 **ASSESSMENT FORM:** A Fire Risk Assessment must be completed before any hot work is performed. This assessment is comprised of 13 factors, each weighted for its importance in determining the risk of a wildfire. The first 6 factors are relatively fixed – meaning that these factors change very little, if at all, over time at a given location. These consist of elevation, angle of slope, direction of slope, emergency access, fuel (vegetation) type and adjacent property. The other 7 factors can vary widely from one day to the next. They are fire danger class, time of day, distance to vegetation, wind speed, temperature, humidity and precipitation.

If any of the 13 risk factors in the Fire Risk Assessment is unknown, select the "high risk" points for that factor. For example, if the fire danger class is unknown, you would select "high-very high-extreme" and assign 15 points.

All completed forms must be kept in the Fire Risk Assessment book (Form 24309) until the book is full. When the book is full, give it to your manager. Managers should sign and date the front cover when a completed book is received and again after it is reviewed. Managers must keep books for at least 90 days from when they were received.

- 4.2 **ELEVATION:** As elevation increases so does the risk of fire. This is due, primarily, to the differences in temperature and relative humidity, the effect of temperature and humidity patterns on plant characteristics and, to some degree, the effect of wind dynamics associated with daily heating and wildfire behavior on long slopes.
- 4.3 **ANGLE OF SLOPE:** Fires burn up a steep slope faster than on a gradual slope or down-slope because the flames are closer to the unburned vegetation ahead of it – heating and drying it out before ignition. When a fire burns down-slope, the flames are angled away from the unburned vegetation.
- 4.4 **DIRECTION OF SLOPE:** Because we're in the Northern Hemisphere, south-facing slopes are exposed to the sun earlier in the day and for longer periods of time. West-facing slopes are exposed later in the day – when temperatures are normally higher and humidity is lower.
- 4.5 **EMERGENCY ACCESS:** If a fire gets out of our control, off-track access to the area for emergency fire responders is critical.
- 4.6 **FUEL TYPE:** Surface vegetation, such as grasses, plants or brush, is normally the ignition source for wildfires. Dry or dead vegetation on our right-of-way ignites easily and spreads quickly. New leafing, wetland plants, freshness of cuttings, drought, frost and other factors can also affect fuel characteristics.
- 4.7 **ADJACENT PROPERTY:** From a risk standpoint, the consequences of a fire – particularly as it affects the safety of people, their homes and our National Forests – must be taken into account. Fire sensitive areas (Level 1) as defined in section 6 are considered to be the highest risks. However, the employee in charge of the hot work must also consider other high risk areas that could pose a significant danger if a fire got out of control. One example is a heavily traveled road or highway that is less than ¼ mile downwind of the hot work. The smoke generated from a fire could cause a significant driving hazard under certain conditions.
- 4.8 **FIRE DANGER CLASS:** To determine the fire danger class, use the US Forest Service's map on the UP Engineering home page by clicking on "Fire Service Map" under the General Information heading. Outside UP's system, this map can be found at http://www.fs.fed.us/land/wfas/fd_cls_f.png.

White areas on this map indicate that the required forecast data was not received from one or more USFS remote reporting stations. If you will be

working in one of these white areas, use the "Wildland Fire Assessment (WFAS) Map" from the Engineering home page (or www.wfas.net) to determine fire danger class. The color scheme is similar to the USFS map: blue-green-yellow-orange-red as the level of fire risk increases from low to extreme.

If the fire danger class for the work area cannot be determined locally, the employee in charge may call MWOC at (402) 636-7434 to obtain this information.

- 4.9 TIME OF DAY:** This is closely related to two other factors – temperature and humidity. To the extent practical and safe to do so, it is usually better to perform hot work late at night or early in the morning when the temperatures are cooler and the humidity is higher.
- 4.10 DISTANCE TO VEGETATION:** Obviously, the closer combustible vegetation is to our hot work, the greater the chance of a fire. High winds can carry sparks from grinders or rail saws more than 50 feet from our work location.
- 4.11 WIND SPEED:** Wind speeds in excess of 10 mph can carry sparks from our hot work to the combustible vegetation along our right-of-way. High winds will also accelerate the burn rate and intensity of a fire.
- 4.12 TEMPERATURE:** As ambient temperatures increase, the air will draw moisture away from the vegetation (evaporation) and lower the temperature needed to ignite the vegetation.
- 4.13 RELATIVE HUMIDITY:** RH is an indicator of the amount of moisture in the air and directly affects the moisture content of the vegetation. The higher the humidity, the less chance of a wildfire. When relative humidity is less than 25%, the chances of a wildfire increase substantially.
- 4.14 PRECIPITATION:** If there is ample moisture present, the danger of fire is reduced. Snow cover or recent rains are examples.

5 PREVENTIVE MEASURES

The preventive measures to be taken are determined by the fire risk assessment completed prior to the hot work. The employee in charge of the work may determine that additional measures must be taken during periods of extreme dryness or high winds. These additional measures may include the use of a welding tent or shutting down the hot work.

When using a welding tent, follow these safety precautions:

- Use care not to create tripping hazards from tools or materials in or near the welding tent. Housekeeping around the work site is critical to preventing slips, trips and falls.
- In hot weather, employees should minimize their time inside the tent and remove the tent when not required in order to prevent heat stress.
- In windy conditions, secure the welding tent to the rail using the tie-down clamps.

- When cutting rail inside the tent with a torch or an abrasive rail saw, a respirator must be worn per UP's respiratory requirements. In addition, a welding/track fan (380-0085) may be used to disperse the dust or fumes.
- When cutting or grinding inside the tent, use spark shields to prevent damage to the tent.
- To allow better air flow and permit easier egress from the tent, it is permissible to leave a flap open if sparks can be completely contained within the tent.
- A welding tent will not be used for cutting, grinding or welding on track components containing more than 2% manganese.

A person performing the duties of a lookout for On-Track Safety may not serve as a fire watcher when one is required (preventive action "E").

5.1 PRODUCTION RAIL GRINDING

Employees and contractors operating or working with production rail grinders will be governed by the following instructions.

5.1.1 When risk is low (green) or moderate (yellow):

- A. Normal operations include the following:
 - A1 Grinders must be equipped with spark guards.
 - A2 Fire suppression systems on grinders will have the capability to inject Class A foam into the water supply. Each grinder will carry a minimum of 500 feet of 1½" fire hose along with hand tools for fire fighting. There should be adequate supply of hand tools for every employee on site.
 - A3 Grinding will cease when the grinder's water reserve falls below 5,000 gallons.
 - A4 At least one railroad or contractor supervisor must have received training on wildland fire fighting. This trained supervisor must accompany the rail grinder at all times when grinding rail.
 - A5 Manager of Rail Grinding will be responsible for notifying state and federal agencies of the grinding schedule prior to beginning work. Grinding supervisor or service unit manager will notify the local Manager of Bridge Maintenance or his representative prior to grinding the rail on any bridge.
 - A6 Grinding contractor must use thermal imaging equipment to ensure no danger of fire exists on or along the right-of-way.
- F. On open deck timber bridges, bridge personnel must be present during grinding and remain at the bridge for a minimum of 15 minutes after grinding has been completed. Bridge personnel will continue to protect the bridge, by making periodic checks every 30-60 minutes, for 4 hours following the final grinding pass on the bridge. The final check on a timber open deck bridge must be performed between 3-1/2 and 4 hours following the final grinding pass on the bridge. On open deck steel or timber ballast deck bridges, bridge personnel must be present during grinding and must make at least one follow-up check on the bridge between 2 and 4 hours following the final grinding pass on the bridge. Bridge personnel must use a hand held infrared heat sensing device (provided by grinder) while performing checks to

detect excessive heat or potential source of fire ignition on or under the bridge.

- H. A hydrant water truck must follow the grinder when the risk is moderate. To ensure an adequate water supply, a second off-track, fire fighting vehicle may be required to follow the grinding operation.

5.1.2 When risk is high (red):

- X. All production grinding operations will be discontinued except as described below.

Many areas of the west, particularly the southwest, are desert territories with sparse cactus plants and, therefore, do not pose the same level of risk for vegetation fires as the rest of the railroad - even when the fire risk assessment is high.

The Chief Engineer - Western Region (or General Director - Western Region in his absence) may authorize production rail grinding in these territories when the fire risk assessment is high after consultation with the rail grinding supervisor. This consultation should include a review of the fire risk assessment, a discussion of the right-of-way vegetation in the areas to be ground and the weather forecast for the area (e.g. high winds).

5.2 FLASH-BUTT WELDING

Employees or contractors involved with flash-butt welding (or any type of electric flash welding) are governed by the following instructions. Support gangs must comply with the instructions specific to their work activities (e.g. rail cutting or grinding).

5.2.1 When risk is low (green):

- A. Gang must have available a minimum of 50 gallons of water with at least 2 pump or pressurized sprayers. They must also carry six round-nose shovels with an overall length of 46 inches or longer.
- B. Spark shields or curtains must be used.

5.2.2 When risk is moderate (yellow):

- A. Gang must have available a minimum of 50 gallons of water with at least 2 pump or pressurized sprayers. They must also carry six round-nose shovels with an overall length of 46 inches or longer.
- B. Spark shields or curtains must be used.
- C. All combustible vegetation within 35 feet of any hot work must be cleared or saturated with water.
- E. One person on each side of the track must be assigned as a fire watcher. Fire watchers will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.

5.2.3 When risk is high (red):

- I. Flash-butt welding operations must be authorized by the Director Track Programs or Director Track Maintenance.

- A. Gang must have available a minimum of 50 gallons of water with at least 2 pump or pressurized sprayers. They must also carry six round-nose shovels with an overall length of 46 inches or longer.
- B. Spark shields or curtains must be used.
- C. All combustible vegetation within 35 feet of any hot work must be cleared or saturated with water.
- E. One person on each side of the track must be assigned as a fire watcher. Fire watchers will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.
- F. One person must remain at the job site for at least 1 hour after the hot work is completed (2 hours when protecting timber structures) to watch for signs of smoke or fire. This person must have at least 5 gallons of water, a round-nose shovel and communications capable of calling for help.

5.3 OPEN-FLAME RAIL HEATING

Rail and curve gang employees are governed by the following instructions when operating an open-flame rail heater. Section and welding gangs using FireSnake™ or similar material to close a pull-apart by heating the rail are also governed by this instruction.

5.3.1 When risk is low (green) or moderate (yellow):

- A. Each rail gang must have available a minimum of 200 gallons of water with at least 4 pump or pressurized sprayers. Each curve gang must have available a minimum of 100 gallons of water with at least 4 pump or pressurized sprayers. One water tank will be positioned directly behind the rail heater to douse all ties with water. On rail gangs, a second water tank will be positioned at the rear of the gang to ensure that any smoldering ties are again doused. They must also carry at least 10 round-nose shovels with an overall length of 46 inches or longer.

Section and welding gangs repairing a pull-apart by heating the rail must have available a minimum of 20 gallons of water with at least 2 pump or pressurized sprayers and enough round-nose shovels for every person involved in the work. The rail seat area of all ties affected must be doused with water before leaving the work site.

5.3.2 When risk is high (red):

- I. The Director Track Programs or Director Track Maintenance must authorize any open-flame rail heating operations.
- A. Each rail gang must have available a minimum of 200 gallons of water with at least 4 pump or pressurized sprayers. Each curve gang must have available a minimum of 100 gallons of water with at least 4 pump or pressurized sprayers. One water tank will be positioned directly behind the rail heater to douse all ties with water. On rail gangs, a second water tank will be positioned at the rear of the gang to ensure that any smoldering ties are again doused. They must also carry at least 10 round-nose shovels with an overall length of 46 inches or longer.

Section and welding gangs repairing a pull-apart by heating the rail must have available a minimum of 20 gallons of water with at least 2 pump or pressurized sprayers and enough round-nose shovels for every person involved in the work. The rail seat area of all ties affected must be doused with water before leaving the work site.

- F. One person must remain at the job site for at least 1 hour after the hot work is completed (2 hours when protecting timber structures) to watch for signs of smoke or fire. This person must have at least 5 gallons of water, a round-nose shovel and communications capable of calling for help.

5.4 THERMITE WELDING

Employees or contractors involved in thermite welding operations are governed by the following instructions. Thermite welding operations include cutting rail, pre-heating, pouring the weld, shearing and grinding. Care must be taken to avoid injury and fire when removing weld molds, slag pan and risers during take-down. Dispose of slag and molds from thermite welding process in an approved waste container or bury in a dry hole. Haul out the mold boxes instead of burning them to prevent a fire.

5.4.1 When risk is low (green):

- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
- Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
- B. Spark shields must be used.

5.4.2 When risk is moderate (yellow):

- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
- Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
- B. Spark shields must be used.
- C. All combustible vegetation within 35 feet of any hot work must be cleared or saturated with water unless a welding tent is used.
- E. One person must be assigned as a fire watcher. Fire watcher will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.

5.4.3 When risk is high (red):

- I. The Director Track Maintenance or Director Track Programs must authorize all thermite welding operations.

- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
 - Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
- B. Spark shields must be used
- D. A welding tent must be used.
- E. One person must be assigned as a fire watcher. Fire watcher will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.
- F. One person must remain at the job site for at least 1 hour after the hot work is completed (2 hours when protecting timber structures) to watch for signs of smoke or fire. This person must have at least 5 gallons of water, a round-nose shovel and communications capable of calling for help.

5.5 ARC WELDING, GRINDING, CUTTING OR USING A TORCH

Employees or contractors involved in arc welding, grinding (including production switch grinding) or cutting, including use of an abrasive rail saw, oxy-fuel torch or carbon arc cutting torch are governed by the following instructions.

5.5.1 When risk is low (green):

- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
 - Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
 - Work equipment mechanics – 5 gallons of water with at least 1 pump or pressurized sprayer
 - Bridge welders working over timber structures or flammable vegetation - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Brushcutter operators - 20 gallons of water with at least 1 pump or pressurized sprayer
 - Production switch grinders – 150 gallons of water with 100 ft. of 1-inch or larger hose attached to a powered water source. Side and tie sprays must be operational. Off-track support vehicle with a minimum of 50 gallons of water must accompany switch grinder. When the temperature is below freezing or the ground is snow-covered, switch grinder may carry four 20 lb. chemical fire extinguishers and the off-track vehicle may carry two 20 lbs. chemical fire extinguishers in lieu of water.
- B. A spark shield must be used when sparks will not be confined to the ballast section and when working over or near timber bridges or structures. Spark shields are not required where their use is not possible or effective, such as welding overhead or cutting in confined

areas. In such cases, saturate the surrounding combustible materials with water.

5.5.2 When risk is moderate (yellow):

- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
- Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
 - Work equipment mechanics – 5 gallons of water with at least 1 pump or pressurized sprayer
 - Bridge welders working over timber structures or flammable vegetation - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Brushcutter operators - 20 gallons of water with at least 1 pump or pressurized sprayer
 - Production switch grinders – 150 gallons of water with 100 ft. of 1-inch or larger hose attached to a powered water source. Side and tie sprays must be operational. Off-track support vehicle with a minimum of 50 gallons of water must accompany switch grinder.
- B. Spark shields must be used except in those cases where their use is not possible or effective, such as welding overhead or cutting in confined areas. In such cases, saturate the surrounding combustible materials with water.
- C. All combustible vegetation within 35 feet of any hot work must be cleared or saturated with water unless a welding tent is used. A welding tent will not be used for cutting, grinding or welding on track components containing more than 2% manganese.
- E. One person must be assigned as a fire watcher. Fire watcher will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.

5.5.3 When risk is high (red):

- I. The Director Track Maintenance or Director Track Programs must authorize any cutting, welding or grinding operations.
- A. The following personnel must have the minimum amounts of water listed below and enough round-nose shovels for every person involved in the work.
- Track welders and grinders - 20 gallons of water with at least 2 pump or pressurized sprayers
 - Track gangs - 5 gallons of water with at least 1 pump or pressurized sprayer
 - Work equipment mechanics – 5 gallons of water with at least 1 pump or pressurized sprayer
 - Bridge welders working over timber bridges or flammable vegetation - 20 gallons of water with at least 2 pump or pressurized sprayers

- Brushcutter operators - 20 gallons of water with at least 1 pump or pressurized sprayer
- B. Spark shields must be used except in those cases where their use is not possible or effective, such as welding overhead or cutting in confined areas. In such cases, saturate the surrounding combustible materials with water.
- D. A welding tent must be used if possible. If welding tent cannot be used, all combustible vegetation within 35 feet of any hot work must be cleared or saturated with water. A welding tent must not be used for cutting, grinding or welding on track components containing more than 2% manganese. A welding tent is not required for cutting scrap or second-hand rail out of the track; saturate the vegetation thoroughly and utilize spark guards to prevent a fire.
- E. One person must be assigned as a fire watcher. Fire watcher will not be assigned other duties during the hot work and will be equipped with at least 5 gallons of water and a round-nose shovel.
- F. One person must remain at the job site for at least 1 hour after the hot work is completed (2 hours when protecting timber structures) to watch for signs of smoke or fire. This person must have at least 5 gallons of water, a round-nose shovel and communications capable of calling for help.
- X. All production switch grinding operations will be discontinued.

5.6 APPLYING CADWELD BONDS

Signalmen applying cadweld bonds must carry 5 gallons of water with at least 1 pump or pressurized sprayer and enough round-nose shovels for every person involved in the work. When risk is high (red), cadweld bonding must be authorized by the Director Signal Maintenance. If authorized, spark shield(s) must be used to protect both the grinding and bonding operations.

5.7 OTHER WORK ACTIVITIES

Employees or contractors must take all precautions necessary to prevent fires from other work activities not specifically mentioned in these instructions. In addition, employees must:

- 5.7.1 Use caution when parking a vehicle so that heat from the exhaust system does not ignite the vegetation.
- 5.7.2 Fuel equipment away from any sources of heat and at least 10 feet from any combustible vegetation. Engine must be stopped while refueling. Restart portable equipment away from the fueling site.
- 5.7.3 Conduct thorough roll-by inspections of trains, watching closely for exhaust sparks from the locomotives, smoke or sparks from brake shoes and hot journals.
- 5.7.4 Properly dispose of all materials generated as waste from the hot work.
- 5.7.5 Controlled burning of vegetation on the right-of-way is prohibited except as specifically authorized by the Regional Chief Engineer. If authorized, all required permits must be obtained in advance of the work.
- 5.7.6 Smoking is prohibited on all company property including the right-of-way.

5.8 TRACK INSPECTORS

Track inspectors must keep a lookout for right-of-way fires during the course of their normal inspections. Each track inspector must carry a minimum of 5 gallons of water with a pump or pressurized sprayer and 1 round-nose shovel with an overall length of 46 inches or longer. When temperatures are below freezing, chemical fire extinguishers may be carried in lieu of water.

6 FIRE SENSITIVE AREAS (LEVEL 1)

Western Region

- Roseville Service Unit
 1. Canyon Subdivision - James to Portola
 2. Roseville Subdivision - Roseville to Reno
 3. Valley Subdivision - Redding to Dunsmuir
 4. Black Butte Sub - Dunsmuir to No. Black Butte & Andesite to Mt. Hebron
 5. Coast Subdivision - Santa Margarita to San Luis Obispo
- Portland Service Unit
 1. La Grande Subdivision - Pendleton to La Grande
 2. Spokane Subdivision - Bonners Ferry to Eastport
 3. Cascade Subdivision - Crescent Lake to Natron
- Los Angeles Service Unit
 1. Mojave Subdivision - Tehachapi to Bena & Hiland to Dike
 2. Santa Barbara Subdivision - Santa Barbara to Surf

Northern Region

- Denver Service Unit
 1. Moffat Tunnel Subdivision - Rocky to Toponas
 2. Glenwood Springs Sub - Dotsero to Glenwood & Newcastle to Debeque
 3. Provo Subdivision - Helper to Springville
 4. Pleasant Valley Subdivision
 5. Laramie Subdivision - Speer to Dale Jct. on #3 track
 6. Colorado Springs Subdivision - Palmer Lake to Colorado Springs
- Twin Cities Service Unit
 1. ~~Weyville Subdivision~~ (Combined with the Altoona Sub.)
 1. Altoona Subdivision – East Altoona, MP93.3 to End of Sub,199.1
- Chicago Service Unit
 1. Adams Subdivision – Adams to Friesland

Southern Region

None

7 RULE REFERENCES

The instructions contained in this Fire Prevention Plan complement the following rules in effect:

General Code of Operating Rules

1.28 Fire

Safety Rules

72.1 Sounding Alarm

72.2	Operating Fire Equipment
72.7.2	Mobile Equipment
72.9	Right-of-Way Fire
72.10	Starting Fires
72.11	Open Burning Prohibited
72.12	Ignition Sources
79.3	Fire Protection
79.3.1	Protecting Area
79.11	Hot Metal Precautions

Safety Resource Manual

IV(AH)	Fire Protection Policy and Guidelines
IV(E)	Respiratory Protection Program
IV(L)	Smoking Policy

Welding Rules

101.7	Fire Protection
101.8	Protecting Timber Structures
103.5	Hot Metal Precautions
110.23	Minimum Take Down Times (Rail Tech)
110.24	Remove Excess Mold (Rail Tech)
111.22	Minimum Take Down Times (Orgo-Thermit)
111.23	Remove Excess Mold (Orgo-Thermit)

Environmental Laws, Policies and Procedures

Section D-5 - Fire Protection

ENGINEERING FIRE RISK ASSESSMENT

(FORM 24309)
REV. 05/01/12



BUILDING AMERICA®

FAP Route 346 (US 41)
Project ACNHPP-0346(019)
Section 125X-N&J-SB-B
Lake County
Contract No. 60K80

Fire Risk Assessment

Type of Risk	Low Risk	Moderate Risk	High Risk	Score	Score
Elevation	< 2,000 ft	2,000 - 4,000 ft	> 4,000 ft	1	2
Slope	Level or On a Fill	Upslope < 45°	Upslope > 45°	3	6
Slope Facing	North or No Slope	East	South/West	1	2
Emergency Access	Road/ROW Access	Off-Road Access	Only Accessible by Rail	1	2
Fuel Type	Sparsely/green vegetation; new cuttings/slash/brush and hardwood species; if summer/green/fully leafed; marsh grasses; green wetland/meadow/swamp.	Moderate vegetation: dried cuttings/slash/brush; brush mixed with dead fine fuels or leaf drop; hardwoods or brush without leaves (except when leaves have just fallen; or in early spring thaw) or if dried out; new and growing perennial grasses; green wetland/meadow/marsh or swamp vegetation after drought.	Dry or dead vegetation; very dry slash; dead grass that is high and has brush growing in it; dry hardwoods and leaves; any matured grasses or low-growing plants; weeds or small vegetation after a killing frost.	3	6
Adjacent Property	Farmland and sparsely vegetated & sparsely populated areas	Residential/commercial areas among combustible vegetation or forests not included in Level 1 areas	Level 1 Areas or other high risk areas such as a heavily-traveled roadway less than 1/4 mile downwind	5	10
Fire Danger Class	Low	Moderate	High-Very High-Extreme	5	10
Time of Day	8 PM to 10 AM	10 AM to 3 PM	3 PM to 8 PM	1	2
Distance to Vegetation	> 100 ft	50 - 100 ft	< 50 ft	5	10
Wind Speed	0 - 10 MPH	11 MPH - 15 MPH	> 15 MPH	3	6
Temperature	< 60° F	61° F - 70° F	> 70° F	1	2
Humidity	> 50%	25% - 50%	< 25%	1	2
Precipitation **	Precipitation or Heavy Fog	Moisture Within Last 3 Days	No Moisture Within Last 3 Days	3	6
TOTAL	33-54	55-69	70-99		

****A Fire Risk Assessment must be completed prior to conducting any hot work unless one of the following conditions exist.**

When any of these conditions exist, the fire risk is low (green). Check the box that applies.

- Ground is covered by snow
- Ground is covered by a heavy frost
- Currently raining, snowing or sleeting
- Ground is saturated as evidenced by standing water with no dry vegetation such as cattails or reeds that pose a fire risk

Fire Risk Assessment Form completed by: _____ MP: _____ Gang(s): _____ Date: _____ Time: _____
 Verified by: _____

Subdivision: _____
Keep all completed forms in this book. When the book is full, give it to your manager.

Preventive Actions Based on Level of Risk	
Type of Work	33-54 or No Vegetation Within 100' <small>IDOT Contract 60K80</small>
Production Rail Grinding	55-69
Flash-Butt Welding	A+F+H
Open-Flame Rail Heating	A+B+C+E
Thermite Welding (including cutting and grinding tasks)	A
Arc Welding, Cutting, Grinding (including production switch grinding) or Using a Torch	A+B+(C or D)+E
Cadweld Bonding	A+B+(C or D)+E
	A

A	Normal operations
B	Use spark shields to protect all hot work
C	Saturate with water or clear vegetation within 35 feet of the hot work
D	Use a welding tent to protect hot work
E	Post fire watcher(s) to watch for signs of smoke or fire during hot work
F	Leave one employee at the job site for 1 hr after hot work (2 hrs for timber structures). Compliance with section 5.1.1 (F) will satisfy this requirement for production rail grinding operations.
H	Hy-rail water truck will follow grinding operations
I	Hot work authorized by director (or MTP, MSP or MBM in their absence) Authorized by _____ Time _____
X	Shut down hot work operations
*	When fire risk is high, tent must be used if it can be used (D). If tent cannot be used, saturate or clear vegetation (C).

**This is to be used as a field reference guide only.
 Read and comply with all applicable instructions detailed in the Fire Prevention Plan.**

Special Condition Safety Management Plan - 04/17/2014

1. General
 - a. Furnish and implement contractor Safety Management Plan.
 - b. Safety Management Plan to include General Contractor employees as well as all Sub-Contractors and their employees.

2. Minimum Requirements – Plan must include, at a minimum:
 - a. Requirements contained in established Contractor Safety Plan
 - b. Governmental Requirements
 - c. UPRR Minimum Contractor Safety Requirements
 - d. UPRR Safety Certification
 - e. UPRR C.I.C. (Contractor in Charge) Policy
 - f. UPRR Fire Prevention Plan and Risk Assessment
 - g. UPRR Back-up Policy.
 - h. E-Railsafe training.
 - i. FRA Roadway Worker training
 - j. FRA Bridge Worker training.
 - k. Safety Audit Process
 - l. Adjustment Plan
 - m. Traffic Control Plan and/or Traffic Management

3. Execution

Furnish Safety Management Plan to UPRR field manager no later than 10 days after NTP, but prior to mobilization on site. Ideally this plan will be submitted prior to the Pre-Construction meeting and will be discussed at this meeting.

 - a. Furnish corrections to Safety Management Plan as required by UPRR field manager no later than 10 days after receipt of request.
 - b. Provide as discussion item in weekly meeting, or as otherwise approved by UPRR field manager.
 - c. Audit Process
 - Provide Safety Audit Form.
 - Provide for management Safety audit program, with weekly plan audit program by contractor management.
 - Provide Safety audit results and corrective actions in a report to UPRR field manager weekly, and provide comprehensive report monthly.
 - d. Adjustment Safety Management Plan – Provide for Safety Management Plan adjustment process which will include behavior modification process or corrective action. If adjustments are not made the contractor may be subject to the deductions as presented below.

4. Measurement and Payment
 - a. Incidental to Mobilization Cost
 - i. 70% of Mobilization paid on first invoice will be contingent upon submittal and approval of Safety Management Plan.
 - ii. Minimum contractor performed audits should include at least one audit per day for each General Contractor work group and for each sub-contractor on-site.
 - b. The contractor is expected to submit a weekly report and a summarized monthly report to the UPRR field manager. Failure to submit weekly Safety audit reports and summarized monthly reports with any necessary corrective action plans will result in **5% deduction applied to the remaining 30% of the mobilization pay item for that month's invoice.**
 - c. In contracts that do not contain a mobilization bid item, failure to submit a weekly audit report over any three weeks during the project **may** result in removal of contractor from bid lists.

UNION PACIFIC RAILROAD COMPANY
 System General Orders
 System Special Instructions
 EFFECTIVE April 1, 2015
 Order Category : Sys. SI. 10-E - 10-G
 System General Order No. 4

89

Purpose:

Item 10-E : Rule 74.6.3: Created New Rule "Back-Up Moves by Off-Track Equipment"

Recent Changes: Item 10-E : Rule 74.6: Add requirement to walk around vehicle and confirm vehicle path is clear when a second person is not available.

Rule 74.6.1: Change entire rule.

EFFECTIVE: 2015 Apr 1st 0900 hours Central.

Cancellations :

This order cancels all previous orders in Order Category: Sys. SI. 10-E - 10-G

Item 10-E - Safety Rules

74.6 - Back-Up Moves

Change first sub-bullet under last bullet (as contained in System Special Instructions) to read:

- The driver must stop every 150 feet. After stopping, the driver must secure the vehicle and walk around the vehicle to confirm that nothing has entered the path of the rearward movement of vehicle.

74.6.1 - Back-up Moves by Engineering Employees and Contractors in Vehicles

Change Rule To Read :

74.6.1	<p>74.6.1: Back-up Moves by Engineering Employees and Contractors in Vehicles</p> <p>Work must be planned to minimize back-up moves and to avoid driving into areas requiring back-up moves. No back-up move is allowed when a forward move can safely be made.</p> <p>Employee(s) in the cab of a vehicle must not distract the driver with unnecessary conversation or other distractions until the back-up move is completed.</p> <p>Before initiating a back-up move, the driver must walk to the rear of the vehicle to confirm that it is safe to move unless a second person is directing the move as described in 2(A) below.</p> <p>In addition, each driver must comply with the following:</p> <ol style="list-style-type: none"> 1. Sound horn frequently if back up alarm is inoperative or unavailable. 2. When safe to do so, proceed not exceeding 5 MPH and complying with either (A) or (B) below. <ul style="list-style-type: none"> (A) When a second person is available to direct the back-up move (i.e any other employees or contractors in the vehicle or present in the immediate vicinity): <ul style="list-style-type: none"> • A job briefing must be performed prior to movement, addressing the direction of move and position of person protecting the move. ▪ The person directing the move (spotter) must be in a position to be seen by the driver and must be able to see the rear of the vehicle and the intended path.
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UNION PACIFIC RAILROAD COMPANY
System General Orders

	<p style="text-align: center;">IDOT Contract 60K80 90</p> <ul style="list-style-type: none">• The spotter must not walk backwards or turn his/her back to the back-up move. Instead, the spotter must bring the vehicle back to a pre-determined point and stop the move. The spotter may then reposition himself before resuming the back-up move.• Driver must immediately stop if the person who is directing the movement disappears from the driver's view. <p>(B) When a second person is not available:</p> <ul style="list-style-type: none">• The driver must stop every 150 feet. After stopping, the driver must secure the vehicle against movement, walk to the rear of the vehicle and visually confirm that the way is clear. <p>There are three exceptions to requirement 2(A or B) above:</p> <p>(1) The vehicle is equipped with an operative rear vision camera that provides sufficient visibility.</p> <p>(2) Short turn-around move or backing into a parking spot that requires a back-up move of 30 feet or less if there are no other persons on the ground within 150 feet and the vehicle has pulled by the area to ensure a safe move can be made.</p> <p>(3) Delivery of materials or equipment to a work site if there are no persons on the ground within 150 feet of the intended path and there is no equipment standing on an adjacent track.</p>
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74.6.3 - Back-Up Moves by Off-Track Equipment

Off-track equipment (bulldozer, backhoe, etc.) working on Union Pacific Railroad property must be equipped with an operative back-up alarm.

SIGNATURE : Cameron A. Scott
SIGNATURE TITLE : EVP OPERATIONS



Smoking

(Policy effective July 1, 2005)

What Is It?

The purpose of this policy is to provide employees on Union Pacific Railroad Company with a work environment free from the potentially harmful effects of tobacco. Included within this policy is the use of electronic devices that mimic cigarettes, pipes or other smoking paraphernalia, e.g., e-cigarettes.

Why Was It Written?

Union Pacific Railroad Company intends to provide employees with a smoke-free work environment. This policy has been implemented because of the potentially harmful effects of tobacco use, in response to employee health concerns, and at the direction of senior management.

What Are The General Provisions?

Smoking, including the use of electronic smoking devices, is prohibited at the following locations and activities:

1. All Company property, whether owned or leased, including mechanical facilities, along the right-of-way, in office buildings, and all service unit facilities and yards.
2. In or near building entrances and contiguous sidewalks.
3. In locomotive cabs, cabooses, bunk cars, company vehicles, and similar equipment.
4. Meetings held at off-site locations.

Cessation Programs

Programs are available for employees who desire to quit smoking. Interested employees should contact the Health Promotion staff at (402) 544-2442 or toll free at (888-767-0169). Information is also available on the Wellness Programs [Tobacco Cessation Options](#) page.

Noncompliance

Failure to comply may result in the assessment of discipline.

For Further Information

- Questions concerning compliance with the Smoking Policy should be referred to your immediate Supervisor.
- Contact the Company Values Line at (800) 998-2000.
- Contact the HR Customer Service representative for your department.

Rule Updated Date

January 28, 2011

System Special Instructions

Revision Date: July 2, 2013

**Procedures for the Installation,
Adjustment, Maintenance and
Inspection of CWR as Required by**

49 CFR 213.119



Effective October 09, 2009

Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR as Required by 49 CFR 213.119

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Table 4-H	Attached
Track Standard Drawing 0461C	Attached
Rail Neutral Temperature Report	Attached
Fracture Report	Attached

NOTE: The appendices listed above are not a part of the Union Pacific submitted CWR procedures but have been sent to FRA as critical reference documents. Any revisions to these accompanying appendices must immediately be forwarded to FRA for inclusion with the submitted plan.

Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR as Required by 49 CFR 213.119

This document details the Railroad's policy on installing, adjusting, maintaining and inspecting Continuous Welded Rail (CWR) track. Each chapter details how the Railroad applies its standards and procedures to comply with FRA standards.

Chapter 1 CWR Installation Procedures

Rail length that exceeds 400 feet is considered CWR. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail at a later time.

1.1 Desired Rail Neutral Temperature

Rail neutral temperature is the temperature at which a rail is neither in tension nor compression. Designated rail laying temperatures have been established to provide a high rail neutral temperature to prevent track buckling. When laying or adjusting CWR use the rail laying temperatures shown in **Table 7- J**.

1.2 Temperature Differential

The difference between the designated rail laying temperature and the actual rail temperature taken at the time of installation is called the temperature differential. CWR laying and adjusting procedures have been established to compensate for this temperature difference.

1.3 Installing CWR

Follow these general requirements when installing CWR:

Refer to **Table 7- J** for the designated rail laying temperature for your area. Rail lengths may be used in lieu of feet in calculating adjustments.

Take the rail temperature and calculate the expansion required before making adjustments.

Record the rail laying temperature, location and date on approved forms. These records may be retained in an electronic format per 213.241. (**Refer to Record of Heat Control.**)

Rail does not need to be adjusted when the actual rail temperature exceeds the designated rail laying temperature.

Use rail heaters or rail expanders to adjust the rail to the correct length when the actual rail temperature is less than the designated rail laying temperature. Heat the rail evenly and uniformly so that the rail expansion occurs evenly and uniformly throughout its length. If rail is laid at a temperature more than 40° F below the designated rail laying temperature, rail must be adjusted or a speed restriction of 40 mph must be placed prior to rail temperature above designated rail laying temperature. When tight rail conditions exist, be governed by Chapter 7.1.

Chapter 2 Rail Anchoring Requirements

Where the anchoring function is otherwise provided, rail anchors may be omitted. Anchors may not be applied where they will interfere with signal or other track appliances, where they are inaccessible for adjustment or inspection or on rail opposite a joint. Anchor pattern may be varied as reasonable to avoid placing anchors against deteriorated ties.

Installation

The following anchoring requirements apply to CWR installation on all main tracks and sidings. These anchoring requirements also apply to all tracks other than main tracks or sidings operating at speeds above class 1.

2.1 Standard Box Pattern

When installing CWR, box anchor every other tie except as outlined in Section 2.2.

2.2 Solid Box Pattern

When installing CWR, box anchor every effective tie at specific locations listed below to provide additional restraint against rail.

Condition	Action
Turnouts Rail crossings Joints where CWR abuts jointed rail	Anchor every tie for 195' in each direction.
Bolted joint installed during CWR installation when using heater, rail stretcher or sufficient ambient temperature. << Effective October 09, 2009 >>	Within 60 days, weld joint, OR install joint with 6 bolts, OR anchor every tie for 195' in each direction.

2.3 Bridge Pattern

When installing CWR, follow these bridge anchoring requirements:

1. Ballast deck bridges should be anchored with the same pattern as in section 2.1 and 2.2.
2. Open deck bridges should be anchored according to (Standard Drawing 0461C.)

Maintenance or Rail Repair

2.4 Legacy Patterns

On CWR installations completed before September 21, 1998, existing anchoring may remain if rail is restrained to prevent track buckles, but rail must be adjusted (by increasing or decreasing the length of rail or by lining on curves) or anchors added to rail if restraint is not sufficient.

2.5 Anchor Pattern after Repair

When repairs result in a joint being added to CWR, the anchor pattern shall match the existing pattern in track. At least every other tie will be box anchored for a distance of 195 feet in each direction unless anchoring is otherwise provided or if it would conflict with sStandard dDrawing 0416C. When repairs are made to a stripped joint or failed joint bar, the adjustment or addition of anchors will be as prescribed in the following table.

Condition	Action
Bolted joint in CWR experiencing service failure (stripped joint) or failed bar(s) with gap* present *Gap exists if it cannot be closed by drift pin	<ol style="list-style-type: none"> 1. Weld joint, OR 2. Remediate joint conditions (per Chapter 6.5), replace bolts (new, in-kind or stronger), and weld joint within 30 days, OR 3. Replace failed bar(s), install 2 additional bolts and adjust anchors, OR 4. Replace failed bars, bolts (if broken or missing) and anchor every tie for 195' in both directions, OR 5. Add rail

Chapter 3 Preventive Maintenance on Existing CWR Track

Performing track buckling maintenance can reduce the risk of buckles. When tight rail conditions exist, be governed by Chapter 7.1.

3.1 Maintaining Desired Rail Installation Temperature Range

A record of rail neutral temperature will be maintained where rail has pulled apart, broken or been cut for defect removal. Record the length of the rail end gap and rail temperature in addition to the other required information on the **Designated Rail Separation Form** for determining rail neutral temperature.

Rail that has pulled apart, broken or been cut for defect removal at rail temperatures at or below 60°F must be readjusted to within the subdivision rail laying temperature minus 20° (RLT-20°) safe range. If the rail has not been readjusted to at least RLT -20° before rail temperatures exceed the values in the TABLE below, a speed restriction of 25 mph will be placed, or a speed restriction of 40 mph will be placed with a required daily inspection made during the heat of the day.

Rail break or cut Temperature (°F)	Rail temperature (°F) at which to readjust or apply slow order
60	135
50	130
40	125
30	120
20	115
10	110
0	105
-10	100
-20	95
-30	90
-40	85

After **October 09, 2009**, known rail neutral temperature locations not adjusted to within RLT -20° safety range must ultimately be adjusted within 365 days of installation. If rail is added for any reason, measure and record the amount of rail added so that adjustments can be made, if necessary.* This measurement may be made by the use of reference marks. The use of reference marks includes:

- Marking the locations where rail is to be cut
- Marking the rail outside the limits of the joint bars
- Measure the distance between the reference marks and mark it on the rail or otherwise record it
- Install the rail and re-measure the distance between reference marks
- Record the difference and document the location

Refer to Placing Rail Reference Marks Document

When welding rail ends together, the required weld gap or rail consumption must be taken into consideration when determining the amount of rail adjustment.

*Where rail has been added to re-establish the desired RLT this requirement need not apply.

3.2 De-Stressing Rail

Rail can be de-stressed by cutting rail out or by re-aligning a curve. When cutting rail out, use this procedure:

1. Use a designated safe procedure to cut rail. It's possible that the rail is under compression and may move unexpectedly. Cut rail to be de-stressed.
2. Remove or reposition anchors or clips for a minimum of 195 feet in both directions from the cut or up to a restriction that prevents rail movement.
3. Wait until the rails stop moving. The rail ends may need to be trimmed more than one time to allow for expansion.
4. Take the rail temperature.
5. Use **Table 7 - J** to compare the rail temperature with the designated rail laying temperature for the territory. This is known as the temperature differential.
6. If the actual rail temperature is lower by more than 20°F from the designated rail laying temperature for the territory, use **Table 4-H** to determine the rail length to be removed based on the total distance the anchors or clips have been removed.

7. If the rail temperature is the rail laying temperature, no additional adjustments are needed.
8. Weld the joint or apply joint bars.
9. Replace the rail anchors or clips.

Chapter 4 Monitoring Curve Movement Following Track Surfacing and Lining

4.1 Staking of Curves

Before surfacing and lining a curve on main tracks, stake curve if it is more than 3° and the rail temperature is more than 50°F below the designated rail laying temperature (or is forecasted to be in the next 24 hours).

To stake a curve prior to surfacing and lining, place at least 3 reference points uniformly spaced around the curve. These reference points shall be no more than 200 feet apart.

4.2 Inspecting for Curve Movement

Inspect for curve movement periodically after the work, especially during periods of large temperature changes. Where curve has been staked per Section 4.1 and curve has shifted inward more than a maximum of 3 inches, the curve must be lined out prior to rail temperatures above or forecasted above the designated rail laying temperature in **Table 7 - J**. If curve is not lined out or de-stressed a speed restriction of 40 mph or less must be placed. When tight rail conditions exist, be governed by Chapter 7.1.

Chapter 5 Placing Temporary Speed Restrictions on Account of Track Work

Place a temporary speed restriction anytime the roadbed or ballast section is disturbed as required in Section 5.4, except where the maximum authorized speed of the track is equal to or less than the required restriction.

5.1 General Requirements

Speed restrictions ensure safe train operations until the affected track stabilizes. Restrictions need to stay in place to allow the ballast to consolidate, rail compressive forces to equalize and the sub grade to compact. Take more restrictive measures when conditions warrant.

5.2 Responsibility for Placing Speed Restrictions

During the work or before returning the track to service, the supervisor or foreman in charge must ensure that:

Gage, surface and alignment have been established.

Crib and shoulder ballast is in place or lateral constraint is otherwise provided.

The rail is anchored per Sections 2 or 3.

5.3 Speed Restriction Length

To minimize running rail and other dynamic forces, trains must have time to brake and adjust slack before entering the disturbed track. For heavy grades, sharp curves or substandard track conditions, extend speed restrictions farther from the work limits, if needed.

5.4 Speed Restrictions for Track Work

When the following track work has been performed, place a speed restriction that complies with the guidelines below.

When rail temperature is above or forecasted above railroad designated temperature within the next 24 hours per **Table 7 - J**:

Activity	Maximum Speed	Minimum Duration
Out-of-face installation of ties Undercutting Laying track/switch panels Constructing track Out-of-face surfacing and lining	30 mph freight 40 mph passenger	8 freight trains or 16 passenger trains OR an equivalent combination*
Spot Maintenance <ul style="list-style-type: none"> Installing ties (no more than 5 ties in 39 ft and no more than 3 consecutive ties) Surfacing/lining (maximum length of 19'6") 	30 mph freight 40 mph passenger	1 train
Mechanically-stabilized track performed after any of the activities listed above	30 mph freight 40 mph passenger	1 train

- 2 passenger trains are equivalent to 1 freight train

When rail temperature is at or below and is forecasted to remain at or below railroad designated temperature within the next 24 hours per **Table 7 - J**:

Activity	Maximum Speed	Minimum Duration
Out-of-face installation of ties	30 mph freight	1 train
Out-of-face surfacing and lining	40 mph passenger	
Undercutting		
Laying track/switch panels		
Constructing track		
Exception: Spot maintenance does not require a speed restriction.		
Mechanically-stabilized track performed after any of the activities listed above	40 mph freight	1 train

When rail temperature is less than 80°F, a speed restriction is not required.

Chapter 6 Rail Joint Inspections

CWR Joint means any joint directly connected to CWR.

6.1 Class of Track

All CWR joints within the following classes must be inspected on foot:

- Class 2 on which passenger trains operate, and
- Class 3 and higher

6.2 Frequency of Inspections

CWR joints shall be inspected on foot at the following minimum frequencies:

Minimum Number of Inspections Per Calendar Year ¹					
	Freight Trains operating over track with an annual tonnage of:			Passenger Trains operating over track with an annual tonnage of:	
	less than 40 mgt	40 to 60 mgt	greater than 60 mgt	less than 20 mgt	greater than or equal to 20 mgt
Class 5 & above	2x	3x ²	4x ²	3x ²	3x ²

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Class 4	2x	3x ²	4x ²	2x	3x ²
Class 3	1x	2x	2x	2x	2x
Class 2	0	0	0	1x	1x
Class 1	0	0	0	0	0
Excepted Track	0	0	0	n/a	n/a
<p>4x = Four times per calendar year, with one inspection in each of the following periods: January to March, April to June, July to September, and October to December; and with consecutive inspections separated by at least 60 calendar days.</p> <p>3x = Three times per calendar year, with one inspection in each of the following periods: January to April, May to August, and September to December; and with consecutive inspections separated by at least 90 calendar days.</p> <p>2x = Twice per calendar year, with one inspection in each of the following periods: January to June and July to December; and with consecutive inspections separated by at least 120 calendar days.</p> <p>1x = Once per calendar year, with consecutive inspections separated by at least 180 calendar days.</p> <p>¹ Where a track owner operates both freight and passenger trains over a given segment of track, and there are two different possible inspection interval requirements, the more frequent inspection interval applies.</p> <p>² When extreme weather conditions prevent a track owner from conducting an inspection of a particular territory within the required interval, the track owner may extend the interval by up to 30 calendar days from the last day that the extreme weather condition prevented the required inspection.</p>					

6.3 Identification of Joints

Each CWR joint requiring action as outlined in section 6.5 shall be identified in the field with a highly visible marking. In addition, such joints shall also be identified as to location by specifying the subdivision, milepost, track number and rail (north, south, etc.).

6.4 Switches, Track Crossings, Lift Rail Assemblies or Other Transition Devices on Moveable Bridges

Joints within or adjacent to switches, track crossings, lift rail assemblies or other transition devices on moveable bridges are exempt from the periodic joint inspection requirements provided they are inspected monthly during the required monthly walking inspection of these devices.

Therefore, inspect these locations on a minimum monthly basis and include in the inspection and report on the following:

At switches:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the switch location, include as a minimum all joints from

the point of the switch to the heel of the frog.

At cross-overs:

- All joints in track between switches.

At track crossings:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the track crossings, include as a minimum all joints that are between or connected to the crossing frogs.

At lift rail assemblies or other transition devices on movable bridges:

- All joints immediately attached to the rail assembly or transition device.

Should a cracked or broken joint bar be discovered during the monthly inspection of any of the above locations, a Fracture Report must be completed as per section 6.7.

6.5 Rail Joint Conditions

When inspecting CWR joints on foot in track listed in 6.1, inspectors must watch for (but not be limited to) the following rail joint conditions outlined in the table below. When such conditions are found, the appropriate action must be taken as outlined.

Rail joint condition	Action ¹
Visible cracks in joint bar	Replace bar
Loose bolts	Tighten bolts
Bent bolts	Replace bolts OR Reinspect as per 6.2
Missing bolts ²	Replace bolts
Tie(s) not effectively supporting joint	Tamp tie(s) Replace or repair tie(s) OR Conduct follow-up inspections every other week until repaired/removed
Broken or missing tie plate(s)	Replace tie plate(s) OR Conduct follow-up inspections every other week until repaired/removed
Deteriorated insulated joint	Replace/repair joint OR Conduct follow-up inspections every other week until repaired/removed
Rail end batter (More than 3/8" in depth and more than 6" in length measured with a 24" straight-edge)	Repair by welding joint or removing rail OR Conduct follow-up inspections every other week until repaired/removed
Rail end mismatch reaches limits specified by 49 CFR 213.115	Weld or grind

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Longitudinal rail movement greater than 2"	Add or adjust rail anchors, tighten bolts, add or remove rail at appropriate time OR Conduct follow-up inspections every other week until repaired/removed
Wide rail gap greater than 1.5"	Adjust rail gap and secure joint OR Conduct follow-up inspections every other week until repaired/removed
Joint vertical movement (profile) that exceeds 75% of the allowable threshold for the designated class of track ³	Surface joint OR Conduct follow-up inspections every other week until repaired/removed
Joint lateral movement (in a curve or spiral) that reaches 3/4" ³	Correct lateral movement OR Conduct follow-up inspections every other week until repaired/removed

- 1 Action may also consist of placing a speed restriction or removing the track from service.
- 2 A minimum of 2 bolts per rail must be in place at each joint.
- 3 Joint lateral and vertical movement is the apparent visible movement measured at the joint.

6.6 Embedded Joints

Permanently Embedded Locations

Where such locations exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads) to conduct an inspection of CWR joints. Make every effort, to the extent practicable, to inspect the visible portion of joints in these structures.

Temporarily Buried Locations

Joints may sometimes be temporarily buried (e.g., where ballast or similar material is in the middle of the track and along the track) and therefore unavailable for inspection. Where CWR joints are buried (e.g., by ballast), wait for the completion of the track work before conducting joint bar inspections.

6.7 Inspection Records

On-Foot Periodic and Follow-up Inspection Reports

Document each on-foot periodic and follow-up inspection on the date of the inspection by noting the following information:

- Date
- Limits of the inspection

- Location and nature of CWR joint conditions specified in section 6.5
- Corrective or Remedial action
- Name and signature of inspector

Fracture Reports

Track subject to inspections under **213.119(g)(5)(i)**, must have a Fracture Report completed for every cracked or broken CWR joint bar that is discovered during the course of an inspection conducted to comply with:

- Track Inspections (213.233),
- Inspections of switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges (213.235),
- Periodic and Follow-Up CWR Joint Inspections (213.119(g)).

The Fracture Report shall be prepared on the date the cracked or broken joint bar is discovered.

Refer to Fracture Report Form

Chapter 7 Extreme Weather Inspections

For purposes of forecasting or initiating extreme weather inspections and conversions of rail temperature in relation to ambient temperatures use the following conversions:

- In hot weather rail temperature is equal to ambient temperature plus 30°F.
- In cold weather rail temperature is equal to ambient temperature.

7.1 Hot Weather Inspections

On main tracks hot weather inspections must be performed as directed by the **Director Track Maintenance** when the temperature is forecast to exceed the **Level 1** temperature for the territory **per table 7- J**.

Perform inspections during the heat of the day - primarily between 12 noon and 6 p.m.

Inspectors will inspect for signs of tight rail conditions, including:

- Kinky or wavy rail
- Rail canting or lifting out of tie plates
- Shiny marks on the base of the rail indicating that the rail is running through anchors and spikes
- Gaps in ballast at the ends of ties
- Churning ballast and ties

When tight rail conditions are present such as above, a speed restriction of 25 mph or less must be placed or track removed from service until repair or adjustment is made.

Inspectors will pay special attention to the following locations:

- Recently disturbed track

- Track at the bottom of sags
- Locations where heavy braking occurs
- Fixed track structures, such as turnouts and bridges
- Locations where rail has been repaired or welds made

7.2 Cold Weather Inspections

On main tracks, cold weather inspections must be performed as directed by the **Director Track Maintenance** when the rail temperature is forecast to drop 100°F below the rail laying temperature per **Table 7-J**.

Inspectors will inspect for:

- Broken rails
- Pull-aparts
- Wide gap between rail-ends
- Cracked or broken joint bars (conventional and insulated)
- Bent bolts
- Curve movement
- Canted rail

Chapter 8 Training

All employees responsible for the inspection, installation, adjustment or maintenance of CWR track must complete training on CWR procedures every calendar year. In addition, they shall be provided a copy of these procedures and accompanying documents. Engineering **Directors and Managers** will maintain lists of those employees qualified to supervise restorations and inspect track in CWR territory. The qualified employee lists will be made available to the FRA upon request. Training programs will address the following:

- CWR installation procedures
- Rail anchoring requirements when installing CWR
- Preventive maintenance on existing CWR track
- Monitoring curve movement following track surfacing and lining
- Placing temporary speed restrictions on account track work
- Rail joint inspections
- Insufficient ballast
- Extreme weather inspections
- Recordkeeping

Chapter 9 Recordkeeping

9.1 Report of CWR Installations

Rail temperature, location and date of CWR installations must be recorded on the prescribed form and must be retained for at least one year after installation.

Refer to Record of Heat Control

9.2 Report Maintenance Work in CWR

Because track maintenance can disturb the lateral and longitudinal resistance of the track, records of the following must be kept until corrections or adjustments are made:

- Rail that is added for any reason, including repair of broken or defective rail, pull-aparts and welding of rail joints.
- Where curve has been staked and has shifted inward more than a maximum of 3 inches.
- CWR installation or maintenance work that does not conform to these written procedures.
- A record of rail neutral temperature will be maintained where rail has pulled apart, broken or been cut for defect removal.

Director Track Maintenance and Manager Track Maintenance must monitor these records to ensure necessary corrections and adjustments are made.

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BUILDING AMERICASM

Form 7913:
Instructions for Inspecting, Welding and
Grinding of Rail and Track Components
Contractor Version (2012)

PB-21321

Revised March 1, 2007

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To obtain additional copies of this book and/or binder(s), order through Corporate Express via e-procurement using the following item numbers:

<u>Description</u>	<u>Item Number</u>
UPRR Instructions for Inspecting, Welding and Grinding of Rail and Track Components (tabs included)	PB-21321
UPRR 7-Ring Field Rules Binder	PB-20500

Scope of Track Welders Duties

All rail welding, welding repairs and grinding maintenance of rail and related track components is the responsibility of the Track Welding Employees in the Engineering Department.

All rules, standards and procedures detailed in this document must be followed to safely and efficiently perform all necessary repairs and maintenance work.

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100.0 General Instructions

100.1 Employee Responsibilities

Following instructions that differ from the Union Pacific Railroad standards, FRA guidelines and rules outlined in Form 7913 could be potentially harmful to the safe operation of the railroad and must be brought to the attention of the Manager of Track Welding.

Where Union Pacific Railroad rules are more restrictive than the FRA, Union Pacific Railroad rules will be followed.

100.1.1 Carry Instructions

Welding managers and supervisors, track managers and supervisors, track inspectors, track maintenance foremen, track welders and helpers and grinder operators must have a current copy of track welding rules as described in Form 7913 (Instructions for Inspecting, Welding and Grinding of Rail and Track Components).

100.2 List of Assigned Duties

100.2.1 Electric Welding

- Repair battered or chipped rail ends.
- Repair worn or damaged rail bound manganese turn-out frogs.
- Repair worn or damaged bolted rigid frogs.
- Repair worn or damaged self-guarded manganese frogs.
- Repair spring frogs (only as allowed in rules).
- Repair crossing frogs.
- Repair switch points (only as allowed in rules).

100.2.2 Thermite Welding

- Install standard gap welds - various manufacturers.
- Install wide gap welds - various manufacturers.

100.2.3 Electric Flash Butt Welding

- Operate In-Track Welders.

100.2.4 Oxy-Fuel Equipment – Operation

- Operate all oxy-fuel cutting equipment.
- Operate all oxy-fuel heating equipment.

100.2.5 Abrasive Wheel Cutting and Grinding

- Operate all grinding equipment used for preventive grinding.
- Operate all grinding equipment used in track welding repairs.
- Operate all abrasive saws used to cut rail.

100.2.6 Reporting

- Complete all timekeeping and production reports as required.
- Complete Laptop Movement Reporting System (LMRS) reports, if applicable.
- Complete "Cut-in/Cut-out" and "Service Failure" reports, if applicable.

100.2.7 Other Duties

- Tamp ties, as necessary, for repair longevity and safe train operation.
- Replace and /or tighten track and frog bolts as part of repair or when necessary for safe train operation.
- Install replacement rail and insulated joint plugs as required before welding.

100.3 Qualifications – Welders/Helpers

- Must meet Commercial Drivers License (CDL) and Department of Transportation (DOT) requirements for specific position.
- Must be qualified by Manager of Track Welding to use welding and/or grinding equipment.
- Qualification will consist of knowledge base and skills assessment.
- Qualification period is determined by applicable labor agreement.
- Prior to qualification, employee may work under the direct supervision of a qualified employee.

100.3.1 Re-qualification

- Every 3 years, employees shall be re-qualified in the use of welding and/or grinding equipment.
- A knowledge base exam and skills assessment will be completed to the satisfaction of the Manager of Track Welding.
- The appropriate training code shall be entered into the employee's record.

100.4 Training Requirements

100.4.1 Track Welding

- Basic welding course or equivalent should be completed within one year of position assignment.
 1. Basic welding equivalent consists of one of the following:
 - a) American Welding Society (AWS) certification.
 - b) Completion of a college level welding course.
 - c) Skills assessment documentation recorded by Manager of Track Welding.
- Track component welding should be completed within two years of position assignment.

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- All training, including Computer Based Training (CBT) must be completed annually.
- All welding skills must be demonstrated to the satisfaction of the Manager of Track Welding.

100.5 Rail Identification

100.5.1 Rail Chemistry Identification

Rail chemistry determines specific maintenance and welding requirements.

(Refer to Table 100A and Table 100B to determine whether rail is alloy or non-alloy)

Alloy Rail		
Manufacturer Branding	Stamping	Chemistry/Type
CF&I	CROMO	Chrome/Molybdenum
CF&I	HI SI	High Silicon
WHEELING PITT	WR	Chrome/Silicon
KLOCKNER-AL	Blank	Chrome/Vanadium
KRUPP-AL	Blank	Chrome/Vanadium
THYSSEN-AL	Blank	Chrome/Vanadium
ATH	Blank	Chrome/Vanadium

Table 100A *Alloy Rail*

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Non-Alloy Rail		
Manufacturer Branding	Stamping	Chemistry/Type
BETHLEHEM STEEL	FT	Fully Heat Treated
BETHLEHEM STEEL	HH	Head Hardened
BETHLEHEM STEEL	MH	Standard Strength
BRITISH STEEL	FT	Head Hardened
CF&I (glue tag attached to rail)	IS	Head Hardened
CF&I	HH	Head Hardened
CF&I	DH390	Head Hardened
CF&I	IS	Standard Strength
CF&I	SS	Standard Strength
COLORADO	Blank	Standard Strength
HAY (HAYANGE)	Blank	Head Hardened
ILLINOIS	Blank	Standard Strength
INLAND	Blank	Standard Strength
ISG (INTERNATIONAL STEEL GROUP)	Blank	Standard Strength
ISG HH (INTL STEEL GROUP)	Blank	Head Hardened
JFE	SP	Head Hardened
KLOCKNER	Blank	Standard Strength
KRUPP	Blank	Standard Strength
MT (MITTAL USA)	Blank	Standard Strength
MT HH (MITTAL USA)	Blank	Head Hardened
MMRA	Blank	Standard Strength
MMRA HH	Blank	Head Hardened
NIPPON	DH340	Head Hardened
NIPPON	DH370	Head Hardened
NIPPON	HE370	Head Hardened

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Non-Alloy Rail		
Manufacturer Branding	Stamping	Chemistry/Type
NIPPON	HE400	Head Hardened
NIPPON	HEX	Head Hardened
NKK	NHH	Head Hardened
NKK	SP	Head Hardened
NKK HH	Blank	Head Hardened
PST (PENNSYLVANIA STEEL TECH)	Blank	Standard Strength
PST HH (PENNSYLVANIA STEEL TECH)	Blank	Head Hardened
RMSM	DH 390	Head Hardened
RMSM	SS	Standard Strength
RMSM	HCP	Head Hardened
RMSM	OCP	Head Hardened
RMSM	Blank	Standard Strength
SDI (STEEL DYMANICS INC.)	Blank	Standard Strength
TENNESSEE	Blank	Standard Strength
THYSSEN	HH	Head Hardened
THYSSEN	Blank	Standard Strength
TZ (CZECH)	SS	Standard Strength
WP (WHEELING PITT)	MH	Standard Strength

Table 100B *Non-Alloy Rail*

100.6 Component Installation

100.6.1 Component Replacement - Marking

The installation date should be marked with a metal marker on the following track components:

- Frogs
- Guard Rails
- Spring Frog Retarders
- Switch Points
- Stock Rails
- I-Bonds

The installation date will be used to verify warranty claims and track component longevity.

100.7 Reference Marks

Reference marks are used to maintain the correct length of rail at neutral temperature in continuous welded rail (CWR). Proper use of reference marks will help achieve this goal. CWR is installed at a pre-determined rail-laying temperature. This rail-laying temperature becomes the initial rail neutral temperature. Neutral temperature is the temperature at which there are no longitudinal forces in the rail, that is, there are no forces pushing or pulling on the rail.

1. Placing reference marks for service failures, pull-aparts and cutting in rails.
 - Reference marks must always be placed before the rail is cut or joint bars removed.
 - When installing reference marks, use a permanent “white” metal marker.
 - Reference marks should be at least 3 feet in each direction from where the cut is made so that joint-bars, if applied, will not cover the marks.

- Place a vertical line on the field side of the web, extending up the side of the head of the rail, on each side of where the rail is to be cut.
 - Next to the line on the web write the gang number, date and the distance between the reference marks.
 - Make all measurements from the vertical lines on the side of the head of the rail.
 - Use only 1 (one) set of reference marks to span all cuts made at a single location.
 - Do not include the “gap” created by a pull-apart or service failure when writing the distance on the rail. The distance specified on the rail must always indicate the original rail length BEFORE the pull-apart or service failure.
 - If rail has been added to make a temporary repair, record the length of “added” rail as a (+) plus measurement.
 - If rail has been “removed” to make the repair, record the length of rail “removed” as a (-) minus measurement.
 - The 1 inch or 2-3/4 inch gap required to make a thermite weld does not affect reference marks and should not be documented as rail removed.
 - When the welding operation is completed the distance between the marks must be equal to or less than the original marked distance.
2. If reference marks are not visible;
- Refer to Cut-in/Cut-out database or refer to Table 100C for continuous welded rail adjustment for neutral rail temperature.

3. Placing reference marks when using In-Track Welder.
 - When making maintenance welds with an in-track welder, use reference marks to span the entire work area when possible.
 - When the welding operation is completed the distance between the marks must be equal to or less than the original marked distance.
4. Work area too large to measure between reference marks.
 - If the work area is too large to measure between reference marks the rail must be adjusted to obtain the designated rail laying neutral temperature. This temperature is referenced in standard drawing 0045.

Continuous Welded Rail Adjustment Table								
	Amount of Adjustment Required (inches) for a Length of CWR							
Temperature Differential (°F)	360 feet	660 feet	720 feet	1,080 feet	1,320 feet	1,440 feet	1,520 feet	1,600 feet
5	1/8	1/4	1/4	7/16	1/2	9/16	5/8	11/16
10	1/4	1/2	9/16	13/16	1	1-1/8	1-1/4	1-5/16
15	7/16	3/4	13/16	1-1/4	1-9/16	1-11/16	1-13/16	1-15/16
20	9/16	1	1-1/8	1-11/16	2-1/16	2-1/4	2-7/16	2-9/16
25	11/16	1-5/16	1-3/8	2-1/8	2-9/16	2-13/16	3-1/16	3-1/4
30	13/16	1-9/16	1-11/16	2-1/2	3-1/16	3-3/8	3-11/16	3-7/8
35	1	1-13/16	1-15/16	2-15/16	3-5/8	3-15/16	4-1/4	4-1/2
40	1-1/8	2-1/16	2-1/4	3-3/8	4-1/8	4-1/2	4-7/8	5-1/8
45	1-1/4	2-5/16	2-1/2	3-13/16	4-5/8	5-1/16	5-1/2	5-13/16
50	1-3/8	2-9/16	2-13/16	4-3/16	5-1/8	5-5/8	6-1/8	6-7/16
55	1-9/16	2-13/16	3-1/8	4-5/8	5-11/16	6-3/16	6-3/4	7-1/16
60	1-11/16	3-1/16	3-3/8	5-1/16	6-3/16	6-3/4	7-5/16	7-3/4
65	1-13/16	3-5/16	3-5/8	5-1/2	6-11/16	7-5/16	7-15/16	8-3/8
70	1-15/16	3-3/8	3-15/16	5-7/8	7-3/16	7-7/8	8-9/16	9

Table 100C Rail Adjustment Table

- Remember to subtract the amount of rail consumed in the welding operation from your calculations.
- When using the Super-Jack, be careful not to "over stretch" the rail, that is; do not raise the neutral temperature excessively. This can cause pull-aparts, misalign switches, damage track components and increase the speed at which transverse defects grow.

It may be necessary to add rail and/or overlap plug rails to obtain the correct rail length.

- Reference marks will be applied to closure welds only. Using six-foot marks, apply each mark three feet from the end of each rail. Marks will be applied with a white paint marker on the field side of the web.
- In-track number, date, rail temperature, amount of rail removed and weld number must be marked on the field side of rail web.

100.8 Rail Bonds

100.8.1 Remove rail bonds by grinding.

- Use of a chisel or hot cut to remove rail bonds is prohibited.

100.8.2 Do not electric arc weld bond wires onto rail.

100.9 Torch Cut Rail Ends and Bolt Holes

100.9.1 Torch Cut Rail Ends

Torch cut rail ends must be re-cut with an abrasive rail saw before train movement is allowed. When cutting rail ends:

- Two (2) inches must be removed on each side of torch cut.
- When thermite welding, torch cut may be trimmed with a rail saw if the thermite weld is poured within 1 hour of the initial torch cut.

- Visually inspect rail ends for split web after saw cutting.
- When flash butt welding, weld must be made within 30 minutes of the initial torch cut.

100.9.2 Torch Cut Bolt Holes

Torch cut bolt holes are prohibited in any track.

100.10 Guardrails

Follow these guardrail repair requirements:

- Do not weld a guardrail face in the field.
- Replace worn or damaged guardrails.
- Use shop repaired or reconditioned guardrails in any track only after they have been inspected and approved for use.

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101.0 Safety

Refer to Union Pacific Railroad safety rules for additional information.

101.1 Personal Protective Equipment (PPE)

Minimum PPE requirements. (Refer to Table 101A)

	Arc Welding Equipment	Oxy-fuel Equipment	Thermite Welding	Abrasive Wheel Cutting & Grinding
Goggles (1)		X (4)	X (2)(3)	X
Face Shield (1)		X (4)	X (2)(3)	X
Safety Glasses	X		X	
Welding Hood (1)	X			
Hearing Protection	X	X	X	X
Welding Gloves	X	X		
Leather Wk Gloves			X	X
Kevlar Welding Jacket (5)	X	X		
Respirator (6)	X	X		X

* Minimum Requirements

- (1) Refer to Rule 101.4 Eye Precautions.
- (2) Face shield and goggles are required when monitoring thermite weld preheat process. One must have at least a number 5 shaded lens.
- (3) Goggles or face shield with approved safety glasses are required for removing molds and cleaning weld.
- (4) Proper shade goggles or shaded face shield with approved safety glasses.
- (5) Welding sleeves may be worn in place of jackets to protect arms.
- (6) Refer to Appendix "A" for minimum respiratory requirement.

Table 101A Personal Protective Equipment

101.2 Respirator Requirements

Respirator use requirements apply to welders performing hazardous activities or tasks.

Information on the Union Pacific Respiratory Protection Program can be found in the Safety Resource Manual, Section IV-E. Section IV-E provides information on job tasks requiring the use of respirators. Respirators must be selected from the attached Appendix A of this manual or the most current version of the UPRR Safety Resource Manual, Section IV-E, Appendix B.

For information on ordering respirators, refer to the most current version of the UPRR Safety Equipment Catalog or the UPRR Safety Resource Manual, Section IV-E, Appendix G. (Refer to Appendix A)

Employees performing activities or tasks that require a respirator must use at least the minimum level of respiratory protection listed under the Minimum Respirator Type column. A respirator offering a higher protection factor is listed under the Other Approved Types column.

Carbon arc gouging or cutting and welding repairs on frogs or crossovers require use of a respirator. If a half-face air-purifying respirator is used, a track fan (380-0085 Allegro axial blower) must also be used. If a powered air-purifying respirator (PAPR) such as the Jackson Shadowaire II NEXGEN V (383-7100) or the 3M L-905 PAPR (383-4735 and additional stock numbers) is used, the track fan is not required.

101.3 Hearing Protection

Approved hearing protection must be worn when using powered equipment including:

- Electric arc welding
- Abrasive wheel cutting or grinding
- Oxy-fuel or other fuel-gas equipment
- Pneumatic tools
- Hydraulic tools
- Gasoline powered tools

101.4 Eye Precautions

All persons performing or observing welding, cutting and heating operations must wear proper eye protection and other personal protective equipment. They must not look at an oxy-fuel flame or electric arc unless properly protected and must warn others against looking at the flame or arc.

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Refer to Table 101B below to determine minimum shade requirements of eye protection when welding or cutting.

Welding Operation	Lens Shade
Shielded metal arc welding – electrodes up to and including 5/32" diameter	10
Gas Tungsten arc welding – (non ferrous) and Gas shielded arc welding (non ferrous) - Electrodes up to and including 5/32" diameter.	11
Gas Tungsten arc welding (ferrous) and Gas shielded arc welding (ferrous) - Electrodes up to and including 5/32" diameter	12
Shielded metal arc welding: Electrodes 3/16" through 1/4" diameter	12
5/16" through 3/8" diameter	14
Carbon Arc Gouging – for most applications	12
Large diameter carbon electrodes	14
Soldering	2
Torch Brazing	5
Oxy-fuel cutting	5
Oxy-fuel heating	5
Gas welding (light) up to 1/8"	5
Gas welding (medium) 1/8" to 1/2"	5 or 6
Gas welding (heavy) 1/2" and over	6 or 8

Table 101B *Minimum Shade Requirements*

Cracked filter glasses (lens shade) must be replaced immediately. Shade numbers of filter plates are not additive. For example, a Number 6 and Number 8 filter do not have the same effective density as a Number 14 filter.

101.4.1 Shielding from View

Welders must warn others to protect their eyes and use shields to prevent injuries and fires.

101.5 Proper Clothing

- When welding, cutting or heating wear approved hearing protection, high top boots, leather welding gloves or leather welding mittens and flame resistant clothing.
- When performing electric arc welding or oxy-fuel operations wear, as a minimum, an approved full Kevlar welding jacket or welding sleeves. When performing overhead welding or any other applications where clothing or body is in danger of being exposed to sparks or hot slag then a full leather jacket shall be used. Flame resistant clothing should not be synthetics, synthetic blends such as nylon, rayon, polyester, etc. Clothing should protect the skin from infrared and ultraviolet radiation.
- When using the 3M L-905, a leather shroud must be attached to the bottom of the welding helmet. The L-905 comes equipped with a shroud.
- Additional protective outerwear such as leather aprons, spats or sleeves shall be worn for overhead welding and for any other applications where clothing or body is in danger of being exposed to sparks or hot slag. Arms must be covered; t-shirts are not acceptable. All buttons on jackets must be buttoned. Sleeves and pockets must be secured against sparks or hot slag.
- Clothing must be free of oil or grease. Trousers or overalls must be without cuffs. Do not carry cigarette lighters or matches where they may be exposed to sparks or excessive heat.

101.6 Cleaning Work Area

Do not use gloved or bare hands to brush slag or metal from material being welded or cut.

101.7 Fire Protection

Follow instructions in the complete UPRR Fire Protection Policy and Guidelines document which is available in the Safety Resource Manual. Information specific to track welders can be found in Appendix B of this manual.

101.8 Protecting Timber Structures

Before leaving the work site, the employee in charge must ensure that no fire or fire hazard exists.

- If a potential fire hazard exists, the employee in charge must assign a watchman equipped with a fire extinguisher or ample water supply to remain in the area for a minimum of 2 hours after the last weld is completed.
- Watchman must have a means of communicating with others in case of emergency.

101.9 On Track Safety

Refer to Chief Engineer Instruction Bulletin 136.

This bulletin explains the On-Track Safety requirements for all roadway workers. The instructions in this bulletin conform to the FRA regulations for roadway worker protection. The purpose of this bulletin is to prevent accidents and injuries from railroad cars, locomotives, and roadway machines striking roadway workers and machines.

101.10 Equipment Condition

Inspect all equipment and ensure it is free of defects and in proper working condition.

101.11 Weather Restrictions

Electric arc or thermite welding in extremely wet weather is prohibited.

- Do not run welding cables or electric cords through water.
- Do not operate any electric equipment that is wet.

If ground is covered with snow; all snow must be removed from welding and disposal areas before starting the thermite welding process.

- Do not install thermite welds when it is raining or snowing.

101.12 Fire or Explosive Potential

Do not weld or cut on piston heads, hollow castings, or containers such as drums, barrels or tanks.

101.13 Abrasive Wheels

101.13.1 Shipping and Inspection

- When abrasive wheels are received, the original shipping container must be inspected for damage or moisture.
- If container damage is observed, the abrasive wheels must be inspected. Any abrasive wheel that is damaged or suspected of being damaged must not be accepted and/or put into service.

Do not use abrasive wheels if they are:

- Chipped, cracked or broken
- Water or oil soaked

101.13.2 Handling

- All abrasive wheels are breakable and therefore care must be exercised in handling and storage to prevent damage.

101.13.3 Storage

- Abrasive wheels shipped on pallets may remain stored on pallets until ready to be used.
- Abrasive wheels in storage must not be exposed to water or other solvents.
- Abrasive wheels in storage must not be exposed to temperature or humidity conditions that cause condensation on the wheels.
- Suitable racks, bins or boxes shall be provided to store the various types of abrasive wheels.

- Abrasive wheels in storage shall be rotated so oldest wheels will be used first.
- Most abrasive wheel manufacturers recommend a shelf life of two years for properly stored abrasive wheels.

101.13.4 Operating Abrasive Tools

- Wear all required PPE. (Refer to Tables 101A and 101B).
- Adhere to all Union Pacific fire prevention policies when operating abrasive wheel equipment. This includes using spark guards as necessary.
- Spindle speed of grinder or rail saw must be checked periodically to ensure that it does not exceed the maximum operating speed marked on the abrasive wheel.
- Hydraulic powered cutting and grinding equipment and hydraulic power sources shall be periodically tested to ensure proper hydraulic pressure and flow.
- Blotters must be used between flanges and abrasive wheel surface to ensure uniform distribution of flange pressure. Flanges must be the same size.
- The blotters shall cover the entire contact area at the wheel flanges.
- When wheel is cold, apply grinding force gradually and uniformly to prevent thermal shock which may cause wheel to break.
- Only Union Pacific approved abrasive grinding and cut-off wheels may be used. The RPM rating of abrasive wheels must meet or exceed the RPM rating of the power equipment that is being used.
- Prior to using a new abrasive wheel, it must be run for one minute. During this period of time, the operator must check the machine for excessive vibration. Should there be excessive vibration, the machine must not be used until the cause is identified and corrected.

- Do not operate grinders or rail saws without the proper guards or shields. Immediately report and replace broken or missing guards or shields.

All abrasive wheels shall be used only on machines provided with safety guards with the following exception:

- Mounted wheels, 2-inch and smaller in diameter used in portable operations.

101.13.5 Observe Work Zones

Adhere to the following work zones when operating abrasive wheel equipment.

Any employee not operating cutting or grinding equipment must not stand closer than 15 feet from equipment.

- Rail Saws - Do not stand or walk in front of rail saw while in operation.
- Grinders - Do not stand or walk in path of sparks.

101.14 Cutting Damaged Rail

When cutting twisted rail or other damaged steel sections, take precautions to prevent personnel from being struck by severed sections. Special equipment such as burning bars are available for this operation and should be used.

1. Use available resources to restrain rail prior to cutting with oxy-fuel equipment.
2. Do not cut joint bar bolts on twisted rail.

101.15 Cutting Rail in Compression (tight rail conditions)

Certain conditions cause the rail to expand, requiring rail to be removed with an oxy-fuel torch.

- Compressive forces exist when rail temperature exceeds installed neutral temperature

When cutting rail, use the following procedures:

1. Locate the area that shows noticeable tight rail condition.
 - a) This can be identified by rail lifting out of plates, ballast bunching, consecutive number of high spikes, rail appears to be kinking, one rail is straighter than the other, deviation in gage, rail crowding tie plates, ties skewing and anchors moving.
2. If track is already buckled, make cut beyond the buckled area.
3. Make torch cut prior to removing rail fasteners and rail anchors.
4. Use the following procedure to safely torch cut rail under high compressive forces:

Use of H-pattern – (Refer to Figure 101A)

- (a) Remove rail head first.
- (b) Remove both sides of base.
- (c) Remove remaining web portion cutting from top to bottom only.

(Removing the rail head and both sides of the base first, then removing the web last will reduce the chance of excessive vertical or lateral movement).

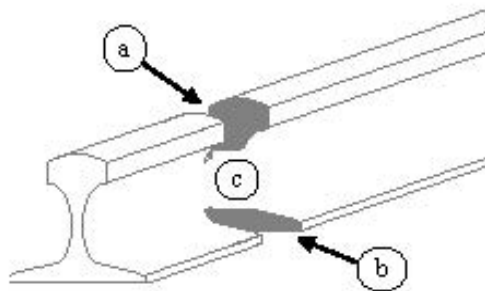


Figure 101A – H Pattern

101.16 Hydraulic Safety

Hydraulic systems must store fluid under high pressure. Four kinds of hazards exist:

- Burns from the hot, high pressure spray of fluid.
- Bruises, cuts or abrasions from flailing hydraulic lines.
- Injection of fluid into the skin.
- Leaking hydraulic fluid may erupt into flames if a source of ignition is present.

Frequent inspection of the hydraulic system can prevent injuries. When performing an inspection, do the following:

1. Visually inspect hose condition; look for damage and signs of leaks before the system is energized.
2. Be sure all line connections are tight and lines are not damaged; escaping oil under pressure is a fire hazard and can cause personal injury.
 - Seepage must be corrected immediately

When a leak is suspected, do the following:

1. Run a piece of wood or cardboard along the hose to detect the leak. Do not use hands, gloved or not, for this purpose.

Keep contaminants from hydraulic oil and replace filters periodically.

- Safe hydraulic system performance requires general maintenance.

Pressure relief valves incorporated into the hydraulic system will avoid pressure buildups during use.

- Do not remove pressure relief valves.
- Only authorized personnel can adjust pressure relief valves.

To prevent ruptures, do not incorporate a low-pressure component, coupler, hose or fitting on a high-pressure system.

Hydraulic system must be checked and maintained to ensure proper flow and pressure.

Systems should be checked:

- Annually
- When tools are not performing properly.
- When any part of the hydraulic system has been repaired.

Gallons Per Minute (GPM) hydraulic flow requirements vary based on the type, model and age of the tool. Refer to the manufacturer's operator manual for pressure and GPM requirements for each specific tool.

Do not operate tools at flow rates outside manufacturer's specifications.

101.17 Equipment Safety

Portable power tools, machinery and equipment must not be operated without the required safety guards. All belts, shafts, gears and other moving parts on machinery must be fully enclosed and guarded.

Maintain equipment in proper working condition and follow all maintenance requirements for that specific equipment.

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102.0 Electric Welding

102.1 Welding and Cutting Processes

102.1.1 Shielded Metal Arc Welding (SMAW)

Shielded Metal Arc Welding is frequently referred to as stick or covered electrode welding. Stick welding is among the most widely used welding processes.

The flux covering the electrode melts during welding. This forms the gas and slag to shield the arc and molten weld pool. The slag must be chipped off the weld bead after welding. The flux also provides a method of adding deoxidizers, and alloying elements to the weld metal.

102.1.2 Flux Core Arc Welding (FCAW)

Flux Core Arc Welding is frequently referred to as wire welding. FCAW welding is a commonly used high deposition rate welding process. The filler wires that are used in FCAW are tubular, and the core is filled with a mixture of mineral flux and powder. This is a self-shielding process that is also called "Innershield". Shielding gases are formed from the inner flux as the welding metal is deposited and like the SMAW process, is used to shield the arc and molten weld pool. Wire is continuously fed from a spool. FCAW welding is therefore referred to as a semiautomatic welding process.

102.1.3 Flash Welding (FW)

(Electric Flash Butt Welding)

A resistance welding process that produces a weld at the rail end surfaces of a butt joint by a flashing action and by the application of pressure after heating is substantially completed.

102.1.4 Carbon Arc Cutting (CAC)

Thermal cutting using an arc for melting the metal, and a stream of air to remove the molten metal. This process is used to remove defective metal from manganese track components.

102.2 Welding Current - Measurement

- Voltage (volts) is the measurement of electrical pressure, in the same way that pounds per square inch is a measurement of water pressure. Voltage controls the maximum gap the electrons can jump to form the arc. A higher voltage can jump a larger gap.
- Amperage (amps) is the measurement of the total number of electrons flowing, in the same way that gallons is a measurement of the amount or volume of water flowing. Amperage controls the size of the arc.

102.2.1 Currents

The three different types of current used for welding are Alternating Current (AC), Direct Current Electrode Negative (DCEN) and Direct Current Electrode Positive (DCEP). The terms DCEN and DCEP have replaced the former terms Direct Current Straight Polarity (DCSP) and Direct Current Reverse Polarity (DCRP).

In Direct Current Electrode Negative, the electrode is negative and the work is positive. DCEN welding current produces a high electrode-melting rate.

In Direct Current Electrode Positive, the electrode is positive and the work is negative. DCEP current produces the best welding arc characteristics.

102.2.2 Types of Welding Power

Constant Voltage (CV) – The arc voltage remains constant at the selected setting even if the arc length and amperage increase or decrease. Recommended for wire feed.

Constant Current (CC) – The total welding current (watts) remains the same. This type of power is also called the Drooping Arc Voltage (DAV), because the voltage will change with different arc lengths while only slightly varying the amperage.

The SMAW process requires a CC arc voltage setting. The SMAW machine's voltage output decreases as current increases. This output power supply provides a reasonably high open circuit voltage before the arc is struck. The high open circuit voltage quickly stabilizes the arc. The arc voltage rapidly drops to the lower closed circuit level after the arc is struck. Following this short starting surge, the power (watts) remains almost constant despite the changes in the arc length. With a CV output, small changes in the arc length would cause the power (watts) to make large swings causing the welder to lose control of the weld. (Refer to Figure 102A)

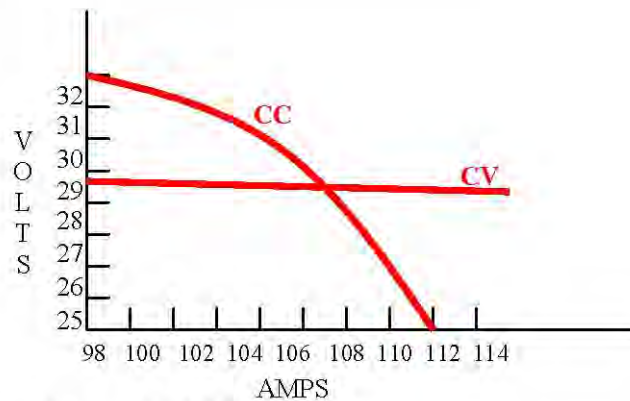


Figure 102A CV/CC Characteristics

102.2.3 Duty Cycle

The Duty Cycle is the percentage of time a welding machine can be used continuously at its maximum setting based on 10 minutes. A 60% duty cycle means that out of every 10 minutes, the machine can be used for 6 minutes at the maximum rated current. When providing power at this level, it must be cooled off for 4 minutes out of every ten minutes or equipment damage may result.

102.3 Electrodes / Electrode Holder

- When not welding, make certain no part of the electrode circuit is touching the work or ground.
- Accidental contact can result in electrical shock, signal damage or cause over-heating and create a fire hazard.
- Stick electrodes must be removed from their holders when not in use. Stick electrode holders and wire feeder guns, shall be placed or protected so that they cannot make electrical contact with employees or conducting objects.
- Do not dip electrode holder in water to facilitate cooling. If electrode holder is over-heating it is usually due to improper amperage rating, loose connections, or dirty contacts with electrode.
- Stick electrodes and welding wire must be stored where they can be kept free of moisture.

102.3.1 Approved Products

Use only approved products within specified welding parameters as listed in Table 102A and Table 102B.

Rail Steel

Approved Electrodes	Welding Parameters
McKay M-932 3/16" Stick	210 – 230 Amps
McKay M-932 1/4" Stick	290 – 310 Amps
Railbuild 540 3/16" Stick	170 – 200 Amps
Railbuild 540 1/4" Stick	210 – 230 Amps
Railbuild 540 5/64" Wire	28-29 Volts / 250 – 300 Amps

Table 102A *Rail Steel*

FORM 7913 **Welding Rules**

Manganese Steel

Approved Electrodes		Welding Parameters
Matweld 900	1/8" Stick	120 Amps
Matweld 900	5/32" Stick	140 Amps
Matweld 900	3/16" Stick	170 Amps
FrogSeal	5/32" Stick	140 – 160 Amps
Frogbuild	3/16" Stick	180 – 200 Amps
Frogbuild	7/32" Stick	200 – 220 Amps
Frogbuild	5/64" Wire	28 – 29 Volts / 250 – 300 Amps
FrogSpec	3/16" Stick	210 to 230 Amps
FrogSpec	5/64" Wire	28 – 29 Volts / 250 – 300 Amps

Table 102B. *Manganese Steel*

102.3.2 Power Source Setup (Miller Equipment)

Equipment reference tables are intended to help the equipment operator in determining the proper setting when using stick electrodes and are estimates only. Power source meters should be checked periodically to ensure accurate readings.

(Refer to Appendix C)

102.3.3 Wire Feed Equipment

Wire feed welding equipment is an efficient and recommended process to repair track components.

- When using wire feed equipment to repair track components, equipment should be used on the CV (Constant Voltage) setting if power source is capable.
- Power source condition and age impact amperage and voltage, and must be taken into consideration during setup.

The wire size standard on the Union Pacific Railroad is 5/64 of an inch and it is important to ensure that the correct drive rolls are being used.

It is a best practice to remove the wire spool after each use, placing the spool back in the plastic bag and then in the box. This not only protects the wire and spool from damage but it is also reduces the

weight of the feeder when loading or unloading from the truck. A new wire spool weighs 30 pounds. Together, the feeder and spool weigh approximately 65 pounds.

To mount the spool and make connections:

1. Remove retaining ring and align the small hub pin with corresponding hole on the spool.
2. Clip any kinks from the wire and mount the spool onto the hub.
3. Open the pressure assembly by flipping up the adjustment knob and carefully thread the wire through the wire guides until two or three inches of wire protrudes from the machine.
4. Flip down adjustment knob and secure the spool with retaining ring.
5. Carefully insert wire into feeder gun, then connect gun to the feeder.
6. Plug in the feeder gun trigger cable, connect feeder grounding plug if not permanently attached to feeder, then connect feeder ground clamp to power source ground clamp.
7. Connect power cable to the wire feeder and start power source.

Wire installation is made easier by laying out the gun in as straight a line as possible.

When welding, always clip the end of the wire before depositing the next weld bead.

102.4 Electric Welding Equipment

102.4.1 Electric Welding Equipment Inspection

Inspect portable welding machines, wire feeders, cables, and connecting plugs monthly. Inspections must include:

1. Equipment condition
2. Damage or wear
3. Operating properly (gauges, switches, controls)
4. Insulation (cables, connectors, electrode holders, ground clamps)

Use the appropriate form 24248 to record the inspection information, including the inspection date, time and place for later review by a welding supervisor. (Refer to Appendix D)

102.4.2 Qualified Mechanic or Electrician

Only a qualified mechanic or electrician is permitted to make repairs or adjustments to electric welding equipment.

Exception: Welders may make routine operating adjustments.

102.4.3 Polarity and Range Finder Switches

To avoid arcing and damage, do not change settings on the amperage range selector switch or polarity output selector switch while machine is operating under welding current load.

102.4.4 Cable Insulation and Connectors.

Electrode and ground cables must be insulated throughout their entire length. Use correctly sized cable and approved cable connections with insulated covering. (Sustained overloading will cause cable failure and result in possible electrical shock or fire hazard)

102.4.5 Cable Repairs

If cables or cable ends must be repaired, turn off power and use lockout/tagout procedures. Disconnect the cable at the first joint and coil the cable to prevent it from being reconnected while under repair.

- Always use same size cable when making splices.
- Always use approved insulated welding cable connectors to make all splices.
- Cable ends cannot be spliced within 10 feet of the electrode holder.

102.4.6 Protect from Electrical Shock and Moisture

Protect yourself from possible dangerous electrical shock. The electrode and work (or ground) circuits are electrically “HOT” when the welder is on.

- Do not permit contact between “HOT” parts of the circuits and bare skin or wet clothing.
- Wear leather welding gloves that are dry and free of holes.
- Insulate yourself from the work and ground by using dry insulation when wet conditions are present.
- Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
- When using the welding machine as a power source for mechanized welding, the above precautions also apply for the welding wire, wire reel, welding head or nozzle.
- Do not loop or coil electrode cables around the body.
- During inclement weather, electrical welding equipment must be properly protected from moisture.

102.4.7 Cable Reels

Unwind entire lengths of cables from the reels when welding.

- Failure to do so creates heat buildup resulting in damage to welding cables.
- High welding currents in coiled cables will create a magnetic field that reduces the welding output.

102.5 Ground Connection

When performing electric arc welding on rail, machinery or equipment of any kind, apply the ground cable to the particular part or piece of rail, machinery or equipment being welded.

102.5.1 Ground Connection Precautions

- Do not permanently bond the welding ground lead to any rail, steel building or other structure.
- Fixed electrical welding equipment must be permanently grounded on the service side to the ground system.

102.5.2 Ground Cable Clamp

Ensure ground cable clamp provides good mechanical and electrical contacts. A poor ground connection will cause excessive heat buildup, which can damage welding cables and equipment, or cause burns.

Do not handle ground clamp or electrode holder with bare hands.

102.5.3 Jump Starting

Do not jump start vehicles or equipment directly from welding machine.

- Jump starting vehicles or equipment is allowed only if power source is equipped with a jump-start kit.

102.5.4 Location of Welding Cables

When welding on individual track components or switch components, e.g., insulated switch plates, turnout frogs etc., place welding cables under rail.

- Do not lay cables over rails.

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103.0 Oxy-fuel Equipment Use

Employees must read and understand all rules associated with the proper setup, use and storage of oxy-fuel equipment. Rules in this chapter, if applicable, apply to both oxy-fuel and fuel-gas operations.

103.1 Authorized to Use Oxy-fuel Equipment

Employees who are regularly tested and qualified are allowed to use oxy-fuel equipment in the performance of their duties.

Welding, cutting and heating equipment shall be used as per manufacturer's instructions.

To be qualified to use oxy-fuel equipment, employees must:

1. Be properly trained in the use of such equipment.
2. Successfully complete a written exam with a score of 85%.
3. Complete the hands-on field examination, conducted by a Manager of Track Welding.

Employees must re-qualify every two (2) years via Computer Based Training consisting of procedure review and exam.

103.2 General Instructions

103.2.1 Repairs or Alterations

Do not make repairs or alterations to cylinders, valves or torches. Defective regulators, torches or other equipment must not be used and must be returned to designated point for repair. Hose showing leaks, burns, worn places, evidence of damage from flashback or other defects must be replaced.

103.2.2 Equipment Condition

Inspect all equipment and verify it is free of defects and in proper working condition.

Torch test must be conducted:

- Prior to initial use each day or shift.
- When combination torches have been converted or altered.
- When the torch equipment is suspected of being damaged.
- When a flashback has occurred.

Torch test must be conducted in a well-ventilated area with no ignition sources present. Test will be conducted in accordance with departmental instruction. (Rule 103.12)

103.2.3 Ventilation

Work in well ventilated areas. Exposure to lead, zinc or other welding fumes requires use of an approved respirator. Spray or dust respirators are not suitable and must not be used.

103.2.4 Fire or Explosive Potential

Do not weld or cut on piston heads, hollow casting, or containers such as drums, barrels, or tanks.

103.3 Welding Gas Description

103.3.1 Oxygen

- A. Oxygen is a colorless, tasteless, odorless gas that is slightly heavier than air.
- B. It is non-flammable but will support combustion with other elements.
- C. The presence of pure oxygen will drastically increase the speed and force with which burning takes place.
- D. Oxygen is required to support any burning process. It is combined with a "fuel" gas to produce the desired operating flame.

- E. Always refer to oxygen as “oxygen”, never as “air”.
Combustibles should be kept away from oxygen, including the cylinder, valves, regulators, and other hose apparatus. Oxygen should never be used in any air tools.
- F. Oxygen must not be used for compressed air, as a source of pressure or to "dust" clothing.
- G. Do not allow oil or grease to come in contact with oxygen.
- H. Oil or grease in the presence of oxygen may spontaneously ignite and burn violently or explode.
- I. Oxygen cylinders and apparatus should not be handled with oily hands or oily gloves.
- J. Do not allow oil or grease to touch regulators, valves or connections.

103.3.2 Liquid Oxygen

- 1. Liquid oxygen is pale blue and extremely cold. Although non-flammable, oxygen is a strong oxidizer.
- 2. Liquid oxygen is a cryogenic liquid. Cryogenic liquids are liquefied gases that have a normal boiling point below -238°F (-150°C). Liquid oxygen has a boiling point of -297.3°F (-183.0°C).
- 3. Because the temperature difference between the product and the surrounding environment is substantial—even in the winter—keeping liquid oxygen insulated from the surrounding heat is essential. The product also requires special equipment for handling and storage.
- 4. Oxygen is often stored as a liquid, although it is used primarily as a gas.

103.3.3 Use of Acetylene

- 1. Acetylene is a colorless, flammable gas composed of carbon and hydrogen, manufactured by the reaction of water and calcium carbide.
- 2. Acetylene, when used with oxygen, produces the highest flame temperature of any of the fuel-gases, approximately $6,300^{\circ}\text{F}$.

3. Because acetylene is stored as a liquid, the cylinder will only work properly if the tank is used in the upright position.
4. Using or storing the tank in any other position can be extremely dangerous.
5. Although acetylene is stable under low pressure, if compressed above 15 psi it becomes unstable.
6. Avoid exposing filled cylinders to heat, furnaces, radiators, open fires, or sparks (from a torch).
7. Avoid striking the cylinder against other objects and creating sparks.
8. To avoid shock when transporting cylinders, do not drag, roll, or slide them on their sides.
9. Acetylene must not be drawn off in volumes greater than 1/7 of the cylinder's rated capacity.
10. If higher volumes are needed, use a manifold system of sufficient size.

103.3.4 Use of Propane

1. Propane is a hydrocarbon (C_3H_8) and is sometimes referred to as liquefied petroleum gas, LP-gas or LPG. It is nontoxic, colorless and virtually odorless and heavier than air.
2. Propane is produced from both natural gas processing and crude oil refining, in roughly equal amounts.
3. As with natural gas, a strong identifying odor is added so the gas can be readily detected.
4. If liquid propane leaks, it vaporizes and dissipates into the air.

103.4 Cylinders

A sticker located near the top of the cylinder identifies the cylinder's contents.

(Refer to Figure 103A)

103.4.1 Cylinder Construction – Oxygen (Refer to Figure 103B)

1. A typical oxygen cylinder is made of steel and has a capacity of 220 cu ft at a pressure of approximately 2250 psi.
2. Attached equipment consists of an outlet valve, a removable metal cap for the protection of the valve, and a low melting point safety fuse plug and disk.
3. The cylinder is fabricated from a single plate of high-grade steel with no seams and is heat-treated for maximum strength.
4. Because of their high pressure, oxygen cylinders undergo extensive testing prior to their release for work, and must be periodically re-tested thereafter.



Figure 103A Non-flammable marker

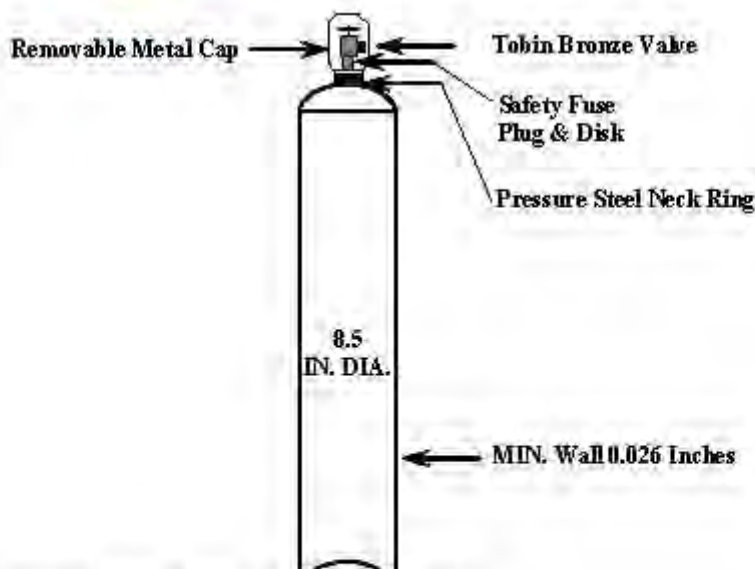


Figure 103B High Pressure Oxygen Cylinder

103-5

**103.4.2 Cylinder Construction - Liquid Oxygen
(Refer to Figure 103C)**

1. Liquid storage is less bulky and less costly than the equivalent capacity of high-pressure gaseous storage.
2. The cryogenic tank is constructed, in principle, like a thermos bottle.
 - There is an inner vessel surrounded by an outer vessel.
 - Between the vessels is an annular space that contains an insulating medium, from which all the air has been removed.
 - This space prevents heat from coming in contact with the liquid oxygen stored in the inner vessel.
3. The temperature of the liquid oxygen is approximately -300° Fahrenheit
4. It remains in a liquid state until the gas "Use Valve" is opened. Opening the "Use Valve" draws the liquid oxygen through coils, which allows the liquid to expand and change into a gas.
5. Liquid oxygen cylinders build up pressure as they sit idle. The cylinder will automatically start to release the pressure or bleed off when the cylinder pressure reaches 250 psi.
6. Cylinders with the highest psi regulator reading should be used first.
7. Care must be taken not to drop liquid oxygen cylinders.
8. Liquid oxygen cylinders must remain upright or in a vertical position.
9. In the event a liquid oxygen cylinder is dropped, tipped over, or abused, do the following:
 - Slowly raise the cylinder to a vertical position.
 - Open the vent to release any excess pressure and leave the valve in the open position.
 - Remove the liquid product from the vessel as soon as possible.

- Inspect the cylinder before returning it to service.
10. Prior to applying the oxygen regulator to the liquid oxygen cylinder, slightly open the "Use" valve to clear the valve stem and then close. Position the oxygen regulator on the "Use" valve and tighten.

Note: Since the "Use" valve stem is fairly long, it must be supported with a gloved hand.

11. The "Use" valve may then be opened slowly for use.
12. Never open the "Liquid" valve.

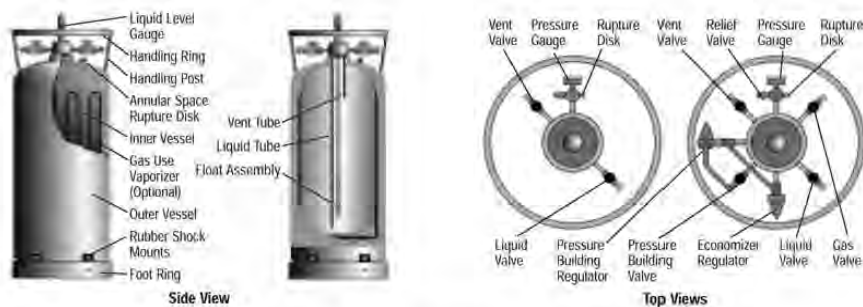


Figure 103C *Liquid Oxygen Cylinder*

103.4.3 Cylinder Construction – Acetylene (Refer to Figure 103D)

1. To decrease the size of the open spaces in the cylinder, acetylene cylinders are filled with porous materials such as balsa wood, charcoal, corn pith, or portland cement.
2. Acetone, a colorless flammable liquid, is added to the cylinder until about 40 percent of the porous material is saturated.
 - The porous material acts as a large sponge, which absorbs the acetone, which then absorbs the acetylene.
 - In this process, the volume of acetone increases as it absorbs the acetylene, while acetylene, being a gas, decreases in volume.

- Fuel-gas cylinders are identified with a flammable sticker attached near the top of the cylinder (Refer to Figure 103E).

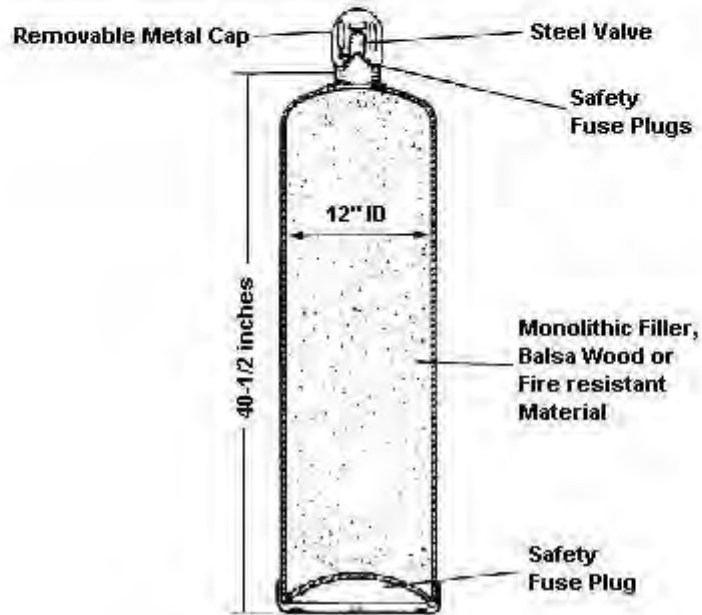


Figure 103D Acetylene Cylinder



Figure 103E Flammable Marker

103.4.4 Exposure to Excessive Heat

Do not allow cylinders to be exposed to sparks, hot slag, open flame and other sources of excessive heat.

103.4.5 Storing Cylinders

When storing oxygen and fuel-gas cylinders:

1. Handle cylinders with extreme caution to avoid dropping and damaging valves.
2. Separate oxygen cylinders from fuel-gas cylinders.
 - Maintain a minimum distance of 20 feet.
 - or
 - Place a barrier of noncombustible material that is at least 5 feet high and has a fire resistance rating of at least 30 minutes between the oxygen and the fuel-gas cylinders.
3. Store oxygen and fuel-gas cylinders in an upright position on approved racks that are properly secured. Keep valve ends up. Cylinders must be secured, whether they are being transported or placed into storage.
4. Store cylinders in cool, well ventilated buildings away from elevators, stairs and passageways, when possible. Place them near exits for easy removal in case of fire.
5. Store cylinders in the open when the cylinders can be protected against freezing or direct sunlight.
6. Do not smoke or use matches, open-flame lights or torches in buildings where cylinders are stored. "No Smoking or Open Flames" signs must be posted on all visible sides.
7. When not in use, all outlet valves should be kept tightly closed, even though cylinders are considered empty. Valve caps must be kept in place.
8. Oxygen and fuel-gas cylinders, connections and appliances must be kept free from oils and greases. Do not handle cylinders with oily hands or gloves. Keep the cylinders

away from combustible materials (e.g., oils, paints, shavings and other flammable materials).

103.4.6 Working with Cylinders

When working with cylinders:

1. Do not place cylinders where they may become part of an electrical circuit. Avoid placing cylinders near wires and electrical welding circuits.
2. Do not strike an arc on or tap an electrode against a cylinder.
3. Oxygen and fuel-gas cylinders must be used in an upright position.
4. Do not throw, drop or otherwise roughly handle cylinders.
5. Do not leave cylinders standing upright unless they are secured to a suitable support with a chain or other holder.
6. Ensure compartments on work trucks are properly vented to the outside.
7. Block cylinders lying on the ground to prevent rolling.

Cylinders may be lifted by a crane, derrick or hoist only when a company-approved lifting device (*sling*) is used, and employees have been instructed on its use.

Note: Use of an electric magnet to lift cylinders is prohibited

103.4.7 Transporting Cylinders

When transporting gas cylinders;

1. Remove gauges, regulators and apply standard caps before transporting oxygen or fuel- gas cylinders, unless valves are covered by a Department of Transportation approved safety cap or device designed for that purpose.
 - An approved safety cap or device protects the cylinder valve but allows regulators to remain attached to the cylinder valve.
2. Caps need not be applied to complete a single series of welding operations.

3. When transporting oxygen and fuel-gas cylinders in tool cars or enclosed compartments, ensure proper ventilation is provided.

103.4.8 Empty Cylinders

When cylinders are empty;

1. Close the cylinder valve before disconnecting the hose. Valves must remain closed when cylinders are not in use.
2. Apply standard caps to empty cylinders.
3. Remove bottom half of tag, where provided (red on fuel-gas cylinders, green on oxygen cylinders).
4. Separate empty cylinders from full cylinders.
5. Promptly exchange empty cylinders at the supply point.

103.4.9 Leaking Cylinder

When a leaking cylinder is discovered;

1. Move it to an open area away from possible sources of ignition until the cylinder is empty.
2. Mark the cylinder, indicating the defect, so the supplier can take necessary corrective action.

103.4.10 Changing Cylinders

Before a regulator is removed from a cylinder valve, the cylinder valve must be closed and the gas released from the regulator.

1. Drain both hoses, one side at a time, to remove any possible gas mixture.
2. Turn pressure-adjusting screw counter-clockwise to ensure no pressure on regulator diaphragm.

103.5 Hot Metal Precautions

When cutting, take precautions, such as barrier or spark guard, to prevent sparks, hot metal or severed sections from contacting cylinders, hose, cable or other flammable material. Do not lay object or material to be heated, cut or welded across a cylinder or on concrete.

103.6 Regulators

103.6.1 Proper Regulator

Do not use a regulator with a gas not intended for that regulator.

Each oxygen / fuel-gas station must have a shut off valve and be controlled with a pressure reducing regulator to obtain the recommended test pressures. Regulators must have operable gauges. Use of regulators without gauges is prohibited.

103.6.2 Single / Two Stage Regulators

The single-stage regulator has one reducing station and reduces the cylinder pressure of a gas to a working pressure in one step. When using a single-stage regulator, small adjustments are required to maintain a specific operating pressure as the cylinder pressure decreases.

The two-stage regulator has two reducing stations. The first station is usually preset at 200 psi and is not adjustable by the operator, which then flows into the second reducing stage.

An operator will not need to make adjustments to maintain operating pressure until the cylinder pressure drops below 200 psi.

There is no safety advantage between the single-stage and two-stage regulator.

The regulator mechanism has a nozzle through which the high-pressure gas passes, a valve seat to close off the nozzle, and balancing springs. Some types have a relief valve and an inlet filter to exclude dust and dirt. Pressure gauges are provided to show the pressure in the cylinder or pipeline and the working pressure.

(Refer to Figure 103F)

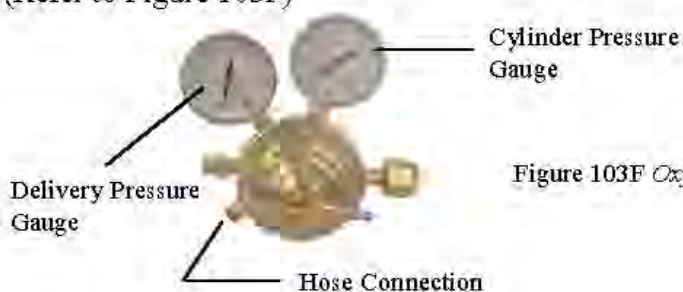


Figure 103F Oxygen Regulator

103-12

103.6.3 Connections and Adapters

Do not force connections. If the thread does not run easily, usually the wrong sized regulator is being applied. Use a standard adapter between the cylinder and the regulator if required. "Tee" or "Y" type connectors are prohibited.

103.6.4 Connecting Regulators

Before connecting regulators to cylinders, welders must open the cylinder valve slightly to blow out any foreign matter.

- The valve should be opened approximately one-quarter turn and closed immediately.
- Do not open a fuel-gas valve near other welding work or near sparks, flame or other possible sources of ignition.

103.6.5 Protecting Regulators

Protect regulators when not in use by:

- Closing cylinder valves.
- Draining hoses at the torch.
- Releasing pressure on the diaphragm.

Prevent a gas mixture from accumulating in the hose when either hose is being relieved of pressure by closing the valve of the other hose. This will prevent flashback, which could damage the torch, hose or pressure regulator.

103.7 Cylinder Valves

103.7.1 Opening Cylinder Valves

Pressure adjusting screws must be fully released before attaching regulator to cylinder. If regulators are already attached to cylinders, relieve pressure on adjusting screws before opening cylinder valve. When opening a cylinder valve, stand to one side, away from the gauge faces and the front of the regulator. Where a special wrench is required, it must be left in position on the valve stem while the cylinder is in use, in the event fuel-gas flow must be quickly turned off in an emergency.

Return the cylinder to the vendor if oxygen valve cannot be opened by hand. Do not use a hammer or wrench to open an oxygen cylinder valve.

103.7.2 Oxygen Cylinder Valve

Most oxygen cylinder valves are double seated and are designed to be used in the fully open or fully closed position. Valve may leak if only partially opened.

- Place hand around oxygen cylinder knob, not on top of it when initially opening valve.
- Slowly open the oxygen cylinder valve until the high pressure gauge indicates full pressure, then fully open the valve.

103.7.3 Acetylene Cylinder Valve

Acetylene cylinder valves are of a single seat design.

- Do not open an acetylene cylinder valve more than 1-1/2 turns. This will allow the cylinder valve to be quickly shut off in case of an emergency.
- Leave the T-wrench on the acetylene cylinder valve stem in case an emergency arises.
- Do not place tools or other items in the recessed top of a cylinder as this may damage the safety plugs or interfere with quickly closing the valve.

103.7.4 Propane Cylinder Valve

Propane cylinder valves are double seated and are designed to be used in the fully open or fully closed position. Valve may leak if only partially opened.

- Slowly open the propane cylinder valve until the high pressure gauge indicates full pressure, then fully open the valve.

103.7.5 Closing Valves

Valves of cylinders and stations on piped and manifold systems must be closed when not in use. When work is stopped or completed, or when the operator leaves the equipment, valves must be operated to relieve pressure on regulators and hoses.

103.7.6 Clogged Valves

If ice or snow clogs fuel-gas cylinder valves, use warm or medium hot water to thaw them. Do not use boiling water, since it may loosen fusible plugs. Do not use any type of flame to thaw fuel-gas cylinder valves.

103.8 Torch Valves

103.8.1 Torch Valves

Ensure torch valves are open when changing or adjusting pressure on regulators so gauges indicate actual operating pressures.

- Do not exceed pressures authorized for welding or cutting.

103.9 Hoses

103.9.1 Hoses

Hoses are provided with connections that allow proper attachment to regulators and torches.

- Fuel-gas hose fittings have left-hand threads which are identified by notches.
- Oxygen hose fittings have right-hand threads.

When using oxy-fuel equipment, use only equipment designed for the gas being used. When not in use, oxygen and fuel-gas hoses must be properly stored to prevent damage.

Oxygen and fuel-gas hoses must be inspected prior to each use. Hoses with leaks, wear or other defects must be repaired or replaced.

Connecting more than one length of hose together is not desirable, but when necessary, all connections must be tight.

Hoses must be protected from being stepped on, run over, kinked or tangled.

When lengths of oxygen and fuel-gas hose are taped together for convenience and to prevent tangling, not more than 4 inches out of 12 inches shall be covered by tape.

Two common hose types are:

1. Grade – “T”: This hose is considered a multi-fuel hose. Different fuel-gases, i.e., acetylene, propane, natural gas, propylene and others can be used.
Grade – “T” hose is manufactured in different diameters with fiber reinforcement throughout its entire length.
 - Track welders are required to use 3/8 inch ID Grade – “T” hose.
2. Grade – “R”: This hose is manufactured for use with acetylene fuel-gas only.
Grade – “R” hose resembles Grade – “T” hose, but doesn’t have the same fiber reinforcement and will deteriorate from the inside out if another fuel-gas passes through the hose.

Information, including hose type and diameter is stamped along the entire length of hose when manufactured. These stamped markings will wear off over time but may still be visible near where it is attached to regulators or hose reels.

Color-codes for hose are:

Red - Combustible gases

Green - Oxygen

Hose must be used only with the gases for which it is intended.

Hose length and diameter will affect stated pressures for equipment used.

103.9.2 Hose Connections

Blow out new hose, with gas for which the hose will be used, to remove residue. In assembling hose connections, only crimp ferrules will be used, with no more than two splices for any length hose. Use of tape, wire or hose clamps to repair hose is prohibited.

103.10 Torches

Torch handles and attachments must be maintained in good condition and carefully handled. When not in use, valves must be closed and torch stored in a safe place.

103.10.1 Handle

Track welders must use a Victor HD310c or equivalent torch handle when performing welding duties. A Victor 315c or equivalent will not provide the required volume needed for thermite welding. (Refer to Figure 103G)

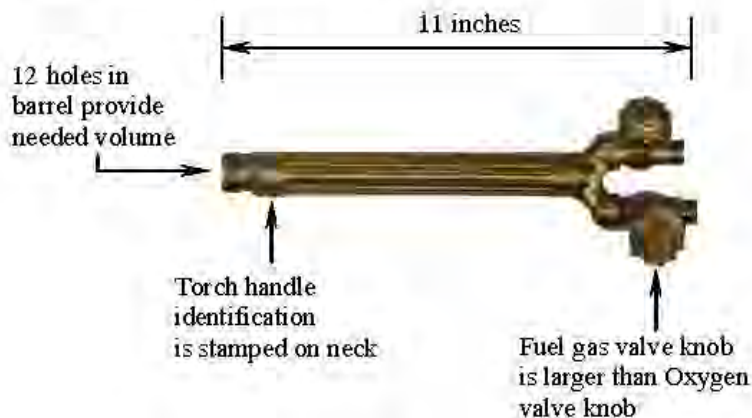
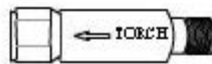


Figure 103G *Victor HD310c Torch Handle Identification*

103.10.2 Flashback Arrestors

Ensure approved flashback arrestors are applied at the torch.

- Flashback arrestors are available in two types - torch mount or regulator mount.
- Ensure that the proper flashback arrestor is applied.
- Proper stamping can identify specific arrestor type (Refer to Figure 103H).
- Flashback arrestors extinguish a fire within the torch, preventing the fire from spreading back toward the cylinders.
- A flashback may occur due to dirty tips, lack of adequate fuel-gas pressure for tip size being used, or fuel-gas cylinders nearly empty. Should a flashback occur, determine its cause and correct before resuming operations.
- If a flashback occurs, immediately shutoff the oxygen valve on the torch handle if welding, or the cutting attachment if cutting.



Torch Mount

Figure 103H *Flashback Arrestor*

103.10.3 Cutting and Welding Attachments and Tips

Use proper torch and tips designed for the fuel-gas, e.g., Acetylene, Propane, Natural Gas, MAPP, etc.

(Refer to Figure 103I)

- Acetylene cutting tips are one piece and have a flush end.
- Propane gas tips are a two piece design and have a recessed end. (The recessed end helps trap propane gas long enough to ignite)



Figure 103I *Cutting Tips*

103.10.4 Torch Precautions

When working with torches:

- Ensure that the gas stream is not directed toward yourself or others.
- Keep the flame and sparks directed away from personnel, flammables, and equipment.
- Torch should be momentarily purged prior to lighting to ensure flow of oxygen and fuel-gas.
- Do not use the torch as a hammer, scraper or for other than its intended purpose.

103.11 Equipment Setup

When setting up welding and cutting equipment, it is important that all operations be performed systematically. The following set-up procedures will assure safety to the operator and the apparatus.

Note: Always have suitable fire extinguishing equipment on hand when using oxy-fuel equipment.

103.11.1 Cylinder Use

When working with gas cylinders:

1. Place the oxygen and fuel-gas cylinders on a level floor (if they are not mounted on a truck), and tie them securely to a work bench, post, wall, or other secure anchorage to ensure the cylinders remain upright.

2. Remove the valve protecting caps.
3. Open the fuel-gas valve for an instant, then close to blow out any dirt or foreign matter that may have accumulated during shipment or storage.
4. Open the oxygen gas valve for an instant, then close.

Note: Do not stand facing cylinder valve outlets when opening cylinder valves.

103.11.2 Pressure Regulators

1. Check the regulator fittings for dirt and obstructions. Also check threads of cylinders and regulators for imperfections.
2. Connect the fuel-gas regulator to the fuel-gas cylinder and the oxygen regulator to the oxygen cylinder. Use an appropriate wrench and tighten the connecting nuts to prevent leakage.
3. Ensure there is no pressure on the adjusting screws by turning counter-clockwise.
4. Check hose for defects including burns, nicks and bad fittings.
5. Connect the red hose to the fuel-gas regulator and the green hose to the oxygen regulator. Secure connecting nuts tightly to insure leak-proof seating.

Note: Fuel-gas hose connections have left-hand threads and are notched for identification.

6. Open the cylinder valves slowly. Read the high-pressure gauges to check the cylinder gas pressure.
7. Connect the red fuel-gas hose to the flashback arrestor mounted on the torch handle. Connect the green oxygen hose to the flashback arrestor mounted on the torch handle.

103.12 Leak Test

The system must be tested for leaks:

- Prior to initial use each day or shift.
- When combination torches have been converted or altered.
- When the torch equipment is suspected of being damaged.
- When a flashback has occurred.

When checking the system for leaks, do the following:

1. With the oxygen cylinder valve open, adjust the oxygen regulator to deliver 20 psig.
2. With the fuel-gas cylinder valve open, adjust the fuel-gas regulator to deliver 10 psig.
3. Ensure the oxygen and fuel-gas control valves on the torch handle are closed.
4. Close the oxygen and fuel-gas cylinder valves.
5. Turn the adjusting screws counterclockwise one turn.
6. Observe the gauges on both regulators for 2 minutes. If the gauge readings do not change, the system is leak tight. If there is a leak, use an approved leak detection solution or soap and water to locate it.
 - a. If the High Pressure gauge reading decreases, a leak is present at the cylinder valve or inlet connection. Perform the following steps:
 - Tighten the inlet connection after releasing pressure from the regulator.
 - If the inlet connection continues to leak, have the regulator repaired by a qualified repair technician.
 - Never tighten a cylinder valve.
 - If the cylinder valve is leaking, remove the regulator from the cylinder and place the cylinder outdoors.
 - Notify your gas supplier immediately.

- b. If the Low Pressure gauge reading decreases, a leak is present at the regulator outlet connection; within the hose; at the torch inlet connection; or at the control valves on the torch handle. Perform the following steps:
- After the pressure has been released from the system, tighten the regulator outlet connection and the torch handle inlet connection.
 - If these connections continue to leak, have the regulator or torch handle repaired by a qualified technician.
 - Replace leaking hoses.
 - Tighten or replace connections where leaks are found.

After testing the system and verifying that no leaks exist, the equipment may be used.

Inspection information, including the date, has been recorded on the approved Form 24249 for the welding supervisors' review. (Refer to Appendix E).

103.13 Igniting and Extinguishing Torch

Use only a standard friction lighter to ignite all oxygen/fuel-gas equipment or fuel-gas equipment.

When igniting a torch, never point the torch toward others or flammable materials.

A lighted torch must not be:

- Laid down.
- Passed from one person to another.
- Kept in your hand when climbing.
- Left unattended.

103.13.1 Igniting Oxy-acetylene Torch

To properly ignite an Oxy-acetylene torch, use the following sequence:

1. Open the acetylene valve on the torch handle and ignite the gas.
2. Adjust flame so that the black carbon smoke disappears.
3. Introduce oxygen and adjust to a neutral flame.

103.13.2 Extinguishing Oxy-acetylene Torch

To properly shut down an Oxy-acetylene torch, use the following sequence:

1. Shut off the oxygen valve on the torch handle.
2. Shut off the acetylene valve on the torch handle.

By following this sequence, both sides of the system are checked for leaks.

1. If a “pop” is heard, the oxygen valve is leaking.
2. If a small flame is still burning on the tip of the torch, the acetylene valve is leaking.

Tighten the leaking valve with a wrench or take to a qualified repair facility.

Note: Shutting off the acetylene valve first will create a “pop” every time and result in soot being blown back into the torch.

103.13.3 Igniting Oxy-propane Torch

To properly ignite an Oxy-propane torch, use the following sequence:

1. Slightly open the propane valve.
2. Open the oxygen valve about 1/4 turn (slightly more than the propane valve).
3. Ignite the torch, adjust to a neutral flame.

Note: When igniting the torch, if there is a gap between the torch tip and the flame, too much propane is present. Extinguish the flame by closing the propane valve first, then closing the oxygen valve and start over.

103.13.4 Extinguishing Oxy-propane Torch

To properly shut down an Oxy-propane torch, use the following sequence:

1. Shut off the propane valve at the torch handle.
2. Shut off the oxygen valve at the torch handle.

103.13.5 Tip Charts

Use appropriate tip chart for fuel-gas type being used.

103.13.6 Draining the System

When work is complete, the oxy-fuel system must be drained and equipment properly stored.

Drain one side of the oxy-fuel system at a time as follows:

1. Ensure all valves on the torch handle are closed.
2. Close both valves on the cylinders.
3. Open the oxygen valve on the torch handle to exhaust oxygen from the hose, close valve.
4. Release the pressure on the oxygen regulator by turning the pressure adjustment screw counter clockwise.
5. Open the fuel-gas valve on the torch handle to exhaust fuel-gas from the hose, close valve.
6. Release the pressure on the fuel-gas regulator by turning the pressure adjustment screw counter clockwise.

104.0 Equipment

Read and understand the operating instructions and maintenance manual supplied with the equipment. If not available, ask your supervisor for a copy.

104.1 Equipment Description

104.1.1 Rail Saws

A rail saw can be powered by gasoline, hydraulic or electric. When operating a rail saw:

- Do not operate a rail saw unless you have been properly trained in its safe use.
- The guide support arm must be used when cutting rail (freehand cutting is prohibited).
- Warn others that you are about to begin cutting rail.
- Personnel are prohibited from standing in front of the rail saw while cutting rail.
- Required Personal Protective Equipment (PPE) must be used when operating a rail saw.
- Inspect equipment regularly to ensure it is operating safely and efficiently.
- Do not fuel gasoline powered rail saws closer than 20 feet from where the rail is to be cut.

104.1.2 Grinders

- Straight Shaft Grinders - A straight shaft grinder can either be hydraulic or electric, and with the appropriate abrasive wheels can be used for many purposes. This can include maintenance grinding, removing metal flow, slotting and welding preparation. This type of grinder is not recommended for finishing rail or component surfaces.

- Angle Grinders - An angle grinder can either be hydraulic or electric and is used primarily to finish grind rail and component surfaces and radii. This type of grinder can also be used in maintenance grinding, removing metal flow and welding preparation.
- Profile Grinder - A profile grinder can either be hydraulic, gas or electric and is used primarily to grind thermite welds and flash butt welds. This type of grinder, if designed for the task, can also be used to grind the surface of rail ends and frogs.
- Switch Grinders - A switch grinder can either be hydraulic, gas or electric and is designed for maintaining turnouts by removing metal flow and restoring radius on stock rails, switch points and frogs.
- Frog Grinders - A frog grinder can either be hydraulic or electric and is used to grind frog flange-ways and running surfaces after weld repairs. This type of grinder can also be used for maintenance grinding, including removing metal flow and restoring radius.
- Bull Nose Grinder - A bull nose grinder is designed specifically to de-burr bolt holes.

104.1.3 Hydraulic Rail Pullers

A rail puller is used to pull rail together at pull-aparts, service failures or while installing thermite welds.

Review and be familiar with manufacturer's operating and maintenance manuals before operating equipment.

- If manuals are not available, contact your supervisor to obtain a copy.

Inspect rail puller; including connections, fittings and hoses for hydraulic leaks, damage or other visible defects. Any time a rail puller is used, extreme caution must be taken and only authorized personnel are permitted to operate equipment.

- All other individuals must not be near rail puller when in operation.
- Do not place feet between rail and rail puller connecting rods.

Follow these procedures when using a rail puller:

1. Remove by grinding, any raised portion on the rail where jaws contact rail.
2. Remove dirt or grease from this area using a wire brush or torch if necessary. Clean and inspect the jaws for conditions that could reduce gripping.
3. Pre-align rail ends to be welded to an approximate crown before pulling.
 - Alignment plates must be used for aligning rail.
4. Remove enough rail anchors or clips to allow the rail to move the required distance to complete the pull. Removing anchors or clips allows the rail to move freely and not over exert the rail puller.
5. If the desired pull cannot be achieved, release the puller, remove additional anchors or clips and pull again.
6. Do not strike any portion of the rail puller or track structure while the rail puller is under load, including removing or applying rail anchors or clips.
 - Striking the rail puller or track structure may cause the rail puller to lose grip and slide on the rail.

Note: Beginning from the end, farthest from the weld, rail anchors or clips may be applied 20 minutes after completion of pour.

In addition, follow these instructions when using the old style RPE 120 Simplex Rail Puller with removable wedges.

- Ensure safety guards and rod latches are in place and functioning properly before use.
- Do not use a rail puller if guards or latches are missing or damaged.
- Clean and inspect the wedges for conditions that could reduce gripping.
- Apply a light coat of oil or grease to the backside of wedges that contact the bracket. This will help when removing the expander.
- Insert the wedges with the teeth facing the rail.
- Store rods and wedges properly to prevent damage.

A rail puller should be used on closure welds when one or more of the following conditions apply:

- A. The rail temperature is lower than the rail laying temperature.
(Refer to standard drawing 0045 to obtain rail-laying temperature)
- B. The reference marks indicate that you are adding rail.
- C. A decrease in rail temperature may occur during the welding process, such as rapidly changing weather conditions.

105.0 Welding Rail Ends

105.1 Purpose of Welding Rail Ends

The purpose of welding rail ends is to:

- Correct rail end batter.
- Repair chipped rail ends.
- Fit a good section of rail next to a worn section of rail.

Do not weld rail ends to:

- Correct drooped ends or surface bent rail.
- Compensate for worn joint bars, loose bolts or poor track surface.
- Repair engine burns (wheel burns) or crushed heads
 - Defect must be replaced with at least a 15 ft. rail.

Do not weld gage face of rail.

105.2 Alloy Rail Precaution

Preheating and postheating procedures are different for alloy and non-alloy rail. Chrome-vanadium and chrome-moly rails are extremely sensitive to rapid cooling. Additional care must also be used when working with alloy rail, including:

1. Not installing alloy rail as replacement rail.
2. Not over heating (blue) alloy rail when drilling or cutting.
3. Using sharp drill bits of the proper size and lubricant when drilling bolt holes.
4. Not performing arc welding on alloy rail when the ambient temperature is below 32° F.

105.3 Use Proper Stick and Wire Electrodes

Use only the following approved stick and wire electrodes when welding.

(Refer to Table 105A)

Rail Steel

Approved Electrodes		Welding Parameters
McKay M-932	3/16" Stick	210 – 230 Amps
McKay M-932	1/4" Stick	290 – 310 Amps
Railbuild 540	3/16" Stick	170 – 200 Amps
Railbuild 540	1/4" Stick	210 – 230 Amps
Railbuild 540	5/64" Wire	28-29 Volts / 250 – 300 Amps

Table 105A *Approved Electrodes*

105.4 Prepare for Welding

Prior to welding rail ends prepare the joint as follows:

1. Surface the joint.
2. Install and/or tighten bolts as necessary.
3. Replace joint bars where necessary.
4. Disassemble Poly-Portec or similar insulated joints and install standard joint bars prior to welding. (Re-install insulation after weld cools).

105.5 Determine Weld Length

If both rails are on the same plane and rail is battered or chipped, follow these instructions:

(Refer to Figure 105A)

1. Build rail to a level surface matching existing rail beyond batter or chip.
2. Do not end weld directly over a bolt hole.
3. Do not weld beyond the outermost bolt hole.
4. To check for true rail end batter, use a straightedge independently on each rail.
 - If rail is damaged beyond outermost bolt hole, the rail must be replaced.

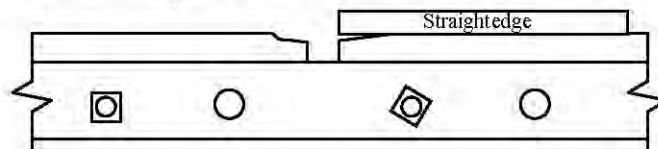


Figure 105A *Chipped or Battered Rail End*

If one rail is on a lower plane than the abutting rail:

1. Place a straightedge on the high rail and extend the end of the straightedge out above the low rail.
2. Measure the distance between the straightedge and the low rail.
3. Determine the length of the weld on the low rail by dividing the measurement (in thousandths of an inch) in step 2 by 0.012 inch. (Refer to Figure 105B)

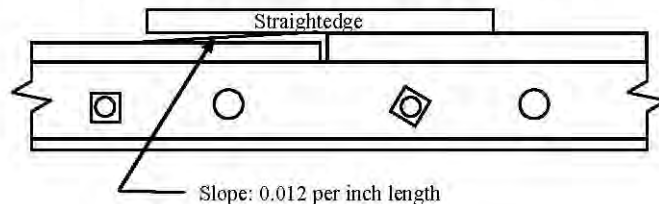


Figure 105B *Marking Joints for Length of Ramp*

105.6 Remove Defective Material

Use a grinder to remove all fatigued, spalled or otherwise defective material.

(Do not use carbon arc cutting or oxy-fuel cutting for this purpose)

105.7 Preheat and Maintain Inter-Pass Temperature

Use of a teleweld or other approved rail end heater is recommended for preheat and postheat. Use a temp-stik or pyrometer to measure the rail temperature during preheating.

1. Preheat the entire weld area plus 3 inches beyond the weld area to the required temperature.
 - Preheat non-alloy rail to 700° F.
 - Preheat alloy rail to 1000° F.
2. Maintain this temperature (inter-pass temperature) throughout the welding operation by using beads 3/4 inch to 1 inch wide.

3. If train operations or other occurrences interrupt the welding operation, the rail must be re-heated to the correct temperature.

105.8 Apply Weld

Apply the ground clamp to a rail anchor.

1. Make weld beads 3/4 inch to 1 inch wide.
2. Weld bead length may be as long as repair area, if necessary.
3. Overlap weld beads 30% to 40%.
4. Remove slag after applying each weld bead.
5. Peen each weld bead 2 to 3 times per inch with a 2 lb. Ball-Peen Hammer.
6. Apply longest weld beads on the gauge side of the rail.
(Refer to Figure 105C)
7. Do not use carbon blocks on high carbon steel - use copper rail end jig.

Top View of Rail Joint

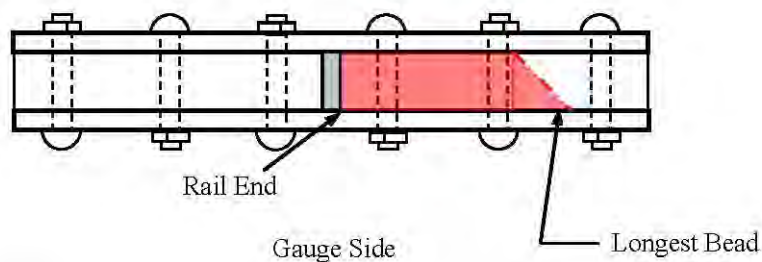


Figure 105C *Weld Bead Pattern*

105.9 Postheat

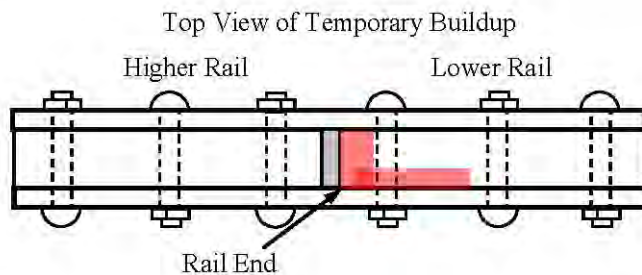
Use a temp-stik or pyrometer to measure the rail temperature during postheating

1. Postheat 1 inch from the end of rail to 3 inches beyond the weld area, to the required temperature.
 - Postheat non-alloy rail to 1000° F.
 - Postheat alloy rail to 1200° F.

105.10 Temporary Rail End Buildup

A temporary buildup is used to prevent batter on mismatched rail ends and comply with FRA tread mismatch requirements; e.g. during curve rail or switch component replacement.
(Refer to Figure 105D)

Temporary rail end buildup must be preheated and postheated the same as permanent welds.



Gauge Side

Figure 105D *Temporary Buildup*

Temporary built-up rail ends are not intended to be permanent and should be removed at first opportunity.

105.11 Surface Grind Rail Ends

(Refer to Figure 105E)

- Grind the gauge and field side of rail ends to match the existing profile of rail (Remove overflow).
- Grind the surface of rail ends level – tolerance is 0.000 inch low to 0.010 high.
- If one rail is lower than the other, after welding, grind an even surface from the end of the high rail to the end of the weld repair on the low rail.
- If bond wires are damaged, notify the Signal Maintainer or Signal Operations Hotline.
 - Remove rail bonds by grinding.

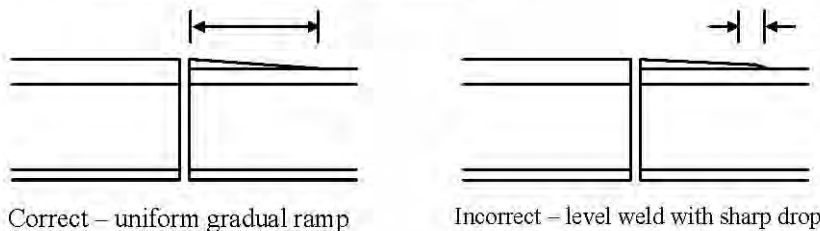


Figure 105E *Grinding Ramp*

105.12 Slot Rail Ends

(Refer to Figures 105F – 105I)

The RPM rating of abrasive wheels must meet or exceed the RPM rating of the power equipment that is being used.

- Slotting wheel must not be more than 1/8 inch thick.
- The slot should match the contour of the rail end.
- Avoid cutting into or nicking the joint bars.

Open Joints:

- Square the rail end by removing any metal flow by grinding.

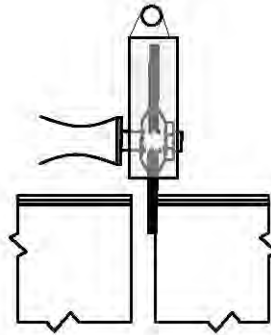


Figure 105F *Squared Rail Ends*

Slot rail ends to the required dimensions.

- Slot the rail end to 1/4 inch to 5/16 inch deep.
- Bevel the rail end to 1/16 inch to 3/32 inch back.

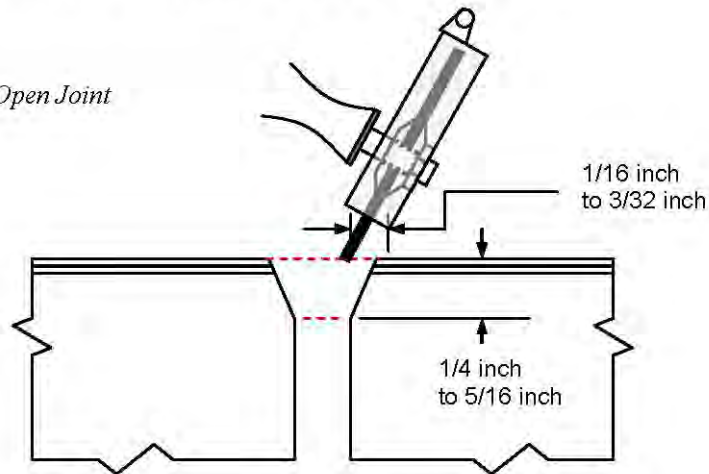


Figure 105G *Open Joint*

Closed Joint:

- Center the slotting wheel between the rail ends of closed joints to remove an equal amount of metal from each rail.
- Slot the rail end to 1/4 inch to 5/16 inch deep.
- Slot to a width of 3/16 inch.

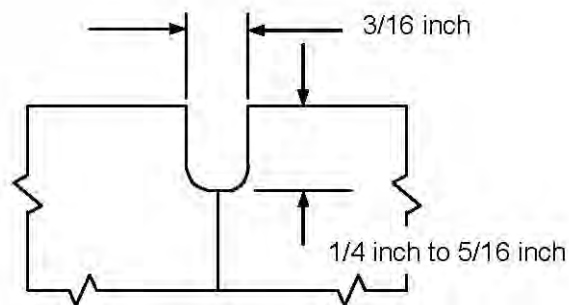
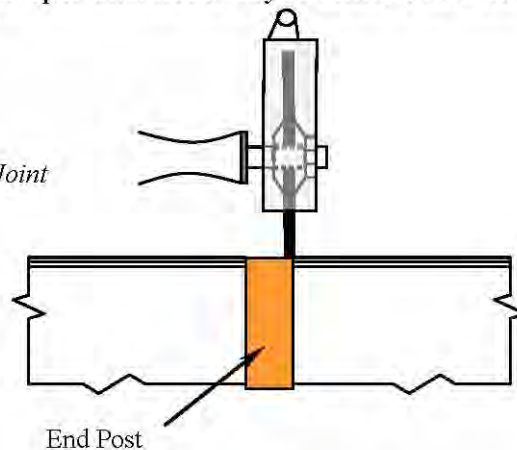


Figure 105H *Closed Joint*

Insulated Joints:

- Remove only flowed metal from rail ends.
- Do not leave a sharp edge on rail end after slotting.
- Avoid cutting the end post as much as possible.
- Do not slot any deeper than necessary to remove flowed metal.

Figure 105I *Insulated Joint*



105-8

106.0 Welding Switch Points

106.1 Location

Do not weld or use repaired switch points on main line switches or sidings in Class 3 and above tracks. This includes both switch points.

However, the heel end of switch points may be welded in all tracks according to procedures for rail end welding in Chapter 105.0 - Welding Rail Ends.

Trains or engines must not operate over switch points being welded or repaired until all grinding, welding, and finish grinding work is complete. Take the switch out of service.

Note: The class of track, including main track or sidings, is determined by the maximum operating speed of the subdivision.

106.2 Switch Point Identification

There are two switch point designs:
(Refer to Figures 106A and 106B)

1. Use Standard (knifepoint) design switch points with standard rail section stock rails.
2. Use Samson design switch points only with Samson type stock rails.

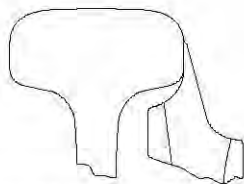


Figure 106A Standard

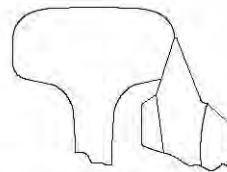


Figure 106B Samson Point

106.3 Identify Rail Type

Rail steel switch points are one piece points and are magnetic. Manganese switch points are an insert that bolts to the carbon steel switch point section and are non-magnetic.

106.4 Switch Point Wear

Repair or replace a switch point that is worn down or chipped so that the top is more than 7/8 inch below the plane across the top of the stock rail. (Refer to Figures 106C and Table 106A)

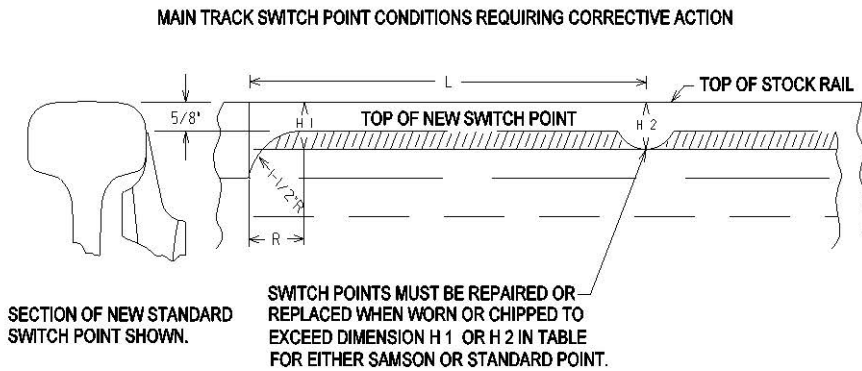


Figure 106C Switch Point Wear

Length of Switch Point	Distance			
	R	H 1	L	H 2
Up to 19' 6"	1-1/2"	7/8"	Over 10"	3/4"
19' 6" or over	1-1/2"	7/8"	Over 16"	3/4"

Table 106A Switch Point Dimensions

Repair or replace a switch point that is chipped and has an unprotected vertical surface that is $5/16$ inch or wider $3/4$ inch below the top of the stock rail. (Refer to Figure 106D)

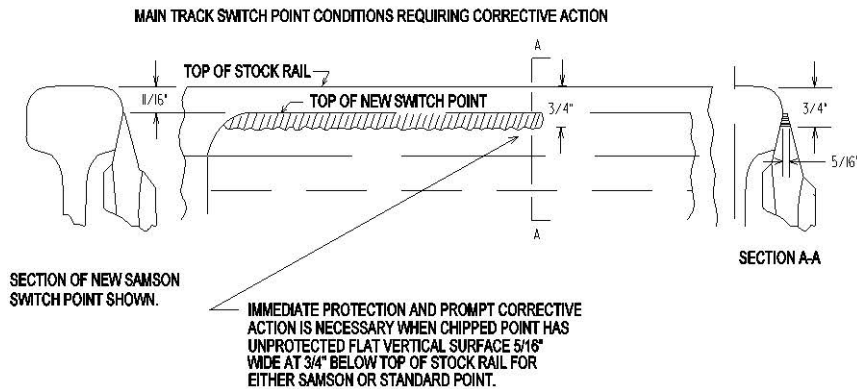


Figure 106D *Switch Point Wear*

106.5 Remove Metal Flow from Stock Rail

To remove metal flow:

1. Remove all flowed metal from the gauge side of the stock rail before welding the switch point as follows:
 - a. Start 4 inches ahead of the switch point and grind back to where the switch point ends contact with the stock rail.
 - b. Ensure no sharp projections remain after grinding.
 - c. When removing metal flow from stock rails, taper a minimum of 4 inches in length.
(Refer to Figure 106E)

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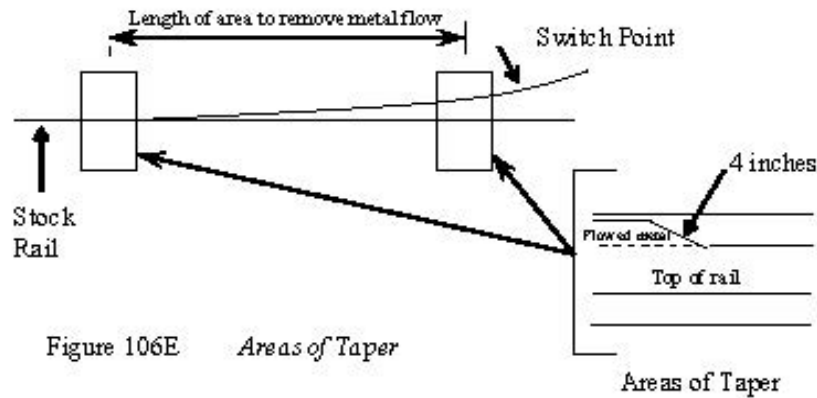


Figure 106E Areas of Taper

2. Restore the gauge and field sides of the stock rail to a 5/16 inch to 9/16 inch radius as per standard drawings.

106.6 Removal of Defective Material

Remove defective material from carbon steel switch points by grinding only.

- Do not use carbon arc cutting or oxy-fuel torch cutting for this purpose.

On manganese switch point inserts, grinding is the preferred method for removal of defective manganese steel, but carbon arc cutting is permitted.

- When removing defective metal prior to welding repairs, create a level surface by grinding the entire weld area flat.
- Maximum length of repair shall not exceed 16 inches.
(Refer to Figure 106F)

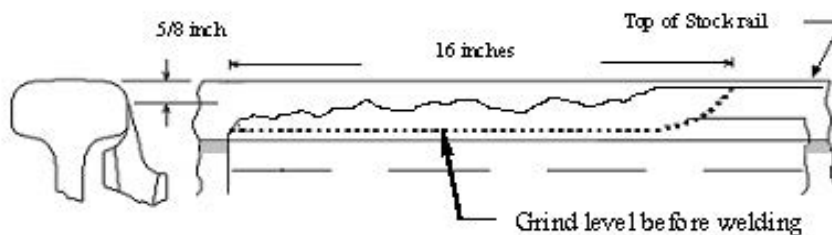


Figure 106F Switch Point Repair

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106.7 Welding Switch Points

When welding switch points:

1. On standard carbon switch points, preheat the entire weld area plus 3 inches past, to 700° F. (Maintain this temperature throughout the welding process).
2. Insert a 1/4 inch x 3 inch x 18 inch copper backup plate between the switch point and the stock rail before welding.
3. Use only the following approved stick electrodes when welding. (Refer to Table 106B)

Rail Steel

Approved Electrodes	Welding Parameters
McKay M-932 3/16" Stick	210 – 230 Amps
Railbuild 540 3/16" Stick	170 – 200 Amps

Table 106B Approved Electrodes

4. Begin welding at the end of the point.
5. Remove all slag before depositing the next layer of weld metal.
6. Peen each bead before applying next layer.

106.8 Grind Switch Points

106.8.1 Top and End of the Switch Point:

Grinding the top and end of the switch point:

1. The tip of the switch point must be 5/8 inch to 3/4 inch lower than the crown of the stock rail. Refer to standard drawings for specific dimensions of various size switch points.
2. Ensure the top of the point tapers back so that the first 8 inches of the point will not carry any load. (Refer to Figure 106G)

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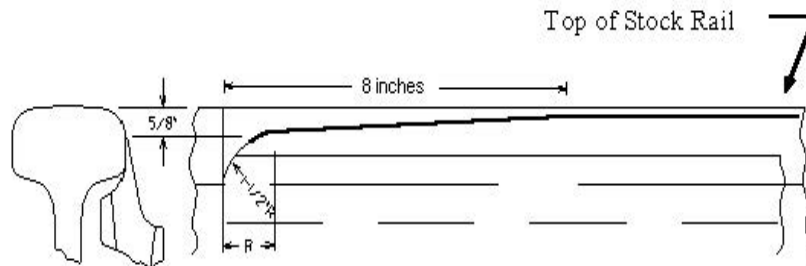


Figure 106G *Finished Switch Point*

3. Grind the end of the switch point to a narrow edge.
4. Grind off the metal flow on the switch point to obtain a close fit between the switch point and the stock rail.

106.8.2 Gauge and Stock Rail Side of the Switch Point

Grinding the gauge and stock rail side of the switch point:

1. Grind the gauge side to a 5/16-inch to 9/16-inch radius.
2. Slightly bevel the top of the stock rail side, except the first 10 inches from the end of the point.
3. Slot the rail end at the heel of the switch point.

Check for proper fit between the switch point and stock rail after all welding and/or grinding operations are completed.

Always have a Signal Maintainer available when welding or grinding on switches equipped with switch machines, electric locks or circuit controllers.

107.0 Frog General

107.1 Frogs

107.1.1 Clamped Frogs

Before welding frogs out of track, clamp them to a rigid support to prevent warping.

107.1.2 Solid Base

Ensure all frogs or other components welded in track are on a solid base and all bolts are tight.

107.1.3 Repairs to Specific Frogs

A. Rail-Bound Manganese Insert Frogs (RBM)

RBM frogs in all main line, branch line and other track may be repaired by welding.

B. Bolted Rigid Frogs

Do not repair bolted rigid frogs by welding in the field, except on the following tracks:

- Branch line track where the maximum authorized speed is 30 MPH or less.
- Sidings, yard tracks or industry tracks beyond the clearance point of the main track switch.

C. Carbon Spring Rail Frogs

Do not repair carbon spring rail frogs by welding except rail ends, horn straps and hold-down housing. See instructions 108.4 Weld Spring Rail Frog Horn for repair guidelines and procedures.

D. Manganese Insert Spring Rail Frogs

Repair manganese spring rail frogs by welding according to the requirements in Chapter 109.0.

E. Solid Manganese Self Guarded (SMSG) Frogs

SMSG frogs in all branch line, yard tracks and other tracks may be repaired by welding.

- Check guard face for excessive wear prior to working on SMSG frog.
(Refer to Figure 107A)
- If guard face requires repair, it must be repaired before welding up the point.
- Switch must be removed from service until guard face repair is complete.

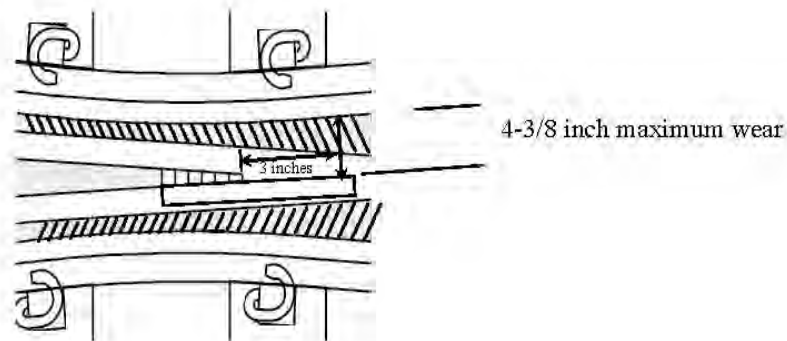


Figure 107A Measure SMSG Frog

107.1.4 Beyond Main Line Switch

If a frog is beyond the clearance point of a mainline switch it can be repaired by welding unless; the repair does not comply with instruction 107.1.3 (B) Bolted Rigid Frogs or (C) Carbon Spring Rail Frogs.

107.1.5 Chipped or Battered Rail Ends

Weld chipped or battered rail ends at the toe and heel of any frog in any track according to procedures for rail end welding in Chapter 105.0.

107.1.6 Reconditioned Manganese Frogs

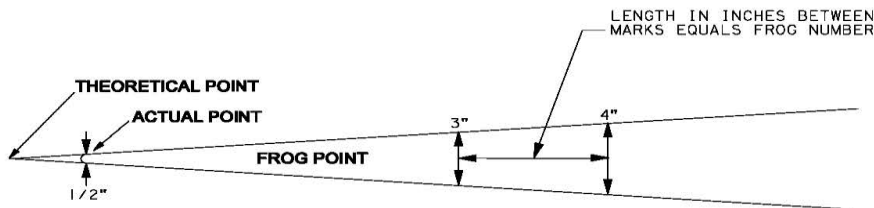
Manganese frogs reconditioned at repair shops are considered *new* frogs.

107.2 Frog Identification

This section explains how to identify frogs by weight, size and type.

The rail weight and frog sizes are stamped on a tag attached to the heel of the frog or cast into the top of the filler block. If these markings are not clearly visible, determine the size of the frog as follows:

- With a tape measure mark a 3-inch width across the top of the frog.
- Mark a 4-inch width across the top of the frog.
- Measure between marks. The number of inches measured equals the frog number.
(Refer to Figure 107B)



FIELD IDENTIFICATION OF FROG NUMBERS

Figure 107B *Frog Size Identification*

- Railbound Manganese Frog (RBM) - The railbound manganese frog has a cast insert for the point section of the frog. (Refer to Figure 107C)

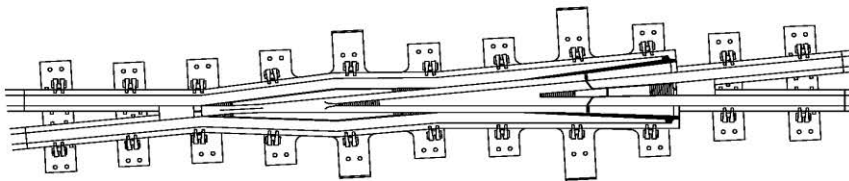


Figure 107C Railbound Manganese Frog

- Rigid Bolted Frog - The rigid bolted frog is similar to the RBM frog, except the point section is rail steel instead of manganese. (Refer to Figure 107D)

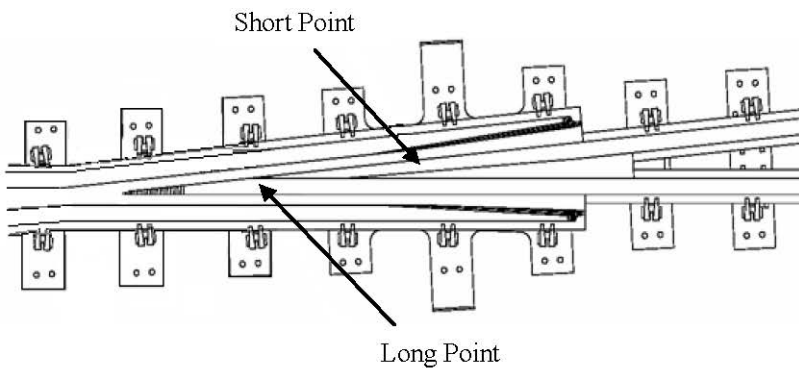


Figure 107D Bolted Rigid Frog

- Spring Rail Frog - The spring frog has a movable wing rail that is held closed against the body of the frog except when pushed open by a diverging movement. Do not weld on the running surface of spring rail frogs except to build up the rail ends. (Refer to Figure 107E)

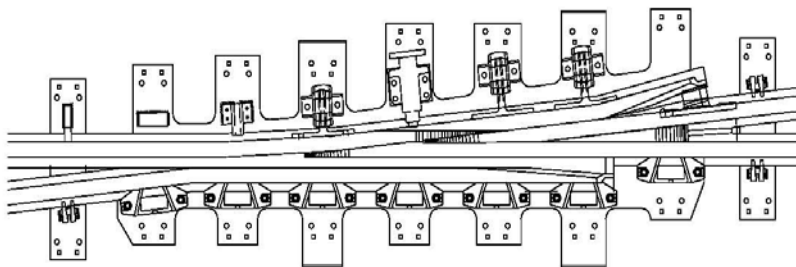


Figure 107E Carbon Spring Rail Frog

- Manganese Insert Spring Frog - Similar to the carbon spring rail frog except the point and one running side of the wing are a manganese insert. (Refer to Figure 107F)

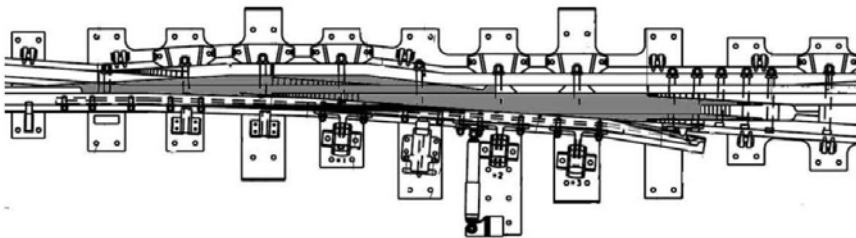


Figure 107F Manganese Spring Rail Frog

- Solid Manganese Self-Guarded Frog (SMSG) - The SMSG frog has a body cast in one piece from manganese steel. A raised guard cast into the body protects the frog point from passing wheels, making the installation of a guardrail on the opposite rail unnecessary. (Refer to Figure 107G)

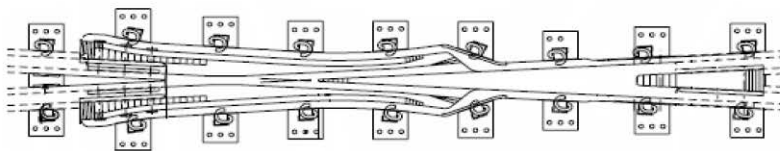


Figure 107G *Solid Manganese Self-Guarded Frog*

- Movable Point Frog (MPF) - The MPF is equipped with a point that is movable in the same manner as switch points. This frog is used in heavy tonnage, high-speed main track where the traffic on the straight and diverging sides of the turnout are comparable. Do not arc weld on MPF frogs. (Refer to Figure 107H)

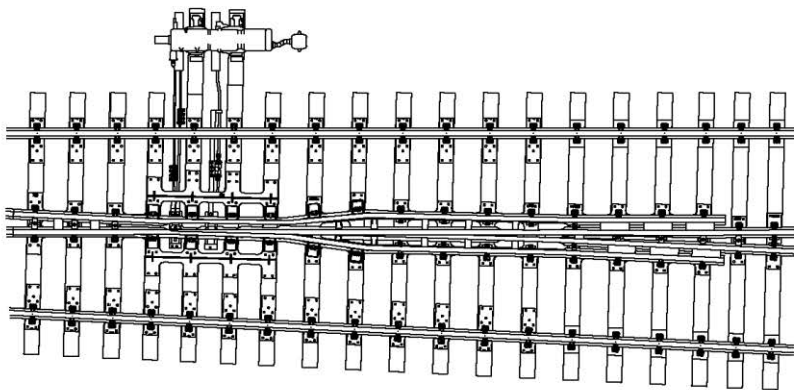


Figure 107H *Movable Point Frog*

- **Railroad Crossing Frogs** – Railroad Crossing frogs allow two tracks to cross over one another at grade. They may be constructed from all rail or with manganese inserts at the locations where the rails cross over each other.
(Refer to Figure 107I)

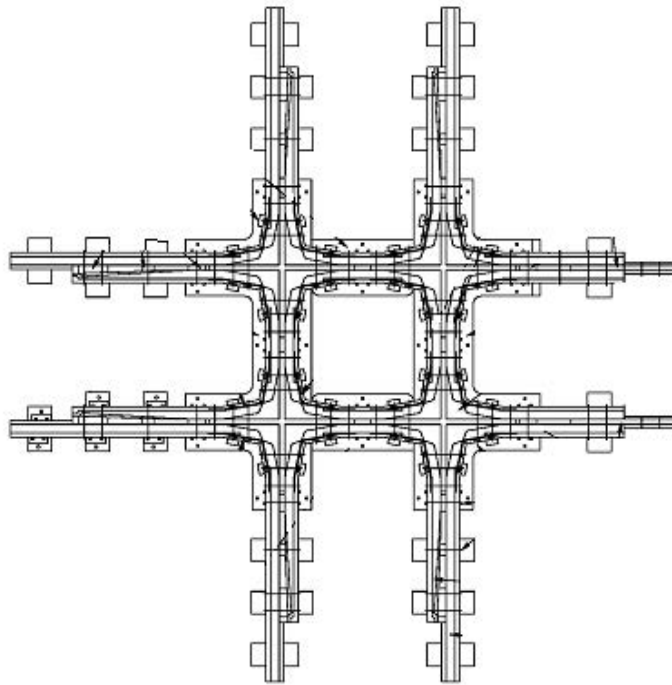


Figure 107I *Crossing Frog*

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108.0 Repairing Carbon Turn Out and Crossing Frogs

The following instructions apply to welding carbon turnout and crossing frogs.

108.1 Preparing for Welding Carbon Steel

Ensure all bolts are tight.

108.1.1 Use Proper Stick and Wire Electrodes

Use only the following approved stick and wire electrodes when welding. (Refer to Table 108A)

Rail Steel

Approved Electrodes	Welding Parameters
McKay M-932 3/16" Stick	210 – 230 Amps
McKay M-932 1/4" Stick	290 – 310 Amps
Railbuild 540 3/16" Stick	170 – 200 Amps
Railbuild 540 1/4" Stick	210 – 230 Amps
Railbuild 540 5/64" Wire	28-29 Volts / 250 – 300 Amps

Table 108A *Approved Electrodes*

108.1.2 Remove Defective Material

Use a grinder to remove all fatigued, spalled or otherwise defective material

(Do not use carbon arc cutting or oxy-fuel cutting for this purpose)

108.1.3 Preheating Carbon Steel

Use of a teleweld or other approved rail end heater is recommended for preheat and postheat.

Use a temp-stik or a pyrometer to determine the desired temperatures.

1. Preheat the area to be welded plus an additional 3 inches on both sides to 700° F

2. Do not allow the metal to cool during the welding operation.
3. If traffic interrupts the welding and the metal cools, re-heat the metal to 700° F before resuming the welding.

Wing Rails:

To preheat wing rails, place the heater on the side of the rail and point the flame toward the junction of the head and the web of the rail.

Frog Points:

To preheat a frog point, place the heater on top of the rail.

Ground Clamp Location:

Attach ground clamp to the non-running surface of the wing/binder rail.

(Refer to Figure 108A)

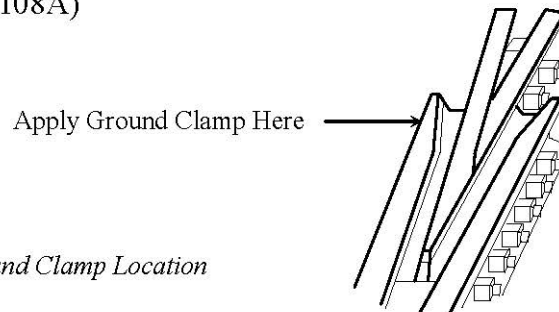


Figure 108A *Ground Clamp Location*

108.2 Welding Carbon Steel Turnout and Crossing Frogs

When welding turnout and crossing frogs:

1. Use electrodes as follows:
 - a. For heavy fill, use a 1/4-inch stick electrode, or wire.

- b. For shallow fill and for feathering out, use a 3/16-inch electrode.
2. Make the weld deposit in successive beads, 3/4 inch to 1 inch wide.
3. Apply each bead parallel to the wing or point until the necessary buildup is obtained.
4. Remove all slag before depositing the next layer of weld metal.
5. Peen each bead 2 to 3 times per inch with a 2 lb. Ball-Peen Hammer.

108.2.1 Postheating Carbon Steel Turnout and Crossing Frogs

Use a temp-stik or pyrometer to determine the desired temperatures.

Immediately after completing a weld repair, postheat the welded area plus an additional 3 inches on each side to 1000° F.

108.3 Finish Grinding

Grind all accessible areas of the frog or crossing to the rail's proper running surface and contour as follows:

1. Use a frog gauge to determine the correct radius and flangeway clearances.
2. Grind all edges at the top of the frog or crossing to a 3/8-inch radius.
3. On turnout frogs, make sure the point at the tip is 1/4 inch lower than the adjacent wings and is sloped upward, so that the point and wings are level at a distance back from the point equal in inches to the number of the frog.

(Example)

7 inches for a #7 frog

10 inches for a #10 frog

Slot all adjoining rail to a depth of $\frac{3}{16}$ inch using a $\frac{1}{8}$ inch slotting wheel.

(Refer to Figure 108B)

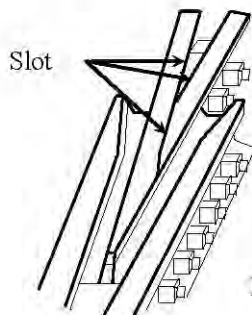


Figure 108B *Areas to Slot*

108.4 Weld Spring Rail Frog Horn

When repairing a spring rail frog horn

- Do not weld replaceable horns

A. Repair Guidelines

Follow these guidelines when repairing a forged steel horn:
The Manager Track Maintenance must ensure that the ties and surface under the frog are maintained to standards before the frog is repaired. (Refer to Figures 108C and 108D)

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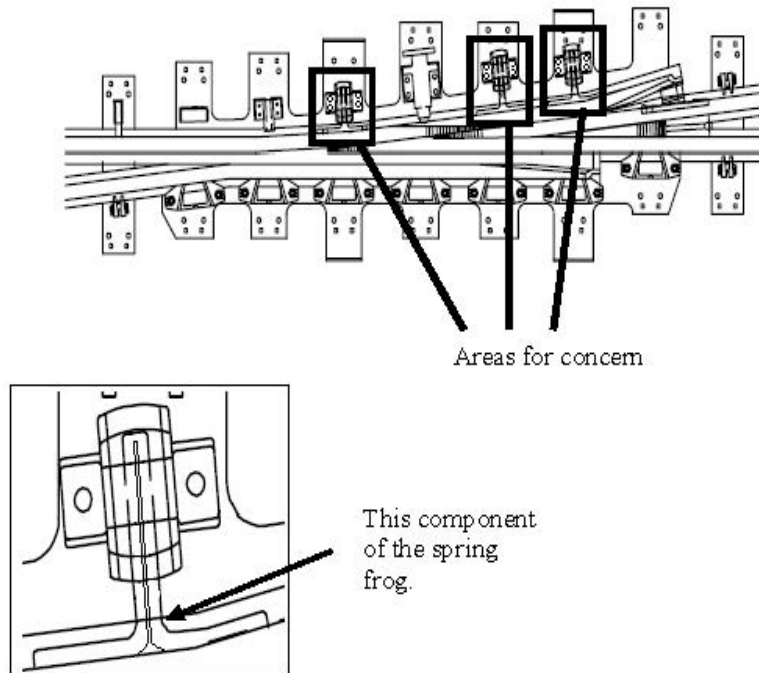


Figure 108C Spring Frog Problem Areas

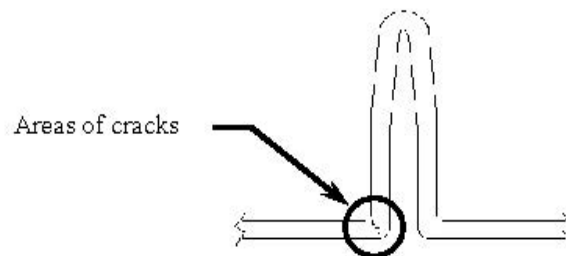


Figure 108D View Looking Down on Horn

- Each frog must have two horns that have *not* been repaired by welding.
- One hundred percent penetration is required.
- Undercutting is not permitted.
- The finishing pass must have a slight crown.
- All mismatched, battered, or chipped rail ends must be repaired.

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- Horn and hold-down clearances must be within FRA specifications after repairs.
- The employee repairing the frog must meet these qualifications and must be qualified by the Manager Track Welding before repairing the frog. The employee must:
 - Be proficient in using a carbon arc cutting torch to remove the defect.
 - Demonstrate the ability to weld using multi-pass vertical progression up.

B. Weld Procedure

Follow this procedure when repairing a forged steel horn:

1. Remove all grease from the area to be welded.
2. Remove the crack using arc-air as follows:
 - a. Ensure a root opening of 1/8 inch to obtain full penetration (see Figure 108E).



Figure 108E *Root Opening*

- b. Ensure that the V-groove is wide enough to permit good electrode penetration.



Figure 108F *Backing Plate*

3. Use a backing plate when clearance permits (see Figure 108F).
4. Weld as follows:
 - a. Use 1/8-inch E7018 electrodes.
 - b. Set welding current within manufacturer's specifications.
 - c. Weld with a vertical progression up.
 - d. Clean all slag after each bead.
 - e. Use a needle scaler to remove slag, if possible.
5. If needed, use a metal tab at the bottom of the groove to start vertical progression up (Refer to Figure 108G).

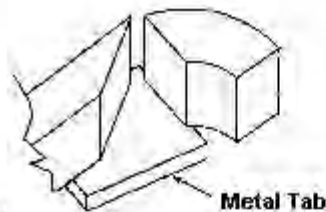


Figure 108G *Metal Tab Position*

6. Remove backing plates if they interfere with spring rail movement.

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109.0 Repairing Manganese Turnout and Crossing Frogs

109.1 Overview

Manganese steel exhibits the following characteristics:

- Unlike most steels that soften when tempered at a relatively low temperature, manganese steel becomes brittle and magnetic when heated above 500° F and will fracture easily.
- The outer portion of a manganese casting work-hardens to a depth of approximately 1/4 inch while the inner area remains ductile.
- Manganese steel can work-harden to more than twice its original hardness.
- Until fully work-hardened, manganese steel remains ductile, and it deforms from its original shape when stressed.
- Good non work-hardened manganese steel is non-magnetic.
- Work-hardened manganese steel will have a slight magnetic attraction.

Magnetic properties can be checked with a magnet in the flangeway of the frog.

109.2 Purpose of Repair

The purpose of repairing manganese frogs is to:

- Repair broken or chipped areas.
- Restore worn surfaces to acceptable FRA standards.

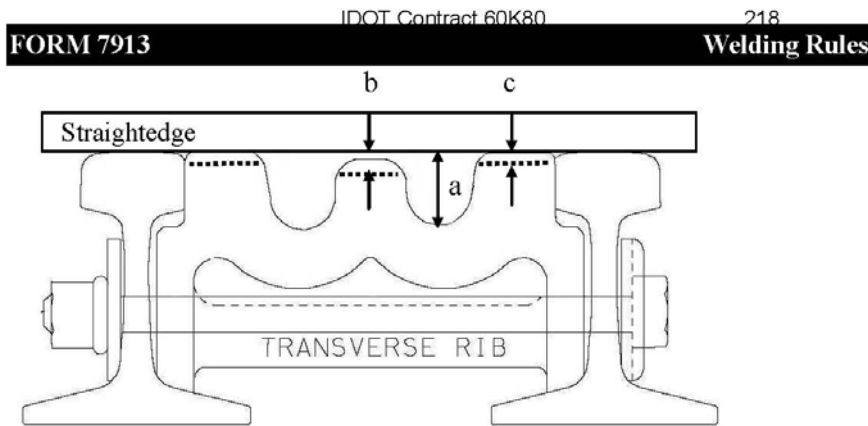


Figure 109A *Frog Wear Measurement*

- a) Flangeway depth must not be less than:
 - 1-3/8 inches for class 1 track.
 - 1-1/2 inches for classes 2 through 5 track.
- b) If the frog point is chipped, broken or worn more than 5/8 inch down and 6 inches back, operating speed will not be more than 10 MPH.
(After the first 6 inches, the point is considered the tread portion of frog)
- c) If the tread portion of frog is worn down more than 3/8 inch below original contour, operating speed will not be more than 10 MPH.
(Refer to Figure 109A)

109.3 Work-Hardening

While manganese steel in track work undergoes work-hardening:

1. Do not weld minor low spots.
2. Avoid all welding repairs unless the track component is deeply cracked or has broken or missing parts.
3. Confine other repairs to grinding only.

4. As the steel loses its ductility and becomes hardened, critical areas of flangeways will show metal flow. Do the following:
 - a) Check clearances using frog gauges when appropriate
 - b) Correct any deviation as follows:
 - Grind off excess metal to restore the proper dimensions and contours.
 - While grinding, make sure no excess heat builds up in the metal.

Note: To grind properly, allow the grinding wheel to cut without applying excessive pressure, which can produce heat buildup.

Before welding repair begins, heat manganese casting if moisture is present.

Note: This temperature must not exceed 100° F

109.4 Mark and Remove Defective Material

Using a straightedge and soap stone, mark worn areas or defective metal to be removed. Use Carbon Arc Cutting (CAC) to remove defective metal.

109.4.1 Power Source Setup (CAC)

Power source equipment must be set at Direct Current Electrode Positive / Constant Current. Use a Carbon Arc Cutting torch with a minimum 400 amp rating.

Angle and travel speed determines depth of cut.

When Carbon Arc Cutting, electrode stick-out should not be more than 6 inches.

- If stick-out exceeds 6 inches, air pressure is insufficient to remove molten metal.
- Ensure air stream is directed toward the end of and under the electrode.

(Refer to Figure 109B)

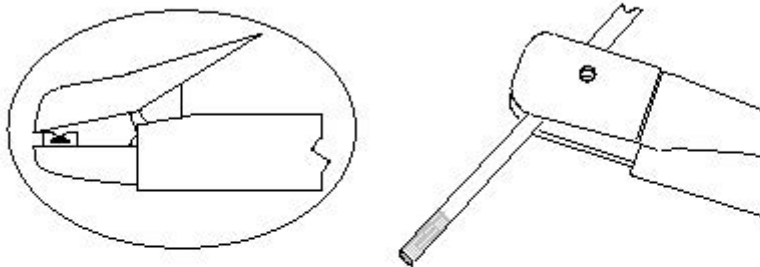


Figure 109B Carbon Arc Cutting Torch

109.4.2 Remove Work Hardened Material

Use CAC to remove work-hardened material.

- Remove 1/4 inch of metal to get below work-hardened zone.
- After CAC, grind area clean.

109.4.3 Remove Horizontal Cracks

Use CAC to remove horizontal cracks.

- Remove all horizontal cracks and taper area at ends to accommodate grinding wheels.
- To properly remove horizontal cracks, remove metal ahead of crack and work back toward damaged metal and crack. Grind area clean.

109.4.4 Removing Vertical Cracks

Use CAC to remove material at a vertical crack.

(Refer to Figure 109C)

- Identify vertical crack.
- Remove entire vertical crack if possible, without burning through frog casting.
- For cracks in frog flangeway, do not exceed 1/2 inch depth.
- Remove metal in a "V" type pattern.



Figure 109C "V" Pattern

Use a stick electrode designed to seal vertical cracks that cannot be fully removed.

- Use no more than three passes over crack.
(Refer to Figure 109D)



Figure 109D Bead Passes

- Complete buildup using approved manganese product.

109.5 Repairing Manganese Frogs

109.5.1 Approved Stick and Wire Electrodes

(Refer to Table 109A)

Manganese Steel

Approved Electrodes		Welding Parameters
Matweld 900	1/8" Stick	120 Amps
Matweld 900	5/32" Stick	140 Amps
Matweld 900	3/16" Stick	170 Amps
FrogSeal	5/32" Stick	140 – 160 Amps
Frogbuild	3/16" Stick	180 – 200 Amps
Frogbuild	7/32" Stick	200 – 220 Amps
Frogbuild	5/64" Wire	28 – 29 Volts / 250 – 300 Amps
FrogSpec	3/16" Stick	210 – 230 Amps
FrogSpec	5/64" Wire	28 – 29 Volts / 250 – 300 Amps

Table 109A *Manganese Steel*

Note: Frogbuild stick electrode is a drag type electrode.

(Maintain contact with the component while welding)

109.5.2 Manganese Buildup Procedures

When repairing manganese castings by welding, use the following instructions:

- Maintain a 10° to 30° trailing electrode angle while welding.
- Drag the molten steel puddle, do not push it.
- Do not start and stop beads at the same place, which creates stress lines.
- Use proper amperage and travel speed to prevent overheating.

109.5.3 Weld Bead Length and Width

To maintain proper weld bead characteristics and low heat input.

1. Bead length must not exceed 9 inches with stick electrodes.
2. Bead length must not exceed 12 inches with wire electrodes.
3. Bead width must not exceed 5/8 inch maximum.

109.5.4 Skip and Alternating Methods

Skip Method: To help prevent frogs from over heating when repairing one portion of the frog, weld a bead of proper length, skip 6 inches, then weld another bead of proper length.

Alternating Method: When repairing more than one part of the frog, alternate from point to wings to avoid over-heating. To evenly support the weight of trains, build point and wings rails up together to maintain even height.

109.5.5 Maintain Temperature

Manganese steel changes metallurgical properties at temperatures above 500° F. It becomes brittle and can fracture easily.

- When welding on manganese steel, keep temperature of the base metal below 500° F.
- Periodically check temperature 1/2 inch from deposited metal by using either the appropriate temp-stik or pyrometer.

Note: If using a non-contact pyrometer, always check at a distance not exceeding 6 inches.

Compressed air is the only approved method for cooling manganese steel.

109.5.6 Welding Areas

Weld lowest areas first to create a level plane.

109.5.7 Removing Slag and Relieving Stress

After applying each weld bead, remove slag and peen to remove stress.

1. Remove slag from the beginning of the weld bead to the end of weld bead.
 - The beginning of the bead is cooler so the slag will be more easily removed.
2. Peen from the end of weld bead toward the beginning 2 to 3 times per inch.
 - Peen with the round part of a 2 lb. Ball-Peen Hammer before weld bead cools.
 - This step places the weld bead in compression and relieves stress created by welding.

Note: Order store Stock Item # 410-2286 for approved hammer.

Another means of stress relief is direction of weld travel. By alternating direction of travel, stresses are reduced to help maintain frog strength.

109.5.8 Train or Equipment Interruption

If welding is interrupted by trains or other equipment movement, grind clean where wheels made contact with frog to remove contaminants.

109.5.9 Finish Grinding

Industry standard radius is 5/8 inch.

After repairing manganese frogs, grind frog point and wings to specified contours.

- Gauge side of point and wings must be ground to original uniform radius as indicated
(Refer to Figure 109E)

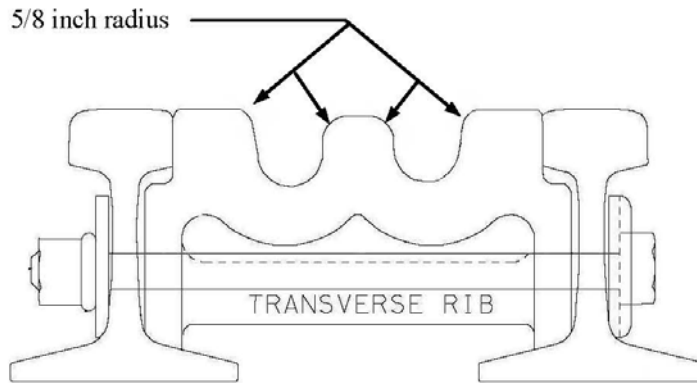


Figure 109E *Frog Radius*

- Grind the surface of frogs to the original contour without grinding onto parent steel

Note: Grinding off of welded area onto parent steel that is at surface creates secondary batter.

The tip of the frog point shall be 3/16 of an inch below the wings and slope upward, until the point is even with the wings and binder rails. (Refer to Figure 109F)

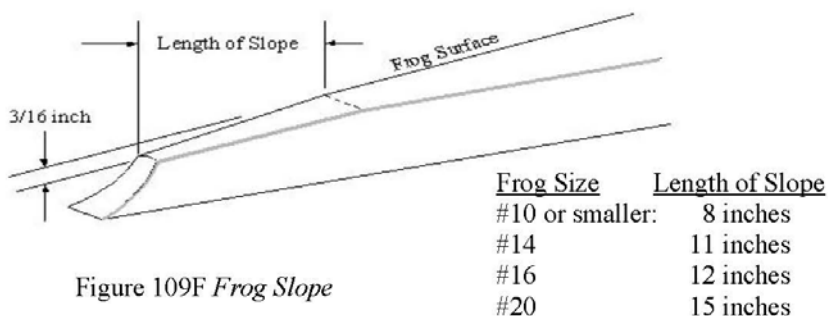


Figure 109F *Frog Slope*

109.5.10 Slotting

Using a hand grinder with a slotting stone no wider than 1/8 inch, grind all areas between the manganese insert and carbon binder rails to a depth of 3/16 inch and slightly bevel to remove sharp edges.

109.5.11 Use of Frog Gauges

The flangeway gauge is used to measure the flangeway width and radius. (Refer to Figure 109G)

The narrow side, or check side of the gauge is for determining flangeways that are too narrow for the wheel flange to pass through. This is the minimum clearance for all flangeway openings. If this portion of the gauge cannot be inserted into the flangeway as shown below, the flangeway must be ground to the original contour.

The finish side of the gauge is the correct opening and must accept the gauge. The radius at the top must also correspond to the gauge as shown in the illustration on the right.

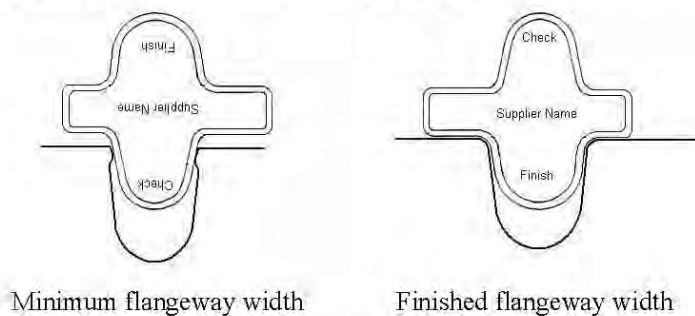


Figure 109G Frog Gauge

Do not over grind sides of flangeways.

- Over grinding reduces running surface area and affects guardrail measurements.

109.5.12 Follow-up Grinding

It is critical to re-grind metal flow and restore radius to frogs. Depending on traffic patterns, follow-up grinding should be completed 7 to 10 days after new frog installations or repairs by welding, to eliminate cracks and chipped areas.

If not completed in a timely manner, metal will flow to the point of failure requiring premature weld repairs.

109.6 Repairs to Carbon Steel Binder Rails

Do not weld carbon steel binding rails on main line frogs where the maximum subdivision speed exceeds 25 mph.

109.6.1 Mark and Remove Defective Metal

- Using a 24 inch straightedge, determine area to be welded and mark with a soap stone.
- Remove defective metal by grinding only.
- Do not use carbon arc cutting or oxy-fuel cutting on carbon rail steel.

109.6.2 Preheat Carbon Steel Binder Rail

Before welding, preheat carbon steel binder rail portion of manganese frogs to 700° F.

- Maintain this inter-pass temperature throughout the entire welding procedure.
- Do not allow carbon steel to cool to a temperature below 700° F.

Note: Inter-pass temperature is the minimum temperature required while welding on carbon steel. This temperature will equal the preheat temperature.

If the welding repair is interrupted and carbon steel binder rail cools below minimum inter-pass temperature, re-heat to required temperature before resuming welding repairs.

109.6.3 Welding Carbon Steel Binder Rail

Do not begin or end weld beads over a bolt hole.

- Beginning or ending weld beads over a bolt hole increases the chance of rail breaking due to stresses caused by welding and the wheel transition from binder rail to manganese wing rail.

Approved stick and wire electrodes for welding rail steels must be used with a weld bead width of 3/4 inch to 1 inch.

- Remove slag from each weld bead before relieving stress by peening.
- Use a 2 lb. Ball-Peen Hammer to relieve stress. 2 to 3 blows per inch of weld.

109.6.4 Finish Grind Carbon Steel Binder Rails

When welding is completed, grind binder rails to their existing contour.

109.6.5 Do Not Postheat Carbon Steel Binder Rails

109.7 Manganese Insert Spring Rail Frogs

- Weld only manganese portion of frog and rail ends. (Refer to Figure 109B)
- Follow manganese steel welding procedures as stated beginning at Rule 109.0.

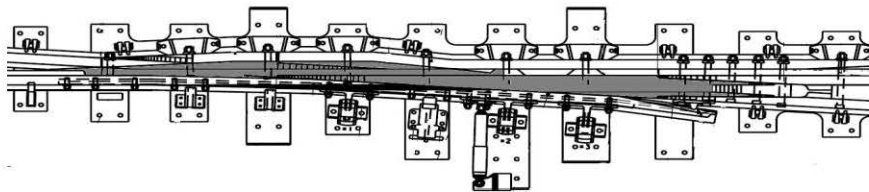


Figure 109B *Manganese Spring Rail Frog*

- It is recommended that a hydraulic jacking tool be used to open wing rail.
- Wing rail must be closed before trains are allowed to pass.
- Grind slope on point (Refer to Table 109B).

Frog Type	Rail Section	Point Depth	Length of Slope
#14 Manganese Spring Insert	133#	3/16 inch	14 inch
#14 Manganese Spring Insert	136#	3/16 inch	14 inch

Table 109B *Manganese Spring Rail Frog Slope*

110.0 Thermite Welds - RailTech

110.1 Overview

Following proper welding and safety procedures is essential to the installation of a quality thermite weld and the continued safe operation of the Union Pacific Railroad.

These instructions apply to installing RailTech thermite welds.

Only RailTech materials (molds, portions, pre-mix packing sand and crucibles) are to be used when installing RailTech welds.

Individual thermite welds are the responsibility of the welder who performs the preheating of the rail ends.

110.2 Safety

The presence of moisture in the thermite portion or in the crucible can lead to the rapid buildup and uncontrolled release of steam when the thermite reaction occurs.

- 1 part water per unit volume = 1,000 parts of steam per unit volume.

This may cause ejection of the molten metal from the crucible. Therefore, the thermite portion, crucible, and molds must be dry and moisture must not be allowed to enter the system before or during the welding process.

110.3 General

The instructions below must be followed when installing a thermite weld.

All thermite welds must have reference marks indicating the original amount of rail between marks.

Do not use a wet crucible, molds or thermite oxide charge to make a weld.

- If moisture enters the crucible, molds or charge, or is suspected of being present in one of them, discard the damaged item.

- Before discarding charges or igniters, contact the local Manager Environmental Field Operations or telephone 402-544-3649 for instructions on proper disposal.

Recommended shelf life for weld kits is three years. All weld kits must be stored in a dry location, stacked no more than three kits high.

When using mold kits:

- Inspect crucibles for loose sand and cracks.
- Molds that are broken with pieces missing should not be used.
- Use standard molds for rail end mismatch up to 1/8 inch.
- Use new to worn molds if rail ends are mismatched between 1/8 inch and 1/4 inch.

Use a transition or taper rail on 6 inch base rail when rail end mismatch exceeds 1/4 inch.

Compromise welds (different rail base widths) must not be installed in class 4 and above main tracks:

- On subdivisions where regularly scheduled passenger trains operate.
- On subdivisions in excess of 40 mgt.

Proper location of a thermite weld is the center of the crib.

Apply reinforcing weld-mate straps to thermite welds only under the following circumstances in any FRA class of track:

- Compromise thermite welds that are between rails of different sections (rail base widths).
- Thermite welds that involve alloy rail (one or both rails).

110.3.1 UT Tested or Certified Rail

All replacement rail must be UT tested or certified in compliance with the Engineering Track Maintenance Field Handbook.

110.4 Weather Restrictions

When severe temperatures and weather conditions are present, observe the following welding restrictions:

1. Do not make thermite welds on alloy rail when the rail temperature is below 32° F. When air temperature is below 50° F, place an insulating cover over the alloy weld for a period of 15 minutes after shearing to prevent the weld from cooling too rapidly.
2. Do not make any other welds when the rail temperature falls below 5° F.
3. Do not make thermite welds during rain, snow, or heavy mist in the air.

Should rain or snow begin while in the process of completing a weld, take the following measures to prevent moisture from entering the mold, crucible or welding charge:

- Use an umbrella to help prevent moisture from entering the molds and crucible.
 - Ensure that rain, snow, or mist does not cool the rail placing the weld in tension as the rail contracts.
 - Use a rail puller, when conditions require, to prevent rail movement.
 - Cover the weld until the weld area cools to 700° F.
4. Before preheating, use a rail thermometer or pyrometer to check the rail temperature.

If the rail temperature is below 35° F, warm the rails as follows:

- Heat 30 inches to 36 inches from the end of each rail.
- Raise the rail temperature to between 90° F and 110° F. (This is to add supplemental heat and remove condensation)

110.5 Identify Rail

110.5.1 Identify Rail Type (Alloy or Standard)

Rail type must be determined because different rail chemistries determine specific maintenance and welding requirements.

110.5.2 Determine Weld Location

Do not place a thermite weld closer than:

- Thirty (30) inches from an existing plant or thermite weld
- Fifteen (15) feet from a rail joint

110.5.3 Compromise Welds

Identify 'handed' joints and welds as follows:

Stand in between rails with back towards larger rail and face the smaller rail. The joint on the left side would be designated as the left-hand (LH) joint, and the joint on the right side would be designated as the right-hand (RH) joint. (Refer to Figure 110A)

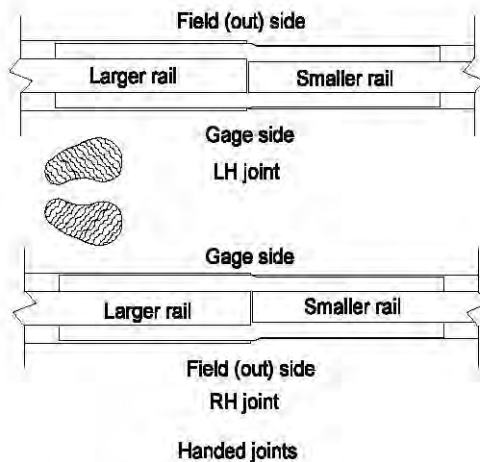


Figure 110A *Compromise Weld Identification*

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Compromise weld kits are not interchangeable due to different base offsets on gauge and field sides.

- Gauge side base offset is 1/8 inch.
- Field side base offset is 3/8 inch.

Do not make a compromise weld between rails of different rail chemistry and different width bases; e.g. between 136 lb. alloy rail and 119 lb. standard carbon rail. (Refer to Figure 110B)

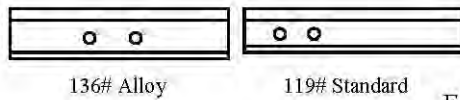


Figure 110B Rail Chemistry

If rails with different base widths and different chemistries must be joined:

1. Weld a standard carbon rail of the same weight and section as the alloy rail, to the alloy rail.
 - Length of rail cut-in must not be less than 15 feet.
2. Make the compromise weld between the rails of the same chemistry.

(Refer to Figure 110C)

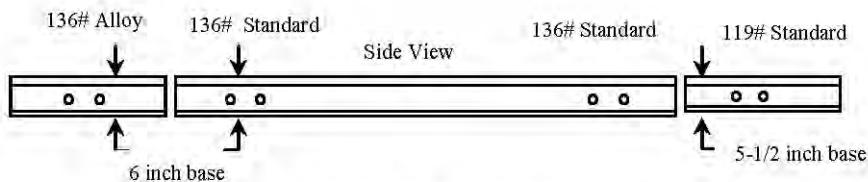


Figure 110C Cut-in Rail

Compromise welds on opposite rails should be made within the same crib.

110.6 Transition Rail

Transition rails and taper rails must be used when required to reduce or eliminate the use of compromise thermite welds. (Refer to Figures 110D and 110E)

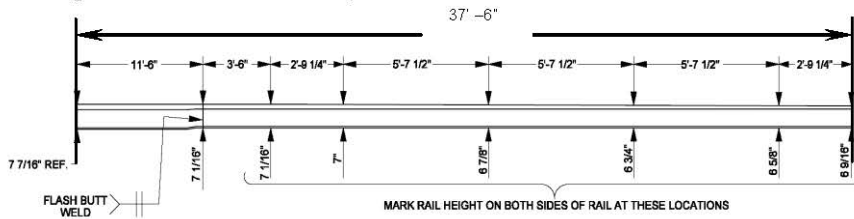


Figure 110D 141# to 133# Transition Rail

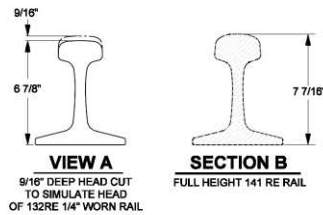
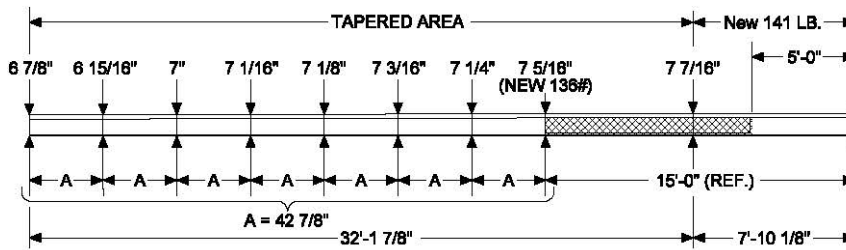


Figure 110E 141# to 136# Transition Rail

110.7 Speed Restrictions – Alloy Rail

For all thermite welds involving alloy rail:

1. Restrict speed to a maximum of 30 mph for a minimum of 24 hours after installation.

2. Do not remove speed restriction until all thermite welds in Class 3 and above tracks are inspected and protected by weld-mate straps.

110.8 Eliminate Bolt Holes

Eliminate bolt holes on thermite welds as follows:

1. On thermite welds that require weld-mate straps, eliminate:
 - a. Bolt holes with centers closer than 8 inches from the rail ends being welded.
 - b. Holes not needed to install the weld-mate strap.
2. On thermite welds that do not require the use of weld-mate straps, eliminate all holes with centers closer than 6 inches from the rail ends being welded.

This includes bond wire holes drilled by Signal Maintainers.

110.9 Reference Marks

Apply reference marks before cutting rail or removing joint bars as outlined in rule 100.7.

110.10 Remove Defects

Refer to Engineering Track Maintenance Field Handbook for rail defect remediation matrix. (Section 4.0 Rail and Joints)

Replacement rail is required when more than one defect of any kind is detected within the same 39-foot length of rail in the same test. (Except for bolt hole crack defects)

When rail detector cars find a defect in a weld, do the following:

1. In a plant weld, cut out the defect by removing a 1-1/2 inch section of rail, 3/4 inch each direction from center of weld. (Refer to Figure 110F)
2. In a thermite weld, cut out the defect by removing a 2-3/4 inch section of rail, at least 1-3/8 inches each direction from center of weld. (Refer to Figure 110F)

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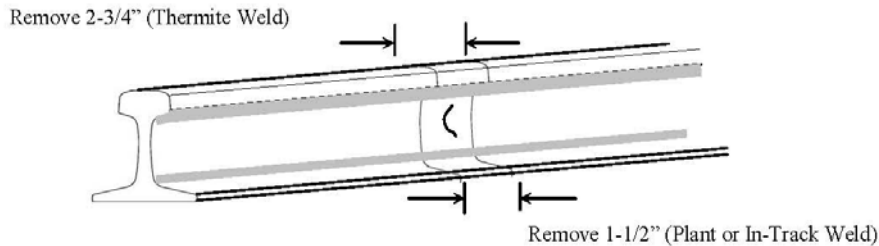


Figure 110F Defect in Weld

When defects previously marked by detector car personnel are repaired, the entire defect must be removed and each rail visually inspected before installing a thermite weld.

- If rail is not cut and marks are not visible, rail must be re-tested.
- If rail is not cut and marks are visible, cut on outside edge of marks. (Refer to Figure 110G)

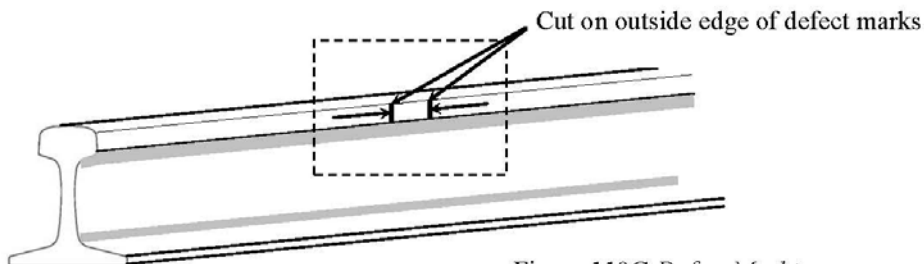


Figure 110G Defect Marking

- If rail was previously cut and no marks are visible, remove 1-3/8 inch from each end. (Refer to Figure 110H)

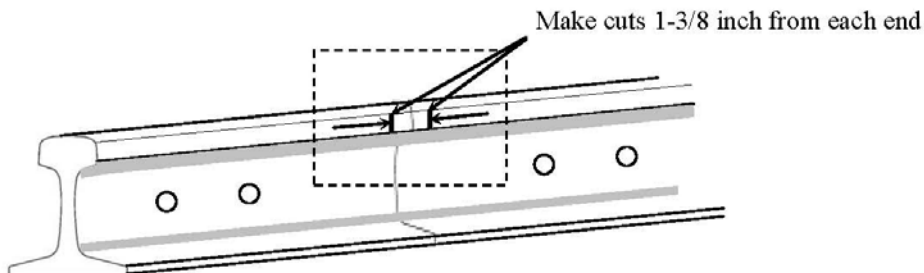


Figure 110H Marking Additional Cuts

110-8

110.11 Rail Under Compression

Torch cut the rail to relieve compression as follows:

1. If the thermite weld will be made within 1 hour of the initial torch cut, use a rail saw to trim the torch cut rail ends square.
2. If the thermite weld will not be made within 1 hour of the initial torch cut, use a rail saw to re-cut the rail ends, removing at least 2 inches from each end of rail.

110.12 Rail Puller

Refer to Chapter 104.1.3 Hydraulic Rail Pullers for operating instructions.

When using a Rail Puller while installing thermite welds, follow these procedures:

1. Surface the joint and tamp at least two ties each side of the joint before placing rail puller on the rail.
2. Remove sufficient amount of rail anchors to allow longitudinal movement of rail.
3. Alignment plates must be used to achieve crown and horizontal alignment prior to pulling rail.
4. Remove by grinding, any raised portion on the rail where puller jaws will contact rail.
5. Remove dirt or grease from this area using a wire brush or torch if necessary.
6. Clean and inspect the rail puller jaws for conditions that could reduce gripping.
7. Operate the rail puller to obtain the correct gap.
8. Never remove additional rail anchors while rail puller is under pressure.
9. If the desired pull cannot be achieved, release the expander, remove additional anchors, and repeat the process.
10. Remove rail puller after weld has cooled to 700° F or less.

(Check the weld temperature on the top center of the weld using a 700° F temp-stik or a pyrometer. If the temp-stik does not melt or the pyrometer registers 700° F or less, remove the rail expander gradually.)

Note: Beginning from the end farthest from the weld, rail anchors or clips may be applied 20 minutes after completion of pour.

110.13 Clean Rail Ends

Clean rail ends removing dirt, rust or other material to ensure a sound weld.

Use an oxy-fuel torch to remove:

- Mill scale 3/4 inch from the each end of rail around the entire periphery.
- Grease 4 inches from each end of rail.

Use a wire brush to remove:

- Dirt, rust or other material 4 inches from the end of each rail.
 - Visually inspect rail ends for defects.

110.14 Rail End Gap – Standard (1-inch) and Wide Gap Weld (WGW)

The required gap must be achieved before thermite welding. Improper gap width results in improper preheating or lack of sufficient weld material.

Rails must be cut to within 1/16-inch perpendicular from the top to the bottom and from the gauge side to the field side.

When thermite welding, create the proper gap as follows:

1. Create a 1 inch gap for a standard thermite weld.
2. Create a 2-3/4 inch gap for a wide gap weld.

110.15 Alignment System

Rail alignment plates are required for use when installing thermite welds.

Exception: Alignment wedges may be used in switches only where rail alignment plates fail to work properly.

110.16 Create Crown – Standard and Wide Gap Weld

Use a 36-inch straightedge to ensure proper crown is established. Use of a taper gauge is required to setup the adjustable type straightedge and must always be used with a non-adjustable straightedge while crowning rail ends.

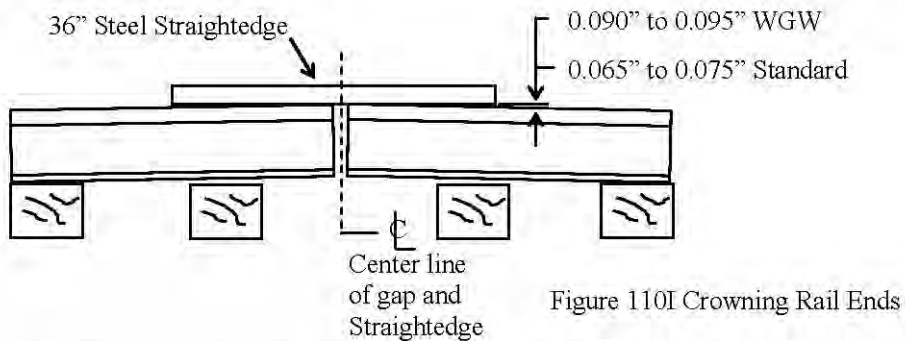
To create the proper crown using rail alignment plates, do the following:

1. On wood ties, move tie plates to accommodate rail alignment plates.
 - Adz ties for proper fit of alignment plates if necessary.
2. On concrete ties, remove pads, if necessary, to accommodate rail alignment plates.
3. Rail fasteners may need to be removed for 2 or 3 ties in each direction of the joint.
4. Insert rail alignment plates and adjust to achieve required crown.

With the proper crown, the ends of each rail just contact the underside of the straightedge. The proper crown for a standard weld is 0.065 inch to 0.075 inch and 0.090 inch to 0.095 inch for a wide gap weld.

(Refer to Figure 110I)

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110.17 Rail Alignment (Straight and Compromise)

Rail twist is the mis-alignment of the railhead and base from the center axis and is not allowed.

When making a weld, use a 36-inch straightedge to check the alignment of rails. Ensure that the gauge sides of the rails are perfectly aligned at the head and base of the rail.

On rail joints where one rail is excessively curve worn, align rail on the field side of the head and base.

When finish grinding the thermite weld; grind the rail on the gauge side of railhead to achieve a gradual transition from full rail to curve worn rail.

On compromise joints where rails are of different base widths:

1. Use alignment plates to achieve proper crown.
2. Align rails so that the gauge side of the head is perfectly aligned.
3. Align rails so that the base on the gauge side has a 1/8 inch offset and that the base on the field side has a 3/8 inch offset.

Compromise weld molds (handed weld molds) are designed with the offsets and are designated left-hand or right-hand.

Compromise weld molds are not interchangeable and cannot be modified to fit other rail configurations.

110.18 Molds, Base Plate and Packing

110.18.1 Molds and Base Plate

- Step 1: Check the mold fit against the rail before applying the base plate. Filing or rubbing may be needed to ensure proper mold to rail fit before installing base plate.
- Step 2: Clean the base plate to allow the base brick to fit freely.
- Step 3: Maintain the base plate in good condition so that it aligns properly at a right angle with the rail.
- Step 4: If rail bases are mismatched over 1/8 inch, a 1/4 inch base brick must be used.
- Step 5: Apply paste to the edges of the base brick only.
- Step 6: Avoid leaving excess paste, which could be carried into the weld with the molten metal.
- Step 7: Ensure that the recess in the base brick is in the exact center of the rail gap and the base plate clamping screws are snug but not over-tightened.
- Step 8: After installing the base plate, recheck the alignment and crown.
- Step 9: Ensure that the molds are perfectly centered on the base plate and rail gap and ensure the molds fit up against the side of the rails and that no gaps are visible.
- Step 10: Place the molds in the steel jackets, then set the molds onto the rail ends so that they fit with the tabs on the metal jackets properly placed onto the base plate.
- Step 11: If any gap is large enough for pre-mixed packing sand to enter the mold cavity, fill the gap with paper to prevent the packing sand from entering the cavity.
- Step 12: Place the mold clamp over the molds and jackets.

Step 13: Tighten the mold clamp only enough to hold the molds firmly against the rail. Over tightening the mold clamp may crack the molds.

Step 14: Cover the top of the mold to prevent any foreign material from entering the mold cavity during packing.

110.18.2 Packing

Pack the mold solid with pre-mix packing sand as follows.

1. Tightly seal all seams and joints with a minimum thickness of packing sand to ensure that all voids are filled.
2. Apply a second layer of packing sand by pressing firmly into place with your finger tips or palm
 - Do not pound against the pre-mix packing sand, as this pounding may jar the rail and cause it to mis-align.
3. Ensure packing sand does not enter the mold cavity.
4. If packing sand does enter the mold cavity, disassemble the mold, remove the sand mixture and repack the mold.
5. Once the packing is complete, do not allow the finished mold to sit more than 10 minutes before preheating.

Plan the packing stage so that the preheating cycle can begin immediately after packing is complete.

110.19 Position Slag Basin

To allow the slag to flow out of the risers properly:

- On tangent track, position the slag basin on the inside of the rail (gauge side).
- On curves, position the slag basin on the low side of the rail.

110.20 Preheating Procedures

Before preheating, ensure you are familiar with and have been properly trained in the operation of that equipment. Approved torch stand must be used when preheating thermite welds. Torch must be level and torch height checked prior to preheating.

1. Use of a stopwatch is required when thermite welding for preheat and take down times.

110.20.1 Use of Oxy-Propane Equipment

Use a Victor HD310C torch body or equivalent with the RailTech flat head or Victor TWN-5 rectangular torch tip.

- Pressure settings may vary for each set of equipment and should be adjusted accordingly.
- Torch mounted in-line gauges must be used to verify pressure settings on every weld and will be placed between torch handle and flashback arrestors.
- Extreme pressure variances of 15 psi or more between cylinder regulator and in-line gauge indicates a restriction or problem, and must be corrected.

These pressure settings are required at the torch and are shown for both standard 1 inch and wide gap welds and assume the torch has 50 feet of 3/8 inch ID Grade “T” hose, check valves and flashback arrestors. (Refer to Table 110A)

Verify the oxygen and propane pressures at the torch and adjust if necessary.

The following pressure settings are required at the torch

	Standard 1 inch Weld	Wide Gap Weld
Propane	15 psi	15 psi
Oxygen	60 psi	60 psi

Table 110A *Torch PSI Requirement*

1. Do not use hose lengths greater than 100 feet.
2. Operate torch 1-1/2 inches above the top of the rail for standard 1 inch weld.
3. Operate torch 2-3/8 inches above the top of the rail for wide gap weld.
4. Ignite the oxy-propane torch and place onto rail mounted torch stand.
5. Adjust for full oxygen by opening the oxygen valve completely.
6. Open the propane valve until a crackle sound occurs, then slowly close the propane valve until the crackle sound disappears.

**110.20.2 Start the Preheat Process
 (Refer to Table 110B)**

Preheat times are as follows:

	Standard 1 inch Welds	Wide Gap Welds
5-1/2 inch rail base – 119# or smaller	5 to 5-1/2 minutes	6 minutes
6 inch rail base – larger than 119#	6 to 6-1/2 minutes	6 minutes
Do not exceed 8 minutes when preheating.		

Table 110B *Preheat Times*

110.20.3 Monitor Preheating Process

Goggles and face shield must be worn when monitoring the preheat process and one of them must have a #5 shade lens.

- Ensure the torch is centered and straight.
- Observe the entire preheat.
- Ensure the rail ends do not melt.

- Ensure the rail ends and molds heat evenly to prevent improper fusion and internal cracks that result from uneven cooling.
- Ensure that the web glows a bright red/orange with no signs of sweating or melting.
 - If rail ends appear to be getting too hot, cool the flame by increasing the propane at the torch handle.
- Ensure the rail head and base glow a dull red and have no black areas.
- After removing the torch, observe the true color of the rail ends. If they do not hold their color, replace the torch and continue preheating.

If rail end melting occurs: Stop, tear down molds, re-cut rail ends and start over.

Preheating is completed when the required preheat time has been achieved and the rail base is 450° F on all four sides. (Measure 2-1/2 inches from the end of rails)

110.20.4 Adjust Oxygen Pressure

To obtain the correct torch temperature, adjust the oxygen pressure as follows:

- If the rail ends are close to melting before the preheat time is achieved, the torch is too hot (assuming the gap is correct, the molds are straight and the torch is properly aligned).
 - Decrease oxygen pressure 5 psi on the next thermite weld
- If the tops of the bases do not melt a 450° F tempilstick, 2-1/2 inches from the ends of the rail at the end of the preheat time, the torch is too cold (assuming the gap is correct, the molds are straight and the torch is properly aligned).
 - Increase oxygen pressure 5 psi on the next thermite weld.

110.20.5 RailTech Propane/Compressed Air Rail Preheater (Model 03800B)

To setup and operate the Propane/Compressed Air Rail Preheater, follow these instructions.

1. Connect the stainless steel line from the regulator on the hydraulic propane unit to the propane cylinder. Make sure that all fittings are tight.
2. Connect the hydraulic hoses from the power source to the hydraulic propane unit.
3. Align the inox-heating nozzle so that the flat piece of the nozzle is no higher than the top of the inside of the mold where the diverter plug fits. The nozzle tip must be aligned straight up and down perpendicular to the rail.
4. Prior to starting the preheating unit, tilt the nozzle up slightly to help start the flame.
5. Ensure that there is no pressure on the diaphragm by turning the pressure adjusting screw counter-clockwise on the propane regulator.
6. Operate hydraulic system at 10 gpm @ 2000 psi.
7. Open the hydraulic valve on the preheater to engage the blower unit.
8. Open the valve on the propane cylinder completely.
9. Use the air bypass valve and adjust the air to 3 psi to 5 psi.
10. Turn the pressure adjustment screw clock-wise on the propane regulator to supply 12 psi to 15 psi.
11. Open the propane valve on the inox heating nozzle and ignite flame by placing a friction lighter over a riser hole.
12. Allow the flames to warm up the molds for approximately 20 seconds to 30 seconds, then slowly straighten the nozzle in the molds so that the nozzle is straight up and down.
 - The flames should be in the rail area and in the risers. If the flames are in the risers only, again tilt the nozzle up, then slowly straighten.
 - It may be necessary to fine tune the pressure on the regulator.

13. After adjusting nozzle to achieve desired flame, begin the preheat time.
 (Refer to Table 110C)

Preheat times are as follows:

	Standard 1 inch Weld	Wide Gap Weld
5-1/2 inch rail base – 119# or smaller	5 to 6 minutes	6-1/2 minutes
6 inch rail base – larger than 119#	6 to 7 minutes	6-1/2 minutes
Do not exceed 8 minutes when preheating		

Table 110C *Preheat Times*

110.21 Crucible

While preheating the molds and rail ends:

- Inspect crucible for loose sand or cracks.
- Do not place crucible directly on any surface that may allow foreign material to stick to the bottom.
- Fill the crucible with the charge.
- Warm the diverter plug by setting it on the top edge of the mold.

When the preheat is complete, insert the diverter plug in the top of the mold where the torch was and push the plug down firmly. Do not pound the plug into place.

Note: The diverter plug allows the molten steel to flow into the mold properly, filling the mold evenly.

Place the crucible onto the molds and center over diverter plug, using the two large riser holes as a guide.

110.22 Igniting and Pouring

To ignite the charge:

- Light the igniter by touching it on the inside of the riser hole.
- Place the igniter in the charge within the crucible to a depth of 1 inch and step back.
 (Do not over insert)

Tap Time: The time it takes after igniting the charge for the molten steel to flow out of the crucible.

- Normal tap time is 23 seconds to 28 seconds.
 - If tap time is less than 15 seconds or more than 35 seconds, the weld could be defective and must be removed.

Hot metal or slag coming in contact with moisture can cause an explosion.

When the thermite weld is pouring, protect yourself and others from:

- Coming in contact with hot molten steel, as high as 5000° F.
- Bright light from the thermite reaction-protect your eyes.

When pouring the weld:

- Stand back at least 15 feet while the molten steel pours into the mold.

If a leak develops in the mold, do not attempt to stop the leak.

110.23 Minimum Take Down Times (Refer to Table 110D)

- Step 1. Remove crucible using a “CJ” fork and place at a safe dry location.
- Step 2. Remove slag pan and place at a safe dry location.
 - Do not tip slag from pan until it has cooled.
- Step 3. Remove mold clamp and jackets.
- Step 4. De-mold weld material.
- Step 5. Shear weld.
- Step 6. Bend down risers without breaking off to accommodate profile grinder.

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When the slag stops pouring into the slag basin, start the minimum take down times as follows:

	Standard 1 inch Weld	Wide Gap Weld
Remove Crucible	5 minutes	5 minutes
Remove Slag Basin	5 minutes	5 minutes
Remove Clamp and Jackets	5 minutes	10 minutes
De-mold	6 minutes	10-1/2 minutes
Shear	7 minutes	11-1/2 minutes
Remove Base Plate	20 minutes	20 minutes
Remove Alignment Tools and Empty Slag Basin	20 minutes	20 minutes
Remove Risers	25 minutes or 900° F	900° F
Remove Rail Puller	When weld is less than 700° F	When weld is less than 700° F

Table 110D *Minimum Take Down Times*

After removing the slag basin, place it in a safe dry location where it can continue to cool. Dispose of slag and mold in an approved waste container or bury in a dry hole. Dig the hole far enough away from the work area to avoid a slip, trip and fall hazard. Fill the hole and ensure the ground is level before leaving worksite.

110.24 Remove Excess Mold

Follow these safety requirements when tearing down weld:

1. Dust goggles or face shield with safety glasses must be worn when removing the mold and cleaning the weld.
2. Protect yourself from hot metal fragments and sand.
3. Do not discard the hot slag where someone could step on it or it could start a grass fire.
4. Do not dump hot slag on wet soil, snow or throw into water.

110.25 Rough Grinding

Rough grinding of the rail head portion of the thermite weld can be performed after shearing. Rough grinding of the running surface of the rail shall be performed with a surface grinder. Rough grinding is completed when the excess weld material is reduced to approximately 30 thousandths (0.030) of an inch.

When the surface of the weld is above 700° F, it is permitted to “blue” the weld.

When the surface of the weld is equal to or less than 700° F, “bluing” of the rail is not permitted.

Remove alignment plates and base plate in accordance with take down times.

Apply rail fasteners and ensure ties are tamped solid under the weld.

Use a hydraulic tamper if available.

Train traffic or heavy work equipment (spikers, tampers, etc.) must not be allowed over a thermite weld until the weld has cooled below 700° F.

110.26 Finish Grinding

Using an 8” x 1” straight stone grinder:

- Taper and remove sharp edges from the teardrop under rail head (Refer to Figure 110J).
- Grind the risers flush with weld collar.
- Do not grind into the collar.
- Do not grind into the parent metal.
- If inclusions are visible and cannot be removed with grinding, cut weld out.

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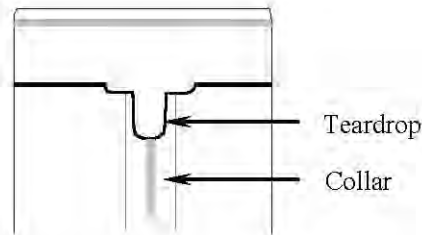


Figure 110J *Underside of Rail Head*

The best results will be obtained when the final grind is performed after the weld has cooled to between 600° F and 900° F. When doing the final grinding, use a straightedge and check as you go. Only grind where the straightedge indicates the need. “Bluing” of the rail or weld surface shall not be permitted at any location on or near the thermite weld during finish grinding. A gentle or light effort shall be used.

The running surface of the weld shall be ground to exactly match the contour of existing rails. A radius is to be applied to the gauge and field sides so no sharp edges remain.

After a thermite weld has been installed, use a straightedge to measure for crown, vertical offset, horizontal offset, kink and over grind. (Refer to Figures 110K – 110O)

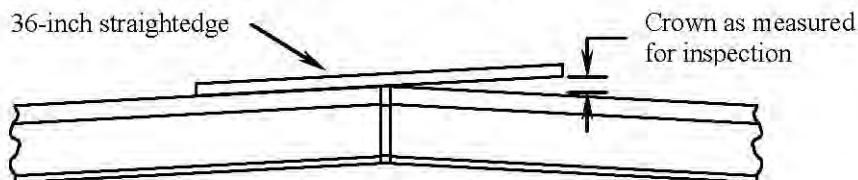


Figure 110K *Crown Inspection – Side Rail View*

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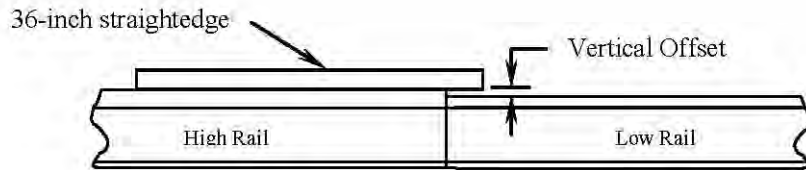


Figure 110L *Vertical Offset – Side Rail View*

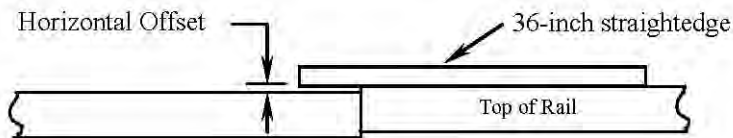


Figure 110M *Horizontal Offset – Top of Rail View*

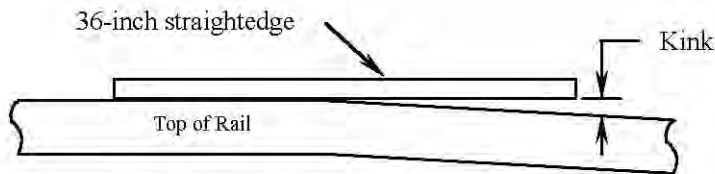


Figure 110N *Kink – Top of Rail View*

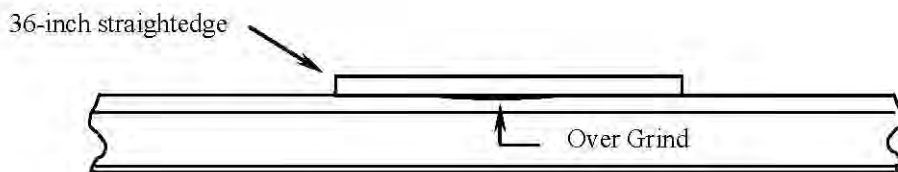


Figure 110O *Over Grind – Side Rail View*

110.27 Identify Weld

The following information must be recorded on the outside web of rail using a white metal marker in 4-inch high letters/numbers:

1. Gang number
2. Date
3. Rail added or removed
4. Rail Temperature

Record thermite charge identification number in GMS production reporting.

110.28 Thermite Weld Quality Audit

Welding managers will use the Thermite Weld Quality Audit form to assess the workmanship of the welding gang.

(Refer to Appendix F)

110.29 Clean Up

The clean up can be performed before the final grinding. Clean up includes:

- Reapplying the rail fasteners.
- Reapplying the anchors.
- Filling cribs.
- Filling the waste hole and ensure the ground is level before leaving worksite.
- Disposing of cardboard and any remaining weld waste.

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111.0 Thermite Welds – Orgo-Thermit

111.1 Overview

Following proper welding and safety procedures is essential to the installation of a quality thermite weld and the continued safe operation of the Union Pacific Railroad.

These general instructions apply to installing both 2 piece and 3 piece Orgo-Thermit welds.

Only Orgo-Thermit materials (molds, portions, luting sand and crucibles) are to be used when installing Orgo-Thermit welds.

Individual thermite welds are the responsibility of the welder who performs the preheating of the rail ends.

111.2 Safety

The presence of moisture in the thermite portion or in the crucible can lead to the rapid buildup and uncontrolled release of steam when the thermite reaction occurs.

- 1 part water per unit volume = 1,000 parts of steam per unit volume

This may cause ejection of the molten metal from the crucible. Therefore, the thermite portion, crucible, and molds must be dry and moisture must not be allowed to enter the system before or during the welding process.

111.3 General

The instructions below must be followed when installing a thermite weld.

All thermite welds must have reference marks indicating the original amount of rail between marks.

Never use a wet crucible, molds or thermite oxide charge to make a weld.

- If moisture enters the crucible, molds or charge, or is suspected of being present in one of them, discard the damaged item.
- Before discarding charges or igniters, contact the Manager Environmental Field Operations for that territory, or telephone 402-544-3649 for instructions on proper disposal or to determine whether there are state specific waste disposal requirements.

Recommended shelf life for weld kits is three years. All weld kits must be stored in a dry location, stacked no more than three kits high.

When using mold kits:

- Inspect crucibles for loose sand and cracks.
- Molds that are broken with pieces missing should not be used.
- Use standard molds for rail end mismatch up to 1/8 inch.
- Use new to worn molds if rail ends are mismatched between 1/8 inch and 1/4 inch.

Use a transition or taper rail on 6 inch base rail when rail end mismatch exceeds 1/4 inch.

Compromise welds (different rail base widths) must not be installed in Class 4 and above main tracks:

- On subdivisions where regularly scheduled passenger trains operate.
- On subdivisions in excess of 40 mgt.

It is not recommended to thermite weld a non-curve worn rail to a section of curve worn rail, especially on the high side of a curve.

The maximum difference in curve worn rail head width should not exceed (1/8) inch on the gauge side of the rail head. This measurement for curve wear should be taken at the top of the rail head.

Proper location of a thermite weld is in the center of the crib.

Apply reinforcing weld-mate straps to thermite welds only under the following circumstances in any FRA class of track:

- Compromise thermite welds that are between rails of different sections (rail base widths).
- Thermite welds that involve alloy rail (one or both rails).

111.3.1 UT Tested or Certified Rail

All replacement rail must be UT tested or certified in compliance with Engineering Track Maintenance Field Handbook.

111.4 Weather Restrictions

Observe these welding restrictions associated with severe temperatures and weather:

1. Do not make thermite welds on alloy rail when the rail temperature is below 32° F. When air temperature is below 50° F, place an insulating cover over the alloy weld for 15 minutes immediately after shearing to prevent the weld from cooling too rapidly.
2. Do not make any other welds when the rail temperature falls below 5° F.
3. Do not make thermite welds during rain, snow, or heavy mist in the air.

Should rain or snow begin while in the process of completing a weld, take the following measures to prevent moisture from entering the mold, crucible or welding charge:

- Use an umbrella to help prevent moisture from entering molds and crucible.

- Ensure the rain, snow, or mist does not cool the rail placing the weld in tension as the rail contracts.
 - Use a rail puller, if conditions require, to prevent rail movement.
 - Cover the weld area until the weld cools to 700° F.
4. Before preheating, use a rail thermometer or pyrometer to check the rail temperature. If the rail temperature is below 35° F, warm the rails as follows:
- Heat 30 inches to 36 inches from the end of each rail.
 - Raise the rail temperature to between 90° F and 110° F.
(This is to add supplemental heat and remove condensation)

111.5 Identify Rail

111.5.1 Identify Rail Type (Alloy or Standard)

Rail type must be determined because different rail chemistries determine specific maintenance and welding requirements.

111.5.2 Determine Weld Location

Do not place a thermite weld closer than:

- 30 inches from an existing plant or thermite weld.
- 15 feet from a rail joint.

111.5.3 Compromise Welds

Identify 'handed' joints and welds as follows:

Stand in between rails with back towards larger rail and face the smaller rail. The joint on the left side would be designated as the left-hand (LH) joint, and the joint on the right side would be designated as the right-hand (RH) joint. (Refer to Figure 111A)

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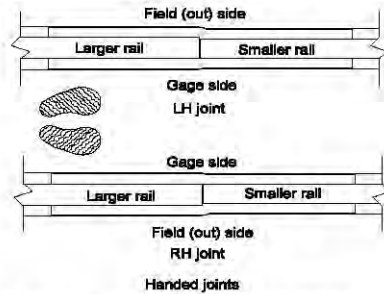


Figure 111A *Compromise Weld Identification*

Compromise weld kits are not interchangeable due to different base offsets on gage and field sides.

- Gauge side base offset is 1/8 inch.
- Field side base offset is 3/8 inch.

Do not make a compromise weld between rails of different rail chemistry and different width bases; e.g., between 136 lb. alloy rail and 119 lb. standard carbon rail (Refer to Figure 111B)

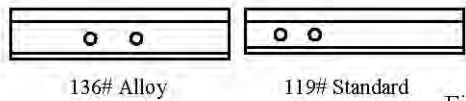


Figure 111B *Rail Chemistry*

If rails with different base widths and different chemistries must be joined:

1. Weld a standard carbon rail of the same weight and section as the alloy rail, to the alloy rail.
 - Length of rail cut-in must not be less than 15 feet.
2. Make the compromise weld between the rails of the same chemistry. (Refer to Figure 111C)

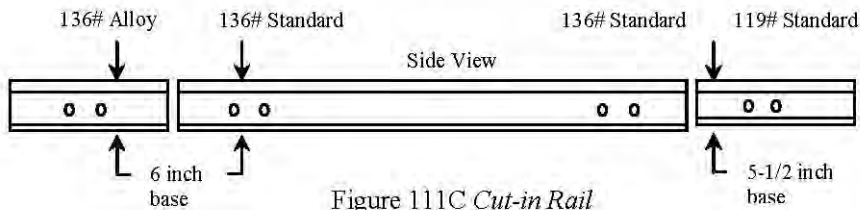


Figure 111C *Cut-in Rail*

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Compromise welds on opposite rails should be made within the same crib.

111.6 Transition Rail

Transition rails and taper rails must be used when required to reduce or eliminate the use of compromise thermite welds. (Refer to Figures 111D and 111E)

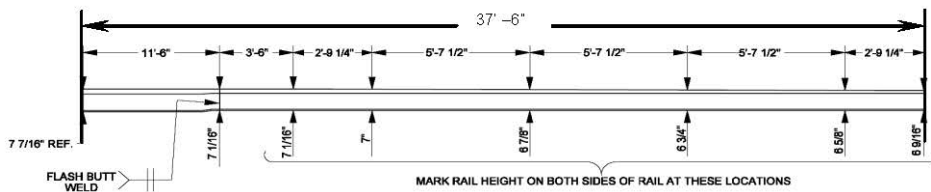


Figure 111D 141# to 133# Transition Rail

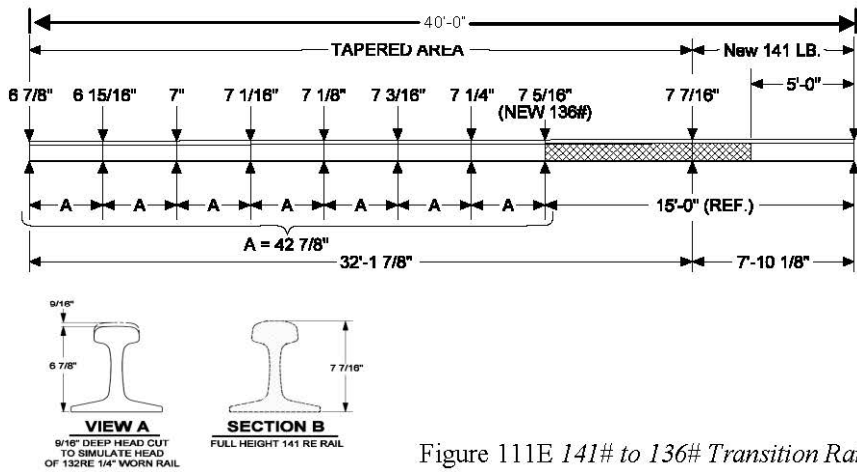


Figure 111E 141# to 136# Transition Rail

111.7 Speed Restrictions – Alloy Rail

For all thermite welds involving alloy rail:

1. Restrict speed to a maximum of 30 mph for a minimum of 24 hours after installation.
2. Do not remove speed restriction until all thermite welds in Class 3 and above tracks are inspected and protected by weld-mate straps.

111.8 Eliminate Bolt Holes

Eliminate bolt holes on thermite welds as follows:

1. On thermite welds that require weld-mate straps, eliminate:
 - a. Bolt holes with centers closer than 8 inches from the rail ends being welded.
 - b. Holes not needed to install the weld-mate strap.
2. On thermite welds that do not require the use of weld-mate straps, eliminate all holes with centers closer than 6 inches from the rail ends being welded.

This includes bond wire holes drilled by Signal Maintainers.

111.9 Reference Marks

Apply reference marks before cutting rail or removing joint bars as outlined in rule 100.7.

111.10 Remove Defects

Refer to Engineering Track Maintenance Field Handbook for rail defect remediation matrix. (Section 4.0 Rail and Joints)

Replacement rail is required when more than one defect of any kind is detected within the same 39-foot length of rail in the same test. (Except for bolt hole crack defects)

When rail detector cars find a defect in a weld, do the following:

1. In a plant weld, cut out the defect by removing a 1-1/2 inch section of rail, 3/4 inch each direction from center of weld. (Refer to Figure 111F)
2. In a thermite weld, cut out the defect by removing a 2-3/4 inch section of rail, at least 1-3/8 inches either side of the centerline for use with a wide gap weld. (Refer to Figure 111F)

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Remove 2-3/4" (Thermite Weld)

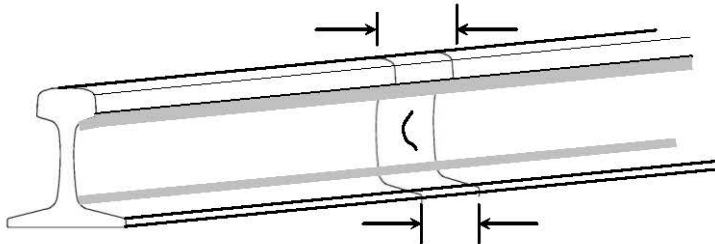


Figure 111F *Defect in Weld*

Remove 1-1/2" (Plant or In-Track Weld)

When defects previously marked by detector car personnel are repaired, the entire defect must be removed and each rail visually inspected before installing a thermite weld.

- If rail is not cut and marks are not visible, rail must be re-tested or replaced.
- If rail is not cut and marks are visible, cut on outside of marks. (Refer to Figure 111G)

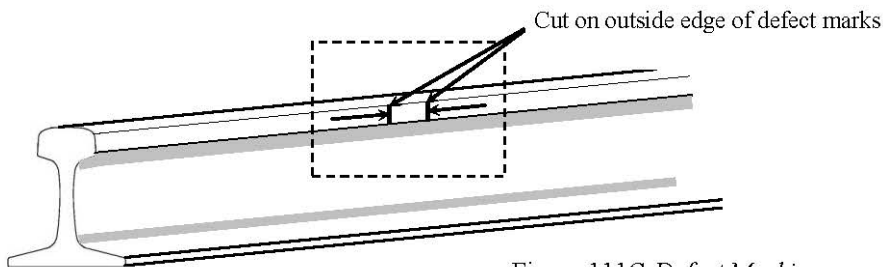


Figure 111G *Defect Marking*

- If rail was previously cut and no marks are visible, remove 1-3/8 inch from each end. (Refer to Figure 111H)

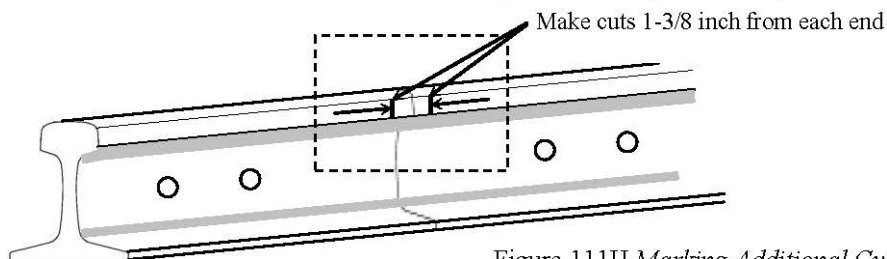


Figure 111H *Marking Additional Cuts*

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111.11 Rail Under Compression

Torch cut the rail to relieve compression as follows:

1. If the thermite weld will be made within 1 hour of the initial torch cut, use a rail saw to trim the torch cut rail ends square.
2. If the thermite weld will not be made within 1 hour of the initial torch cut, use a rail saw to re-cut the rail ends, removing at least 2 inches from each end of rail.

111.12 Rail Puller

Refer to Chapter 104.1.3 Hydraulic Rail Pullers for operating instructions.

When using a Rail Puller while installing thermite welds, follow these procedures:

1. Surface the joint and tamp at least two ties each side of the joint before placing rail puller on the rail.
2. Remove sufficient amount of rail anchors to allow longitudinal movement of rail.
3. Alignment plates must be used to achieve crown and horizontal alignment prior to pulling rail.
4. Remove by grinding, any raised portion on the rail where puller jaws will contact rail.
5. Remove dirt or grease from this area using a wire brush or torch if necessary.
6. Clean and inspect the puller jaws for conditions that could reduce gripping.
7. Operate the rail puller on the rail to obtain the correct gap.
8. Never remove additional rail anchors while rail puller is under pressure.
9. If the desired pull cannot be achieved, release the expander, remove additional anchors, and repeat the process.

10. Release rail puller after weld has cooled to 700° F or less. (Check the weld temperature on the top center of the weld using a 700° F temp-stik or a pyrometer. If the temp-stik does not melt or the pyrometer registers 700° F or less, remove the rail expander gradually.)

Note: Beginning from the end farthest from the weld, rail anchors or clips may be applied 20 minutes after completion of pour.

111.13 Clean Rail Ends

Clean rail ends removing dirt, rust or other material to ensure a sound weld.

Use an oxy-fuel torch to remove:

- Mill scale 3/4 inch from the each end of rail around the entire periphery.
- Grease 4 inches from each end of rail.

Use a wire brush to remove:

- Dirt, rust or other material 4 inches from the end of each rail. (Visually inspect rail ends for defects.)

111.14 Rail End Gap – Standard (1-inch) and Wide Gap Weld (WGW)

The required gap must be achieved before thermite welding. Improper gap width results in improper preheating or lack of sufficient weld material.

Rails must be cut to within 1/16-inch square from top to bottom and from gauge side to field side.

When thermite welding, create the proper gap as follows:

1. Create a 1 inch gap for a standard thermite weld.
2. Create a 2-3/4 inch gap for a wide gap weld.

111.15 Alignment System

Rail alignment plates are the required alignment system for use when installing thermite welds.

Exception: Alignment wedges may be used in switches only when rail alignment plates fail to work properly.

111.16 Create Crown – Standard and Wide Gap Weld

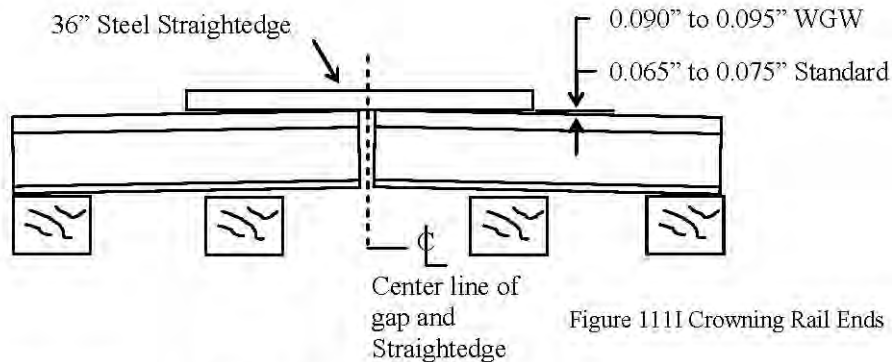
Use a 36 inch straightedge to ensure proper crown is established. Use of a taper gauge is required to setup the adjustable type straightedge and must always be used with a non-adjustable straightedge while crowning rail ends.

To create the proper crown using rail alignment plates, do the following:

1. On wood ties, move tie plates to accommodate rail alignment plates.
 - Adz ties for proper fit of alignment plates if necessary.
2. On concrete ties remove pads, if necessary, to accommodate rail alignment plates.
3. Rail fasteners may need to be removed 2 or 3 ties each side of joint.
4. Insert rail alignment plates and adjust to achieve required crown.

With a proper crown, the ends of each rail just contact the underside of the straightedge.

The proper crown for a standard weld is 0.065 inch to 0.075 inch and 0.090 inch to 0.095 inch for a wide gap weld. (Refer to Figure 111I)



111.17 Rail Alignment (Straight and Compromise)

Rail twist is the mis-alignment of the railhead and base from the center axis and is not allowed. When making a weld, use a 36-inch straightedge to check the alignment of rails. Ensure that the gauge side of the rails is perfectly aligned at the head and base of the rail.

On rail joints where one rail is excessively curve worn, align rail on the field side of the head and base. When finish grinding the thermite weld; grind the rail on the gauge side of railhead to achieve a gradual transition from full rail to curve worn rail.

On compromise joints where rails are of different base widths:

1. Use alignment plates to achieve proper crown.
2. Align rails so that the gauge side of the head is perfectly aligned.
3. Align rails so that the base on the gauge side has a 1/8 inch offset and the base on the field side has a 3/8 inch offset.

Compromise weld molds (handed weld molds) are designed with base offsets and are designated left-hand or right-hand. Compromise weld molds are not interchangeable and cannot be modified to fit other rail configurations.

111.18 Setting Molds / Base Plate and Packing

111.18.1 Base Plate and Molds

Step 1: Check the mold and/or base brick fit against the rail.
Filing or rubbing may be needed to ensure proper fit.

The following steps are for 3 piece welds only.

Step A: Clean the base plate to allow the base brick to fit freely.

Step B: Maintain the base plate in good condition so that it aligns properly at a right angle with the rail.

Step C: Make sure that the recess in the base brick is in the exact center of the rail gap and is evenly spaced on the sides of the base.

Step D: Ensure clamping screws are snug but not over-tightened and are positioned perpendicular to the rail to allow for ease of packing.

Step E: After installing the base plate, recheck the alignment and crown.

Step 2: Place the setting gauge in the welding gap. (Refer to Figure 111J)

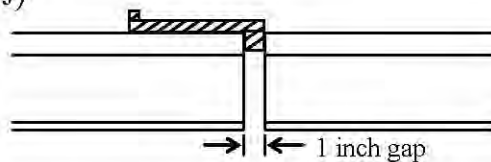


Figure 111J *Setting Gauge Placement*

- Step 3: Attach universal clamp to rail flush with end of setting gauge and ensure clamp is in an absolute vertical position.
- Step 4: Half of the mold is applied, centered on the gap and the swivel arm screw slightly tightened while lifting upwards on the mold shoe.
- Step 5: Apply the other half in the same fashion while aligning at the base and the top.
- Step 6: Swivel arm screws should not be over-tightened and should be left in the horizontal position to allow for slag pan placement.
- Step 7: Tap the bottom of both mold shoes lightly to ensure tight fit-up.
- Step 8: Check alignment of the mold halves on rail gap and ensure molds are flush on sides and bottom.
- Step 9: Check diverting plug for fit if molds have been excessively filed.
- Step 10: When welding in a curve, file the top of the diverting plug to ensure it sets level when installed, to provide uniform distribution of molten steel when pouring.
- Step 11: If any gap is large enough for luting sand to enter the mold cavity, fill the gap with paper to prevent the luting sand from entering the cavity.
- Step 12: Cover the top of the mold to prevent any foreign material from entering the mold cavity during packing.

111.18.2 Luting

Use only Orgo-Thermit luting sand with Orgo-Thermit weld kits. Pack the mold solid with luting sand as follows:

1. Tightly pack all seams starting from the base to the top as follows:
 - Base lip (2 Piece Only)

- Bottom of rail base
 - Top of rail base
 - Web
 - Rail head
 - Side of mold above rail head
 - Pouring lip
 - Do not pound against the luting sand, as this will cause the rail to mis-align.
 - Mold shoes should be firmly packed such that the luting flare is full.
2. If luting sand does enter the mold cavity, disassemble the mold, remove the sand mixture and repack the mold.
 3. Position slag pans onto mold shoe lugs prior to beginning preheat.
 - Dry slag pans with preheating torch to ensure all moisture is removed.

Plan the packing stage so that the preheating cycle can begin immediately after packing is complete. Do not allow finished molds to set more than 10 minutes before preheating.

111.19 Preheating Procedures

Before preheating, ensure you are familiar with and have been properly trained in the operation of that equipment.

Use of a stopwatch is required when thermite welding for preheat and take down times.

Prior to preheating, do the following:

- Torch must be level and torch height checked prior to preheating.
- Place burner saddle assembly on the universal clamp.
- Turn the saddle adjustment knobs to center the burner head in the gap.
- Align the burner head so it is vertically straight and not pointing toward the gauge or field side of the railhead.

- After pre-aligning the burner, remove the burner saddle assembly from the universal clamp.

111.19.1 Use of Oxy-Propane Equipment

Use a Hesa SKV-5 torch tip and body, Victor HD310C torch body or equivalent with the RailTech flat head or Victor TWN-5 rectangular torch tip. (Refer to Table 111A)

- Pressure settings may vary for each set of equipment and should be adjusted accordingly.
- Torch mounted in-line gauges must be used to verify pressure settings on every weld and will be placed between the torch handle and flashback arrestors.
- Extreme pressure variances of 15 psi or more between cylinder regulator and in-line gauge indicates a restriction or problem, and must be corrected.

These pressure settings are required at the torch and are shown for both standard 1 inch and wide gap welds and assume the torch has 50 feet of 3/8 inch ID Grade “T” hose, check valves and flashback arrestors.

The following pressure settings are required at the torch.

	Standard 1 inch Weld	Wide Gap Weld
Propane	15 psi	15 psi
Oxygen	60 psi	60 psi

Table 111A *Torch PSI Requirement*

The following pressures at the regulators are guidelines for length of hose.

Preheat Process	Hose Lengths	Oxygen Pressure	Propane Pressure
5 minute SKV	50 feet	67 psi	17 psi
5 minute SKV	100 feet	72 psi	22 psi

Table 111B *Hose Length /PSI Requirement*

Verify the oxygen and propane pressures at the torch and adjust if necessary. (Refer to Table 111B)

1. Do not use hose lengths greater than 100 feet.
2. Operate torch 1-3/8 inches above the top of the rail for standard 1 inch weld.
3. Operate torch 2-3/8 inches above the top of the rail for wide gap weld.
4. Ignite the oxy-propane torch and place onto rail mounted torch stand.
5. Adjust for full oxygen by opening the oxygen valve completely.
6. Open the propane valve until a crackle sound occurs, then slowly close the propane valve until the crackle sound disappears.

**111.19.2 Start the Preheat Process
 (Refer to Table 111C)**

Preheat times are as follows:

	Standard 1 inch Weld	WideGap Weld
5-1/2 inch rail base – 119# or smaller	5 to 5-1/2 minutes	5-1/2 minutes
6 inch rail base – larger than 119#	6 to 6-1/2 minutes	6-1/2 minutes
Do not exceed 8 minutes when preheating.		

Table 111C *Preheat Times*

111.19.3 Monitor Preheating Process

Goggles and face shield must be worn when monitoring the preheat process and one of them must have a #5 shade lens.

- Ensure the torch is centered and straight.
- Observe the entire preheat.
- Ensure the rail ends do not melt.

- Ensure the rail ends and molds heat evenly to prevent improper fusion and internal cracks that result from uneven cooling.
- Ensure that the web glows a bright red/orange with no signs of sweating or melting.
 - If rail ends appear to be getting too hot, cool the flame by increasing the propane at the torch handle.
- Ensure the rail head and base glow a dull red and have no black areas.
- After removing the torch, observe the true color of the rail ends. If they do not hold their color, replace the torch and continue preheating.
- If rail end melting occurs: Stop, tear down molds, re-cut rail ends and repeat the process.

Preheating is completed when the required preheat time has been achieved and the rail base is 450° F on all four sides. (Measure 2-1/2 inches from the end of rails)

111.19.4 Adjust Oxygen Pressure

To obtain the correct torch temperature, adjust the oxygen pressure as follows:

- If the rail ends are close to melting before the preheat time is achieved, the torch is too hot (assuming the gap is correct, the molds are straight and the torch is properly aligned).
 - Decrease oxygen pressure 5 psi on the next thermite weld.
- If the tops of the bases do not melt a 450° F temp-stik, 2-1/2 inches from the ends of the rail at the end of the preheat time, the torch is too cold (assuming the gap is correct, the molds are straight and the torch is properly aligned).
 - Increase oxygen pressure 5 psi on the next thermite weld.

111.19.5 RailTech Propane/Compressed Air Rail Preheater (Model 03800B)

To setup and operate the Propane/compressed air rail preheater, follow these instructions.

1. Connect the stainless steel line from the regulator on the hydraulic propane unit to the propane cylinder. Make sure that all fittings are tight.
2. Connect the hydraulic hoses from the power source to the hydraulic propane unit.
3. Align the inox-heating nozzle so that the flat piece of the nozzle is no higher than the top of the inside of the mold where the diverter plug fits. The nozzle needs to be lined up so that the tip of the nozzle is straight up and down perpendicular to the rail.
4. Prior to starting the preheating unit, tilt the nozzle up slightly to help start the flame.
5. Ensure that there is no pressure on the diaphragm by turning the pressure adjusting screw counter-clockwise on the propane regulator.
6. Operate hydraulic system at 10 gpm @ 2000 psi.
7. Open the hydraulic valve on the preheater to engage the blower unit.
8. Open the valve on the propane cylinder completely.
9. Use the air bypass valve and adjust the air 3 psi to 5 psi.
10. Turn the pressure adjustment screw clock-wise on the propane regulator to supply 12 psi to 15 psi.
11. Open the propane valve on the inox-heating nozzle and ignite flame by placing a friction lighter over a riser hole.
12. Let the flames warm up the molds for approximately 20 seconds to 30 seconds, then slowly straighten the nozzle in the molds so that the nozzle is straight up and down.
 - The flames should be in the rail area and in the risers. If the flames are in the risers only, again tilt the nozzle up, then slowly straighten.
 - It may be necessary to fine tune the pressure on the regulator.

13. After adjusting nozzle to achieve desired flame, begin the preheat time. (Refer to Table 111D)

Preheat times are as follows:

	Standard 1 inch Weld	Wide Gap Weld
5-1/2 inch rail base – 119# or smaller	5 to 6 minutes	6-1/2 minutes
6 inch rail base – larger than 119#	6 to 7 minutes	6-1/2 minutes
Do not exceed 8 minutes when preheating.		

Table 111D *Preheat Times*

111.20 Crucible

While preheating the molds and rail ends:

- Inspect crucible for loose sand or cracks.
- Place crucible on a clean, dry surface.
- Fill the crucible with the charge.
- Warm the diverter plug by setting it on the top edge of the mold.
- Use tongs to hold the diverter plug above the molds in the flame for 30 seconds during the final preheat.

When the preheat is complete, insert the diverter plug in the top of the mold where the torch was and push the plug down firmly. Do not pound the plug into place.

Note: The diverter plug allows the molten steel to flow into the mold properly, filling the mold evenly.

Place the crucible onto the mold shoes and ensure the crucible handle is aligned with the rail so the handle will fall toward a slag pan.

Note: This is because of the secondary safety tap placement in the bottom of the crucible.

111.21 Igniting and Pouring

To ignite the charge:

- Light the igniter by touching it on the inside of the riser hole.
- Place the igniter in the charge within the crucible to a depth of 1 inch and step back. (Do not over insert)
- Welding portion must be ignited within 15 seconds after burner has been removed.

Tap Time: The time it takes after igniting the charge for the molten steel to flow out of the crucible.

- Normal tap time is 23 seconds to 28 seconds.
 - If tap time is less than 15 seconds or more than 35 seconds, the weld could be defective and must be removed.

Hot metal or slag coming in contact with moisture can cause an explosion. When the thermite weld is pouring, protect yourself and others near the mold from:

- Hot molten steel as high as 5000° F.
- Bright light from the thermite reaction.

When pouring the weld:

- Stand back at least 15 feet while the molten steel pours into the mold.

If a leak develops in the mold, do not attempt to stop the leak.

111.22 Minimum Take Down Times (Refer to Table 111E)

- Step 1. Remove crucible and place at a safe dry location.
- Step 2. Remove slag pans and place at a safe dry location.
 - Do not tip slag from pans until they have cooled.
- Step 3. Remove universal clamp and shoes
- Step 4. De-mold weld material.
- Step 5. Shear weld.
- Step 6. Bend down risers without breaking off to accommodate profile grinder.

When the slag stops pouring into the slag pans, start the minimum take down times as follows:

	Standard 1 inch Weld	Wide Gap Weld
Remove Crucible	5 minutes	9 minutes
Remove Slag Pans	5 minutes	9 minutes
Remove Universal Clamp and Shoes	5 minutes	9 minutes
De-mold	6 minutes	10-1/2 minutes
Shear	7 minutes	11-1/2 minutes
Remove Base Plate * for 3 piece only	20 minutes	30 minutes
Remove Alignment Tools & <u>Empty Slag Pans</u>	20 minutes	30 minutes
Remove Risers	25 minutes or 900° F	900° F
Remove Rail Puller	When weld is less than 700° F	When weld is less than 700° F

Table 111E *Minimum Take Down Times*

After removing the slag pans, place them in a safe dry location where they can continue to cool.

Dispose of slag and mold in an approved waste container or bury in a dry hole. Dig the hole far enough away from the work area to

avoid a slip, trip and fall hazard. Fill the hole and ensure the ground is level before leaving worksite.

111.23 Remove Excess Mold

Follow these safety requirements when tearing down weld:

1. Dust goggles or face shield with safety glasses must be worn when removing the mold and cleaning the weld.
2. Protect yourself from hot metal fragments and sand.
3. Do not discard the hot slag where someone could step on it or it could start a grass fire.
4. Do not dump hot slag on wet soil, snow or throw into water.

111.24 Rough Grinding

Rough grinding of the rail head portion of the thermite weld can be performed after shearing. Rough grinding of the running surface of the rail shall be performed with a surface grinder. Rough grinding is completed when the excess weld material is reduced to approximately 30 thousandths (0.030) of an inch.

When the surface of the weld is above 700° F, it is permitted to “blue” the weld.

When the surface of the weld is equal to or less than 700° F, “bluing” of the rail is not permitted.

Remove alignment plates and base plate in accordance with take down times.

Apply rail fasteners and ensure ties are tamped solid under the weld.

Use a hydraulic tamper if available.

Train traffic or heavy work equipment (spikers, tampers, etc.) must not be allowed over a thermite weld until the weld has cooled below 700° F.

111.25 Finish Grinding

Using an 8" x 1" straight stone grinder:

- Taper and remove sharp edges from the underside of the rail head at the weld.
(Refer to Figure 111K)
- Grind the risers flush with weld collar.
- Do not grind into the collar.
- Do not grind into the parent metal.
- If inclusions are visible and cannot be removed with grinding, cut weld out.

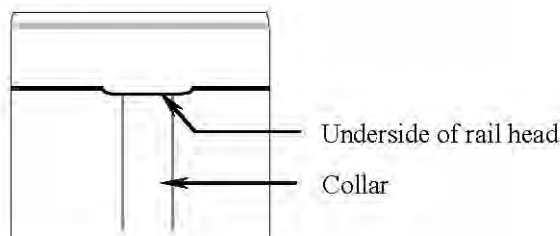


Figure 111K *Underside of Rail Head*

The best results will be obtained when the final grind is performed after the weld has cooled to between 600° F. and 900° F. Plan your work so the final grind is the last procedure before leaving the work site. When doing the final grinding, use a straightedge and check as you go. Only grind where the straightedge indicates the need. "Bluing" of the rail or weld surface shall not be permitted at any location on or near the thermite weld during finish grinding. A gentle or light effort shall be used.

The running surface of the weld shall be ground to exactly match the contour of existing rails. A radius is to be applied to the gauge and field edges so no sharp edges remain.

After a thermite weld has been installed, use a straightedge to measure for Crown, Vertical Offset, Horizontal Offset, Kink and over grind. (Refer to Figures 111L – 111P)

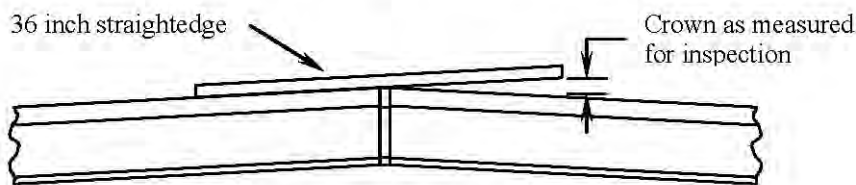


Figure 111L *Crown Inspection – Side Rail View*

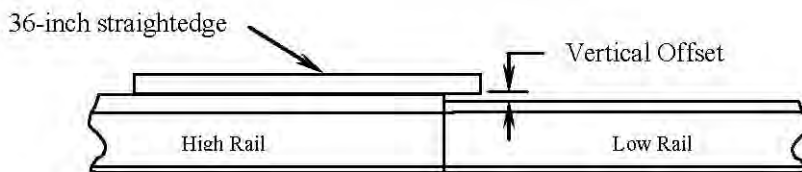


Figure 111M *Vertical Offset – Side Rail View*

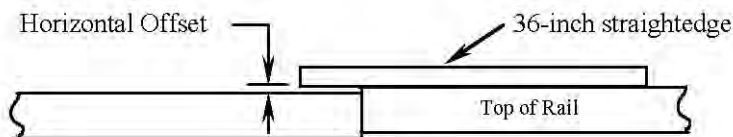


Figure 111N *Horizontal Offset – Top of Rail View*

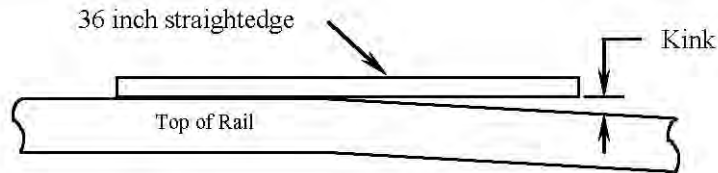


Figure 111O *Kink – Top of Rail View*

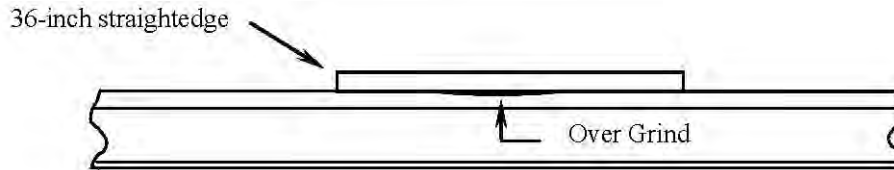


Figure 111P *Over Grind – Side Rail View*

111.26 Identify Weld

The following information must be recorded on the outside web of rail using a white metal marker in 4-inch high letters/numbers.

1. Gang number
2. Date
3. Rail added or removed
4. Rail Temperature

Record thermite charge identification number in GMS production reporting.

111.27 Thermite Weld Quality Audit

Welding managers will use the Thermite Weld Quality Audit form to assess the workmanship of the welding gang.

(Refer to Appendix F)

111.28 Clean Up

The clean up can be performed before the final grinding. Clean up includes:

- Reapplying the rail fasteners.
- Reapplying the anchors.
- Filling cribs.
- Filling the waste hole and ensure the ground is level before leaving worksite.
- Disposing of cardboard and any remaining weld waste.

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Welding Rules

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112.0 Electric Flash Butt Welding

112.1 Scope

The following instructions must be adhered to when making all Electric Flash Butt (EFB) welds utilizing In-Track Welder (ITW) equipment, including:

- Plasser in-track welders.
- Union Pacific owned Chemetron in-track welders.
- All contract EFB in-track welders.

112.2 Types of Welds

EFB welds will be either of the following types:

- Head Weld – Weld is made with one or both rails not secured longitudinally.
- Closure Weld – Weld is made on longitudinally secured rails using a rail puller (Super Jack) to pull rails together during weld flashing and upset.

112.3 Qualified Operators

Only employees qualified by an In-Track Welding Supervisor, Manager of Track Welding or Manager of Work Equipment are allowed to operate any controls on Union Pacific owned in-track welders.

112.4 Transporting or Moving Union Pacific ITW'S

When moving Union Pacific rail bound ITW'S from one job location to another the following conditions apply:

- ITW supervisor must accompany ITW during move.
- Welding head must be in cradle.
- All auxiliary equipment on ITW must be secured.
- When moving with locomotive assistance, refer to System Special Instructions.

Note: Drive line must be removed.

On any ITW move over 1 mile, the welding head must be positioned in the cradle.

112.5 Reference Marks

1. Placing reference marks when using an In-Track Welder.

- When making maintenance welds with an in-track welder, use reference marks to span the entire work area when possible.
- When the welding operation is completed, the distance between the marks must be equal to, or less than the original marked distance.

2. Work area too large to measure between reference marks.

- If the work area is too large to measure between reference marks the rail must be adjusted to obtain the designated rail laying neutral temperature. This temperature is referenced in standard drawing 0045.
- Before cutting rail or removing joint bars, apply reference “pullback” marks to rail. (Refer to Figure 112A)

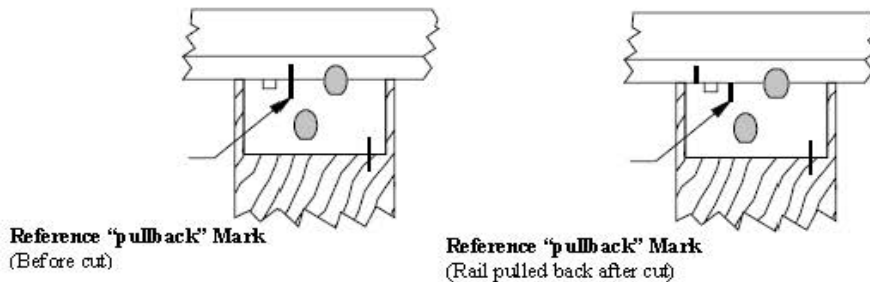


Figure 112A Reference “pullback” Marks

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Welding Rules

If the rail has pulled back when the cuts are made at either end of the work area, the rail must be returned to the pullback marks.

If the work area rail temperature is below the designated rail laying temperature, calculate the required amount of rail to be removed. (Refer to Table 112A)

Continuous Welded Rail Adjustment Table								
Temperature Differential (°F)	Amount of Adjustment Required (inches) for a Length of CWR							
	360 feet	660 feet	720 feet	1,080 feet	1,320 feet	1,440 feet	1,520 feet	1,600 feet
5	1/8	1/4	1/4	7/16	1/2	9/16	5/8	11/16
10	1/4	1/2	9/16	13/16	1	1-1/8	1-1/4	1-5/16
15	7/16	3/4	13/16	1-1/4	1-9/16	1-11/16	1-13/16	1-15/16
20	9/16	1	1-1/8	1-11/16	2-1/16	2-1/4	2-7/16	2-9/16
25	11/16	1-5/16	1-3/8	2-1/8	2-9/16	2-13/16	3-1/16	3-1/4
30	13/16	1-9/16	1-11/16	2-1/2	3-1/16	3-3/8	3-11/16	3-7/8
35	1	1-13/16	1-15/16	2-15/16	3-5/8	3-15/16	4-1/4	4-1/2
40	1-1/8	2-1/16	2-1/4	3-3/8	4-1/8	4-1/2	4-7/8	5-1/8
45	1-1/4	2-5/16	2-1/2	3-13/16	4-5/8	5-1/16	5-1/2	5-13/16
50	1-3/8	2-9/16	2-13/16	4-3/16	5-1/8	5-5/8	6-1/8	6-7/16
55	1-9/16	2-13/16	3-1/8	4-5/8	5-11/16	6-3/16	6-3/4	7-1/16
60	1-11/16	3-1/16	3-3/8	5-1/16	6-3/16	6-3/4	7-5/16	7-3/4
65	1-13/16	3-5/16	3-5/8	5-1/2	6-11/16	7-5/16	7-15/16	8-3/8
70	1-15/16	3-3/8	3-15/16	5-7/8	7-3/16	7-7/8	8-9/16	9

Table 112A *Continuous Welded Rail Adjustment*

- Remember to subtract the amount of rail consumed in the welding operation from your calculations.
- When using the Super-Jack, be careful not to "over stretch" the rail, that is, do not raise the neutral temperature excessively. This can cause pull-aparts, misalign switches, damage track components and increase the speed at which transverse defects grow.

It may be necessary to add rail and/or overlap plug rails to obtain the correct rail length

- Reference marks will only be applied to closure welds. Using six-foot marks, apply each mark three feet from the end of each rail. Marks will be applied with a white paint marker on the field side of the web.

112.6 Welding Near Fixed Structures

To minimize longitudinal stresses on track components, do not make closure welds within 150 feet of any fixed track structure.

Fixed track structures include:

- Bridges
- Crossing Frogs
- Switches

All rail restraints must be applied between weld and fixed track structure. Care must be taken when working near detectors, insulated joints or other signal appliances.

When welding in or near a tunnel with a curve, do not over stretch the rail. Over stretching can disturb track alignment and decrease tunnel clearances.

112.7 Weather Guidelines

Welding is prohibited during rain or heavy snow

- Welding supervisor or welding manager will determine if conditions are safe for operation.
 1. Ensure that all welding machine fluids, including welding head and Super-Jack, are at operating temperature before starting welding process.
 2. After the welding process is complete, the weld must be covered until the weld temperature is below 700° F.

112.8 Rail Requirements

Replacement rail used for maintenance welding in an in-track operation must meet the following guidelines:

- Minimum length of 15 feet.
- Vertical height difference from existing rail must not exceed 1/4 inch.
- Torch cut ends must have at least 2 inches removed with an abrasive rail saw.
- Thermite welds must be removed when practical.
- Must be certified rail per Section 4 of the Engineering Track Maintenance Field Manual.
- Do not EFB weld alloy rail.

112.9 Preparation

Before flash butt welding, do the following:

1. Remove mill scale, rust, grease etc., where the welding electrodes will contact the rail.
 - Area to be cleaned must be ground or sand blasted to bright metal.
2. Remove by grinding, all raised lettering where the electrodes or jack wedges will contact the rail.
3. Clean rail ends of all foreign material.
4. All bolt holes should be eliminated when possible:
 - Completed welds must not be closer than 6 inches from the center of any hole including bolt holes and rail bond holes.
 - All bolt holes must be chamfered.
5. Prepare weld location
 - Track must be properly aligned and surfaced prior to welding.
 - Adz ties if necessary to provide proper clearance for weld head.

- Spikes and anchors or clips must be removed to allow movement when aligning rail.
- All fasteners and plates removed must be kept clear of the welding head during the welding operation.
- Ties must be spaced and ballast removed to provide clearance for shear as required.
- On closure welds, remove anchors or clips a minimum of 250 feet in both directions from the rail ends. If fixed track structures are encountered, such as a bridge, crossing frog or switch, remove additional anchors in the opposite direction.

112.10 Flash Butt Welding Procedures

1. Rail Alignment

- Rail must be aligned vertically to provide finished welds that are within the vertical crown and vertical off-set dimensions at ambient temperature. (Refer to Table 112B)
 - a. If vertical off-set is less than 1/8 inch, align the rail head even and have the off-set in the base.
 - b. If vertical off-set is 1/8 inch to 1/4 inch split the off-set between the base and rail head. (Do not off-set the base more than 1/8 inch)
 - c. If vertical off-set is more than 1/4 inch a transition or taper rail must be installed.

2. Data Recorder

A chart or data recorder capable of monitoring and retaining the following information must be operational. Data must be retained for 1 year.

- Welding time.
- Welding current.
- Upset starting force and maximum welding force.

- Platen position in all welding cycles.

3. Interruptions

Interruptions of platen travel or flashing current during the last 1/2 inch of final flashing before upset are not allowed.

- If a travel or current interruption occurs during the last 1/2 inch of final flashing, the weld is considered defective. It must be cut-out and re-welded.

4. Upset Current

The upset current must be at least 1 second in duration.

- If the upset current is less than 1 second in duration, the weld is considered defective. It must be cut-out and re-welded.

5. Upset distance and pressure

If the upset distance and/or pressure do not meet the specifications, the weld is considered defective. It must be cut-out and re-welded.

- A. Minimum upset pressure is 40 metric tons for a head weld.
- B. Upset to a refusal with 1/2-inch minimum, 5/8-inch standard.
- C. The holding pressure time after the upset is 7 seconds minimum. Do not allow clamp slippage.
- D. Check the weld data recorder for verification.

Note: Low consumption welds may be made with Chief Engineer approval.

112.11 Re-weld

If a weld must be cut out immediately after the welding process and re-welded, do the following:

- Cut out the old weld with a rail saw and re-weld at any time.
- or

- Cut out the old weld with an oxy-fuel torch and re-weld within 30 minutes.

If re-weld cannot be made within 30 minutes, ends of rails must be trimmed back 2 inches with an abrasive rail saw.

112.12 Adjusting Welding Machine

1. Add or delete the flashing time until a 5/8-inch standard upset is achieved.
 - Requires approval of welding supervisor or welding manager.
2. Welding head must be shimmed to provide finished welds that are within the horizontal off-set and kink specifications.

112.13 Weld Quality Standards

Finished welds must meet the following requirements.

Maximum Tolerance of Finished Weld	
Vertical Offset (rail head)	0.125 inch
Vertical Offset (rail base)	0.125 inch
Horizontal Offset	0.040 inch
Horizontal Kink	0.025 inch
Vertical Crown	0.060 inch

Table 112B *Maximum Tolerance of Finished Weld*

112.14 Traffic Restrictions

Train traffic or heavy work equipment (spikers, tampers, etc.) must not be allowed over an EFB weld until:

- The running surface and gauge face are rough ground to within 0.030 inch.
- The weld has cooled below 700° F.
- All wedges, jacks and blocks are removed.

- The weld is supported by a tamped tie on each side of the weld.

112.15 Finish Grinding

112.15.1 Rail Head

When grinding the rail head:

1. Grind the gauge and field side of the rail to match the existing rail profile.
(Remove overflow)
2. The running surface of the weld shall be ground to exactly match the contour of existing rails. A radius is to be applied to the gauge and field edges so no sharp edges remain.

112.15.2 Rail Web, Fillets and Base

When grinding rail web, fillets and base:

1. Grind all welds smooth to within 1/16 inch of the original contour of the web and fillets. Do not grind into the parent metal.
2. Grind the top of the base to within 1/16 inch of the original contour.
3. Grind the sides of the base smooth.
4. Visually inspect all weld joints for defects.
5. When using the external stripper or shear for removing the upset, inspect the clamp area in the web on every weld for gouges or smear.
6. Reject any weld with an excessive gouge in the parent metal.

112.16 Measuring Cooling Rate of Rail

Weld temperature must be below 700° F before releasing super-jack, lowering crowning cylinders and lowering machine.

- Do not alter or bypass timer settings.

112.17 Identify Welds

ITW machine number, date, rail temperature, amount of rail removed and weld number (consecutive number starting the first of each year) must be recorded on the field side of rail web with a white metal marker.

113.0 Switch Maintenance Grinding

113.1 Overview

These instructions apply to turnout maintenance grinding. The purpose of switch maintenance grinding is to remove metal flow and restore radius.

When performing any of these tasks, use frog and radius gauges to check and control the amount of grinding.

The RPM rating of abrasive wheels must meet or exceed the RPM rating of the power equipment that is being used.

113.2 Grinding Turnout and Crossings Frogs

113.2.1 Remove Flowed Metal

1. Remove all flowed metal from the gage side of the frog.
2. Grind the edge to a 5/8-inch radius.

113.2.2 Grind Slots

Abrasive wheels used in slotting must not be more than 1/8 inch thick. Rubber or paper blotters must be used between the abrasive wheel and metal flange.

A. Carbon Rail Frogs

On carbon rail frogs, slot to a depth of at least 3/16-inch and slightly bevel the top:

- Slot between the short point and the adjacent rail.
- Slot between the filler block at the heel of the frog and the adjacent rail.

B. Manganese Insert Frogs

On manganese insert frogs, slot to a depth of at least 3/16-inch and slightly bevel the top:

- Slot between the insert and the binder rails.
- Slot between the heel extension and the carbon rail at the heel of the frog.

113.2.3 Grind Running Rail

Remove metal flow from running rails in the area adjacent to guardrails.

113.3 Grinding Stock Rails and Switch Points

113.3.1 Remove Flowed Metal

Remove all flowed metal from the gauge and field sides of the stock rail as follows:

1. On gauge side, remove metal flow 4 inches ahead of the switch point and grind back to where the switch point ends contact with the stock rail.
2. Ensure no sharp projections remain after grinding.
3. Ensure the flowed metal on stock rail is beveled back from the switch point at a minimum of 4 inches.
4. Grind the gauge and field sides of the stock rail to a 5/16-inch to 9/16-inch radius.

113.3.2 Grind Switch Points

Grind switch points as follows:

1. Ensure tip of the point is 5/8 inch to 3/4 inch lower than the stock rail. Refer to standard drawings for specific dimensions of various size switch points.
 - a. Ensure the top of the point tapers back so the first 8 inches of the point will not carry any load.
 - b. Remove metal flow on the gage side of the switch point and restore to a 5/16-inch to 9/16-inch radius.
2. Remove metal flow on the back of switch point to obtain a close fit between switch point and stock rail.
3. The back of the switch point must be slightly beveled at the top, except the first 10 inches from the end of the point.
4. Slot the rail ends at the heel of the switch point.

113.4 Grinding and Slotting Rail Ends

113.4.1 Use Proper Abrasive Wheels

Abrasive wheels used in slotting rail ends must not be more than 1/8 inch thick. Rubber or paper blotters must be used between the abrasive wheel and metal flange.

113.4.2 Slot Rail Ends

After surface grinding, slot rail ends to the required dimensions using proper equipment.

- The slot should match the contour of the rail end.
- Avoid cutting into or nicking the joint bars.

The following procedures apply to slotting rail ends:

Open Joints:

- Square the rail end by removing any metal flow by grinding.
- Slot the rail end to 1/4 inch to 5/16 inch deep.
- Bevel the rail end to 1/16 inch to 3/32 inch back.

Closed Joint:

- Center the slotting wheel between the rail ends of closed joints to remove an equal amount of metal from each rail.
- Slot the rail end to 1/4 inch to 5/16 inch deep.
- Slot to a width of 3/16 inch.

Insulated Joints:

- Remove only flowed metal from rail ends and ensure no sharp edges remain.
- Avoid cutting the end post as much as possible.
- Do not slot any deeper than necessary to remove flowed metal.

Slot Outside Rail of Curves:

On the outside rail of curves, continue slotting over and around the gauge side to include the area usually engaged by the wheel flange.

- Avoid nicking or grinding the joint bar.

115.0 Definitions

ACETONE:

A flammable, volatile liquid used in acetylene cylinders to dissolve and stabilize acetylene under high pressure.

ACETYLENE:

A highly combustible gas composed of carbon and hydrogen. Used as a fuel gas in the oxyacetylene welding process.

AIR-ARC CUTTING:

An arc cutting process in which metals to be cut are melted by the heat of the carbon arc.

ALLOY:

A mixture with metallic properties composed of two or more elements, of which at least one is a metal.

ALTERNATING CURRENT:

An electric current that reverses its direction at regularly recurring intervals.

ANNEALING:

A comprehensive term used to describe the heating and cooling cycle of steel in the solid state. The term annealing usually implies relatively slow cooling. In annealing, the temperature of the operation, the rate of heating and cooling, and the time the metal is held at heat depend upon the composition, shape, and size of the steel product being treated, and the purpose of the treatment. The more important purposes for which steel is annealed are as follows: to remove stresses; to induce softness; to alter ductility, toughness, electric, magnetic, or other physical and mechanical properties; to change the crystalline structure; to remove gases; and to produce a definite microstructure.

ARC BLOW:

The deflection of an electric arc from its normal path because of magnetic forces.

ARC CUTTING:

A group of cutting processes in which the cutting of metals is accomplished by melting with the heat of an arc between the electrode and the base metal. See CARBON-ARC CUTTING, METAL-ARC CUTTING, ARC-OXYGEN CUTTING, AND AIR-ARC CUTTING.

ARC LENGTH:

The distance between the tip of the electrode and the weld puddle.

ARC VOLTAGE:

The voltage across the welding arc.

ARC WELDING:

A group of welding processes in which fusion is obtained by heating with an electric arc or arcs, with or without the use of filler metal.

AS WELDED:

The condition of weld metal, welded joints, and weldments after welding and prior to any subsequent thermal, mechanical, or chemical treatments.

BACK FIRE:

The momentary burning back of a flame into the tip, followed by a snap or pop, then immediate reappearance or burning out of the flame.

BASE METAL:

The metal to be welded or cut. In alloys, it is the metal present in the largest proportion.

CARBON-ARC CUTTING:

A process of cutting metals with the heat of an arc between a carbon electrode and the work.

CARBONIZING FLAME:

An oxyacetylene flame in which there is an excess of acetylene. Also called excess acetylene or reducing flame.

CRACK:

A fracture type discontinuity characterized by a sharp tip and high ratio of length and width to opening displacement.

CRATER:

A depression at the termination of an arc weld.

CUTTING TIP:

A gas torch tip especially adapted for cutting.

CUTTING TORCH:

A device used in gas cutting for controlling the gases used for preheating and the oxygen used for cutting the metal.

CYLINDER:

A portable cylindrical container used for the storage of a compressed gas.

DEFECT:

A discontinuity or discontinuities which, by nature or accumulated effect (for example, total crack length), render a part or product unable to meet the minimum applicable acceptance standards or specifications. This term designates rejectability.

DEPOSITED METAL:

Filler metal that has been added during a welding operation.

DEPOSITION EFFICIENCY:

The ratio of the weight of deposited metal to the net weight of electrodes consumed, exclusive of stubs.

DEPTH OF FUSION:

The distance from the original surface of the base metal to that point at which fusion ceases in a welding operation.

DIRECT CURRENT ELECTRODE NEGATIVE (DCEN):

The arrangement of direct current arc welding leads in which the work is the positive pole and the electrode is the negative pole of the welding arc.

DIRECT CURRENT ELECTRODE POSITIVE (DCEP):

The arrangement of direct current arc welding leads in which the work is the negative pole and the electrode is the positive pole of the welding arc.

DISCONTINUITY:

An interruption of the typical structure of a weldment, such as lack of homogeneity in the mechanical, metallurgical, or physical characteristics of the material or weldment. A discontinuity is not necessarily a defect.

DUCTILITY:

The property of a metal which allows it to be permanently deformed, in tension, before final rupture. Ductility is commonly evaluated by tensile testing in which the amount of elongation and the reduction of area of the broken specimen, as compared to the original test specimen, are measured and calculated.

DUTY CYCLE:

The percentage of time during an arbitrary test period, usually 10 minutes, during which a power supply can be operated at its rated output without overloading.

EFFECTIVE LENGTH OF WELD:

The length of weld throughout which the correctly proportioned cross section exists.

ELECTRODE:

- a. Metal-Arc. Filler metal in the form of a wire or rod, whether bare or covered, through which current is conducted between the electrode holder and the arc.
- b. Carbon-Arc. A carbon or graphite rod through which current is conducted between the electrode holder and the arc.

ELECTRODE HOLDER:

A device used for mechanically holding the electrode and conducting current to it.

FACE OF WELD:

The exposed surface of a weld, made by an arc or gas welding process, on the side from which welding was done.

FILLER METAL:

Metal to be added in making a weld.

FILTER GLASS:

A colored glass used in goggles, helmets, and shields to exclude harmful light rays.

FLAME HARDENING:

A method for hardening a steel surface by heating with a gas flame followed by a rapid quench.

FLAME SOFTENING:

A method for softening steel by heating with a gas flame followed by slow cooling.

FLASHBACK:

The burning of gases within the torch or beyond the torch in the hose, usually with a shrill, hissing sound.

FLAT POSITION:

The position in which welding is performed from the upper side of the joint and the face of the weld is approximately horizontal.

FLUX:

A cleaning agent used to dissolve oxides, release trapped gases and slag, and to cleanse metals for welding, soldering, and brazing.

FUSION:

A thorough and complete mixing between the two edges of the base metal to be joined or between the base metal and the filler metal added during welding.

FUSION ZONE (FILLER PENETRATION):

The area of base metal melted as determined on the cross section of a weld.

GAS POCKET:

A weld cavity caused by the trapping of gases released by the metal when cooling.

GAS WELDING:

A process in which the welding heat is obtained from a gas flame.

GOGGLES:

A device with colored lenses, which protect the eyes from harmful radiation during welding and cutting operations.

GROUND CONNECTION:

The connection of the work lead to the work.

HARD FACING:

A particular form of surfacing in which a coating or cladding is applied to a surface for the main purpose of reducing wear or loss of material by abrasion, impact, erosion, galling, and cavitations.

HARD SURFACING:

The application of a hard, wear-resistant alloy to the surface of a softer metal.

HARDENING:

- a. The heating and quenching of certain iron-base alloys from a temperature above the critical temperature range for the purpose of producing a hardness superior to that obtained when the alloy is not quenched. This term is usually restricted to the formation of Martensite.
- b. Any process of increasing the hardness of metal by suitable treatment, usually involving heating and cooling.

HEAT AFFECTED ZONE:

That portion of the base metal whose structure or properties have been changed by the heat of welding or cutting.

HEAT TIME:

The duration of each current impulse in pulse welding.

HEAT TREATMENT:

An operation or combination of operations involving the heating and cooling of a metal or an alloy in the solid state for the purpose of obtaining certain desirable conditions or properties. Heating and cooling for the sole purpose of mechanical working are excluded from the meaning of the definition.

HELMET:

A device used in arc welding to protect the face and neck. It is equipped with a filter glass and is designed to be worn on the head.

HOT SHORT:

A condition which occurs when a metal is heated to that point, prior to melting, where all strength is lost but the shape is still maintained.

INERT GAS:

A gas which does not normally combine chemically with the base metal or filler metal.

INTERPASS TEMPERATURE:

In a multi-pass weld, the lowest temperature of the deposited weld metal before the next pass is started.

KERF:

The space from which metal has been removed by a cutting process.

LAYER:

A stratum of weld metal, consisting of one or more weld beads.

MANIFOLD:

A multiple header for connecting several cylinders to one or more torch supply lines.

MARTENSITE:

Martensite is a microconstituent or structure in quenched steel characterized by an acicular or needle-like pattern on the surface of polish. It has the maximum hardness of any of the structures resulting from the decomposition products of austenite.

MELTING POINT:

The temperature at which a metal begins to liquefy.

MELTING RANGE:

The temperature range between solid and liquid.

METAL-ARC WELDING:

An arc welding process in which a metal electrode is held so that the heat of the arc fuses both the electrode and the work to form a weld.

MIXING CHAMBER:

That part of a welding or cutting torch in which the gases are mixed for combustion.

NEUTRAL FLAME:

A gas flame in which the oxygen and acetylene volumes are balanced and both gases are completely burned.

NONFERROUS:

Metals which contain no iron. Aluminum, brass, bronze, copper, lead, nickel, and titanium are nonferrous.

NORMALIZING:

Heating iron-base alloys to approximately 100 °F (38 °C) above the critical temperature range followed by cooling to below that range in still air at ordinary temperature.

OPEN CIRCUIT VOLTAGE:

The voltage between the terminals of the welding source when no current is flowing in the welding circuit.

OVERLAP:

The protrusion of weld metal beyond the bond at the toe of the weld.

OXIDIZING FLAME:

An oxyacetylene flame in which there is an excess of oxygen. The unburned excess tends to oxidize the weld metal.

OXYACETYLENE CUTTING:

An oxygen cutting process in which the necessary cutting temperature is maintained by flames obtained from the combustion of acetylene with oxygen.

OXYACETYLENE WELDING:

A welding process in which the required temperature is attained by flames obtained from the combustion of acetylene with oxygen.

OXY-PROPANE CUTTING:

An oxygen cutting process in which the necessary cutting temperature is maintained by flames obtained from the combustion of propane with oxygen.

PASS:

The weld metal deposited in one general progression along the axis of the weld.

PEENING:

The mechanical working of metals by means of hammer blows. Peening tends to stretch the surface of the cold metal, thereby relieving contraction stresses.

POROSITY:

The presence of gas pockets or inclusions in welding.

POSITIONS OF WELDING:

All welding is accomplished in one of four positions: flat, horizontal, overhead, and vertical. The limiting angles of the various positions depend somewhat as to whether the weld is a fillet or groove weld.

POSTHEATING:

The application of heat to an assembly after a welding, brazing, soldering, thermal spraying, or cutting operation.

PREHEATING:

The application of heat to a base metal prior to a welding or cutting operation.

QUENCHING:

The sudden cooling of heated metal with oil, water, or compressed air.

REGULATOR:

A device used to reduce cylinder pressure to a suitable torch working pressure.

REVERSE POLARITY:

The arrangement of direct current arc welding leads in which the work is the negative pole and the electrode is the positive pole of the welding arc.

ROCKWELL HARDNESS TEST:

In this test a machine measures hardness by determining the depth of penetration into the specimen under certain arbitrary fixed conditions of test. The penetrator may be either a steel ball or a diamond spherocone.

ROOT CRACK:

A crack in the weld or base metal which occurs at the root of a weld.

ROOT FACE:

The portion of the prepared edge of a member to be joined by a groove weld which is not beveled or grooved.

SHIELDED WELDING:

An arc welding process in which protection from the atmosphere is obtained through use of a flux, decomposition of the electrode covering, or an inert gas.

SLAG INCLUSION:

Non-metallic solid material entrapped in the weld metal or between the weld metal and the base metal.

SPALL:

Small chips or fragments which are sometimes given off by electrodes during the welding operation. This problem is especially common with heavy-coated electrodes.

SPATTER:

The metal particles expelled during arc and gas welding which do not form a part of the weld.

STRAIGHT POLARITY:

The arrangement of direct current arc welding leads in which the work is the positive pole and the electrode is the negative pole of the welding arc.

STRESS RELIEVING:

A process of reducing internal residual stresses in a metal object by heating to a suitable temperature and holding for a proper time at that temperature. This treatment may be applied to relieve stresses induced by casting, quenching, normalizing, machining, cold working, or welding.

STRING BEAD WELDING:

A method of metal arc welding on pieces 3/4 in. (19 mm) thick or heavier in which the weld metal is deposited in layers composed of strings of beads applied directly to the face of the bevel.

TEMPORARY RAIL END BUILDUP:

Welding beads applied on the lower rail to protect the taller rail when rail ends are mismatched. Rail ends must be properly prepared and preheated before welding, then postheated when completed.

THERMITE CRUCIBLE

The vessel in which the thermit reaction takes place.

THERMITE MIXTURE:

A mixture of metal oxide and finely divided aluminum with the addition of alloying metals as required.

THERMITE MOLD:

A mold formed around the parts to be welded to receive the molten metal.

THERMITE REACTION:

The chemical reaction between metal oxide and aluminum, which produces, superheated molten metal and aluminum oxide slag.

THERMITE WELDING:

A group of welding processes in which fusion is produced by heating with superheated liquid metal and slag resulting from a chemical reaction between a metal oxide and aluminum, with or without the application of pressure. Filler metal, when used, is obtained from the liquid metal.

UNDERCUT:

A groove melted into the base metal adjacent to the toe or root of a weld and left unfilled by weld metal.

UNDERCUTTING:

An undesirable crater at the edge of the weld caused by poor weaving technique or excessive welding speed.

UPSET:

A localized increase in volume in the region of a weld, resulting from the application of pressure.

UPSET WELDING:

A resistance welding process in which fusion is produced simultaneously over the entire area of abutting surfaces, or progressively along a joint, by the heat obtained from resistance to the flow of electric current through the area of contact of those surfaces. Pressure is applied before heating is started and is maintained throughout the heating period.

UPSETTING FORCE:

The force exerted at the welding surfaces in flash or upset welding.

WEAVE BEAD:

A type of weld bead made with transverse oscillation.

WEAVING:

A technique of depositing weld metal in which the electrode is oscillated. It is usually accomplished by a semicircular motion of the arc to the right and left of the direction of welding. Weaving serves to increase the width of the deposit, decreases overlap, and assists in slag formation.

WELD:

A localized fusion of metals produced by heating to suitable temperatures. Pressure and/or filler metal may or may not be used. The filler material has a melting point approximately the same or below that of the base metals, but always above 800 °F (427 °C).

WELD BEAD:

A weld deposit resulting from a pass.

WELD GAUGE:

A device designed for checking the shape and size of welds.

WELD METAL:

That portion of a weld that has been melted during welding.

WELD SYMBOL:

A picture used to indicate the desired type of weld.

WELDABILITY:

The capacity of a material to form a strong bond of adherence under pressure or when solidifying from a liquid.

WELDER CERTIFICATION:

Certification in writing that a welder has produced welds meeting prescribed standards.

WELDER PERFORMANCE QUALIFICATION:

The demonstration of a welder's ability to produce welds meeting prescribed standards.

WELDING LEADS:

- a. Electrode lead. The electrical conductor between the source of the arc welding current and the electrode holder.
- b. Work lead. The electrical conductor between the source of the arc welding current and the workpiece.

WELDING PRESSURE:

The pressure exerted during the welding operation on the parts being welded.

WELDING ROD:

Filler metal in wire or rod form, used in gas welding and brazing processes and in those arc welding processes in which the electrode does not provide the filler metal.

WELDING TECHNIQUE:

The details of a manual, machine, or semiautomatic welding operation which, within the limitations of the prescribed joint welding procedure, are controlled by the welder or welding operator.

WELDING TIP:

The tip of a gas torch especially adapted to welding.

WELDING TORCH:

A device used in gas welding and torch brazing for mixing and controlling the flow of gases.

WELDING TRANSFORMER:

A device for providing current of the desired voltage.

WELDMENT:

An assembly whose component parts are formed by welding.

WORK LEAD:

The electric conductor (cable) between the source of arc welding current and the workpiece.

Appendix A: RESPIRATOR USE TABLE FOR ENGINEERING DEPT. and REGIONAL ENGINEERING EMPLOYEES

Respirator use requirements apply to employees performing maintenance of way, tunnel maintenance or building maintenance tasks. These requirements also apply to Commuter Operations department employees.

HOW TO USE THE RESPIRATOR USE TABLES

1. Identify the job/activity/task being performed in Column 1.
2. Determine if a respirator is required or optional by reading across from the task listed to Respirator Use Requirements in Column 2.
3. Determine the minimum respirator to be used and whether other respirator types are acceptable by reading across to Minimum Respirator Type and Other Approved Respirator Types in Columns 3 and 4.
4. Refer to Appendix G, Respirator Information Table, to identify the specific respirator make, model, and UPRR Supply item numbers.
5. Read the instructions on how long respirator filters or cartridges may be used and related issues in Column 5.

APPENDIX A-1

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
A. WELDING – ELECTRIC				
(1) Galvanized Metal or metals with more than 10% lead, cadmium, zinc, silver or brass content				
	Required	<u>3M6000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u>	Change filter after breathing obstruction. See <u>Note 3</u> .
		<u>3M7500 half face respirator with P100 filters</u>	<u>3M6000 full face respirator with P100 filters</u>	
		<u>Scott XCel half face respirator with P100 filters</u>	<u>3M L-905 powered air purifying respirator with GVP440 filter</u>	
		<u>Survivair 2000 half face respirator with P100 filters</u>		

APPENDIX A-2

IDOT Contract 60K80 315
FORM 7913 **Welding Rules**

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
(2) Frog, Cross-over diamond or Track Component, Welding electrode, wire, or other consumable containing greater than 2% manganese	Welder - Required	With approved fan, per policy requirements 3M6000 half face respirator with P100 filters 3M7500 half face respirator with P100 filters Scott XCel half face respirator with P100 filters	3M6000 full face respirator with P100 filters 3M7800S full face respirator with P100 filters AO Safety 8000 full face respirator with P100 filters 3M L-905 powered air purifying respirator with GVP440 filter	Change filter after breathing obstruction. See <u>Note 3.</u>

APPENDIX A-3

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
		Survivair 2000 half face respirator with P100 filters	Jackson Shadowaire II, EOC, NEXGEN V powered air purifying respirator with P3 filters	
	Welder - Required	Without approved fan, per policy requirements	None	Change filter after breathing obstruction. See Note 3.
		3M L-905 powered air purifying respirator with GVP440 filter	Jackson Shadowaire II, EOC, NEXGEN V powered air purifying respirator with P3 filters	

APPENDIX A-4

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
	Welder-Helper or other workers	Working within 20 feet of welding operation	<p>3M6000 half face respirator with P100 filters</p> <p>3M7500 half face respirator with P100 filters</p> <p>Scott XCel half face respirator with P100 filters</p> <p>Survival 2000 half face respirator with P100 filters</p>	Change filter after breathing obstruction. See Note 3.
			<p>3M6000 full face respirator with P100 filters</p> <p>3M7800S full face respirator with P100 filters</p> <p>AO Safety 8000 full face respirator with P100 filters</p>	

APPENDIX A-5

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(3) General - Welding electrode, wire, or other consumable containing greater than 2% manganese				
	Required	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u>	Change filter after breathing obstruction. See <u>Note 3.</u>
		<u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>AO Safety 8000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	

APPENDIX A-6

IDOT Contract 60K80 319
FORM 7913 **Welding Rules**

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1.]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2.]	5 CARTRIDGE EXCHANGE PERIOD
(4) Hardened surfaced metals similar to stainless steel				
	Required	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> <u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	Change filter after breathing obstruction. See Note 3.

APPENDIX A-7

IDOT Contract 60K80 320
FORM 7913 **Welding Rules**

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(5) Welding consumables designed for use on aluminum and/or aluminum alloys				
	Required	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> <u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	Change filter after breathing obstruction. See Note 3.

APPENDIX A-8

IDOT Contract 60K80 324
FORM 7913 **Welding Rules**

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
(6) Carbon Steel, Mild Steel, Welding consumables designed for use on mild steel to include unpainted bridges (also see F. WORKING ON PAINTED BRIDGES)				
	Required	<p><u>3M6000 half face respirator with P100 filters</u></p> <p><u>3M7500 half face respirator with P100 filters</u></p> <p><u>Scott XCel half face respirator with P100 filters</u></p> <p><u>Survivair 2000 half face respirator with P100 filters</u></p>	<p><u>3M7800S full face respirator with P100 filters</u></p> <p><u>3M6000 full face respirator with P100 filters</u></p> <p><u>3M L-905 powered air purifying respirator with GVP440 filter</u></p>	<p>Change filter after breathing obstruction. See Note 3.</p>

APPENDIX A-9

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
B. WELDING OXY – FUEL				
Carbon Steel, Mild Steel, Welding consumables designed for use on mild steel	Required for unpainted bridges (also see F. WORKING ON PAINTED BRIDGES) Optional for other unpainted Carbon Steel, Mild Steel, Welding consumables designed for use on mild steel structures and components	3M6000 half face respirator with P100 filters	3M7800S full face respirator with P100 filters	Change filter after breathing obstruction. See Note 3.
		3M7500 half face respirator with P100 filters	3M6000 full face respirator with P100 filters	
		Scott, Xcel half face respirator with P100 filters	3M L-905 powered air purifying respirator with GVP4440 filter	
		Survivair 2000 half face respirator with P100 filters		

APPENDIX A-10

FORM 7913 IDOT Contract 60K80 323 Welding Rules

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
C. FIELD WELDING				
(1) Cad - Weld	Optional	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> <u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	Change filter after breathing obstruction. See Note 3.

APPENDIX A-11

FORM 7913 IDOT Contract 60K80 324 Welding Rules

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(2) Thermitite Field Weld	Optional	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> <u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	Change filter after breathing obstruction. See <u>Note 3.</u>

APPENDIX A-12

FORM 7913 IDOT Contract 60K80 325 Welding Rules

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
D. BRAZING / SOLDERING				
(1) Brazing compound or solder if more than 10% brass, lead, silver, zinc or cadmium				
	<p>Optional when using soldering or brazing guns with controlled operating temperatures below 400 degrees F.</p> <p>Required in all other cases.</p>	<p><u>3M6000 half face respirator with P100 filters</u></p>	<p><u>3M7800S full face respirator with P100 filters</u></p> <p><u>3M6000 full face respirator with P100 filters</u></p> <p><u>3M L-905 powered air purifying respirator with GVP440 filter</u></p>	<p>Change filter after breathing obstruction. See <u>Note 3</u>.</p>
		<p><u>3M7500 half face respirator with P100 filters</u></p> <p><u>Scott XCel half face respirator with P100 filters</u></p> <p><u>Survivair 2000 half face respirator with P100 filters</u></p>		

APPENDIX A-13

FORM 7913 IDOT Contract 60K80 326 Welding Rules

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
E. AIR ARCING / PLASMA CUTTER				
General use	Required	<u>3M6000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u>	Change filter after breathing obstruction. See <u>Note 3</u> .
		<u>3M7500 half face respirator with P100 filters</u>	<u>3M6000 full face respirator with P100 filters</u>	
		<u>Scott X-Cel half face respirator with P100 filters</u>	<u>3M L-905 powered air purifying respirator with GVP440 filter</u>	
		<u>Survivair 2000 half face respirator with P100 filters</u>		

APPENDIX A-14

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
F. WORKING ON PAINTED BRIDGES				
(1) General Cleanup, Paint Scraping, Welder-Helper Activities				
	<p>Required per Safety Resource Manual Section IV-AC.</p>	<u>3M6000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u>	<p>Change filter after breathing obstruction. See <u>Note 3</u>.</p>
		<u>3M7500 half face respirator with P100 filters</u>	<u>3M6000 full face respirator with P100 filters</u>	
		<u>Scott XCel half face respirator with P100 filters</u>	<u>3M L-905 powered air purifying respirator with GVP440 filter</u>	
		<u>Survivair 2000 half face respirator with P100 filters</u>		

APPENDIX A-15

FORM 7913 IDOT Contract 60K80 328 Welding Rules

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(2) Torch Burning or Cutting, Welding, Rivet Busting, Needle Gun Use	Required per Safety Resource Manual Section IV-AC.	3M L-905 powered air purifying respirator with GYP440 filter	3M L-905 helmet supplied breathing air	Change filter after breathing obstruction. See Note 3. CEP does not apply to supplied breathing air respirators.

APPENDIX A-16

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
G. CUTTING / HEATING - OXY - FUEL.				
(1) Galvanized Metal or metals with more than 10% lead, cadmium, zinc, silver or brass content				
	Required	<p><u>3M6000 half face respirator with P100 filters</u></p>	<p><u>3M7800S full face respirator with P100 filters</u></p>	<p>Change filter after breathing obstruction. See <u>Note 3.</u></p>
		<p><u>3M7500 half face respirator with P100 filters</u></p>	<p><u>3M6000 full face respirator with P100 filters</u></p>	
		<p><u>Scott XCel half face respirator with P100 filters</u></p>	<p><u>3M L-905 powered air purifying respirator with GVP4440 filter</u></p>	
		<p><u>Survivair 2000 half face respirator with P100 filters</u></p>		

APPENDIX A-17

1	2	3	4	5
ACTIVITY/ TASK	RESPIRATOR USE REQUIREMENTS	MINIMUM RESPIRATOR TYPE [See Note 1]	OTHER APPROVED RESPIRATOR TYPES [See Note 2]	CARTRIDGE EXCHANGE PERIOD
(2) General				
	Optional	As above	As above	Change filter after breathing obstruction. See Note 3 .
H. POURING MOLTEN METALS OR BATTERY SHOP WORK where work involves fuming metals that contain more than 10% lead, cadmium, silver, zinc or brass content				
	Required	<u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> <u>Scott XCel half face respirator with P100 filters</u> <u>Survivair 2000 half face respirator with P100 filters</u>	<u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u> <u>3M L-905 powered air purifying respirator with GVP440 filter</u>	Change filter after breathing obstruction. See Note 3 .

APPENDIX A-18

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
I. METAL GRINDING				
(1) Rail - Hand or Portable Disc				
	<p>Required for metal grinding on steel alloys containing 2% or more manganese, such as frogs, cross-over diamonds, or high strength steels</p>	<p><u>3M6000 half face respirator with P100 filters</u> <u>3M7500 half face respirator with P100 filters</u> Scott XCel half face respirator with P100 filters Survivair 2000 half face respirator with P100 filters</p>	<p><u>3M7800S full face respirator with P100 filters</u> <u>3M6000 full face respirator with P100 filters</u></p>	<p>Change filter after breathing obstruction. See Note 3.</p>

APPENDIX A-19

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(2) Rail Grinding Train	Required for employees working in or around grinding dusts.	<p><u>3M6000 half face respirator with P100 filters</u></p> <p><u>3M7500 half face respirator with P100 filters</u></p> <p><u>Scott XCel half face respirator with P100 filters</u></p> <p><u>Survivair 2000 half face respirator with P100 filters</u></p>	<p><u>3M7800S full face respirator with P100 filters</u></p> <p><u>3M6000 full face respirator with P100 filters</u></p>	Change filter after breathing obstruction. See <u>Note 3.</u>

APPENDIX A-20

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(3) Pedestal	Optional	3M6000 half face respirator with <u>P100 filters</u> 3M7500 half face respirator with <u>P100 filters</u> Scott XCel half face respirator with <u>P100 filters</u> Survivair 2000 half face respirator with <u>P100 filters</u>	3M7800S <u>full face</u> <u>respirator</u> <u>with P100</u> <u>filters</u> 3M6000 full face respirator with P100 filters 3M L-905 powered air purifying respirator with <u>GVP440 filter</u>	Change filter after breathing obstruction. See Note 3.

APPENDIX A-21

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
J. HEATING RAIL.				
Burning - Rope, Sawdust, or other fuels used to heat rail.	Required	3M6000 half face respirator with <u>60926 cartridges and filters</u> 3M7500 half face respirator with <u>60926 cartridges and filters</u>	3M6000 full face <u>respirator with 60926</u> <u>cartridges and filters</u> 3M7800S full face respirator with 60926 <u>cartridges</u> <u>and filters</u>	Change cartridges after 10 hours of use or one work shift (whichever comes first). Do not replace cartridges in a work area where air contaminants may be present
		Scott XCel half face respirator with multi-contaminant cartridges and P100 filters Survivair2000 half face respirator with multi- contaminant cartridges and P100 filters	AO Safety full face respirator with multi- cont- aminant cartridge and P100 filter	

APPENDIX A-22

FORM 7913 IDOT Contract 60K80 335 Welding Rules

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
K. RAIL CUTTING				
(I) Abrasive Saw				
Optional, except when cutting in poorly ventilated areas.	3M6000 half face respirator with P100 filters	3M7800S full face respirator with P100 filters	AO Safety 8000 full face respirator with P100 filters	Change filter after breathing obstruction. See Note 3.
	3M7500 half face respirator with P100 filters			
	Scott XCel half face respirator with P100 filters	3M6000 full face respirator with P100 filters		
	Survivair 2000 half face respirator with P100 filters			

APPENDIX A-23

1 ACTIVITY/ TASK	2 RESPIRATOR USE REQUIREMENTS	3 MINIMUM RESPIRATOR TYPE [See Note 1]	4 OTHER APPROVED RESPIRATOR TYPES [See Note 2]	5 CARTRIDGE EXCHANGE PERIOD
(2) Oxy - Fuel Cutting	Required if over five cuts will be made in a day.	3M6000 half face respirator with P100 filters 3M7500 half face respirator with P100 filters Scott XCel half face respirator with P100 filters Survivair 2000 half face respirator with P100 filters	3M7800S full face respirator with P100 filters 3M6000 full face respirator with P100 filters	AO Safety 8000 full face respirator with P100 filters Change filter after breathing obstruction. See Note 3.

APPENDIX A-24

EXPLANATORY NOTES TO RESPIRATOR USE TABLE:

NOTE 1. Minimum respirator type is the minimum level of respiratory protection for the activity or task listed. Levels of respiratory protection range by protection factors. The following is a list of respirators arranged in descending order of protection provided to the wearer:

Supplied Air Respirator ([SAR](#)) (**Maximum** protection factor)
Powered Air Purifying Respirator ([PAPR](#))
Full-Face Air Purifying Respirator ([FFAPR](#))
Half-Face Air Purifying Respirator ([HFAPR](#)) (**Minimum** protection factor)

NOTE 2. A respirator offering a higher protection factor may be worn for each activity/task listed, as long as, the same filter configuration indicated in the minimum respirator type column is used.

NOTE 3. Replace filters after 40 hours of use or weekly. If filters are damaged, soiled, contaminated with water and/or breathing resistance is increased, go to a clean area such as a lunchroom or office and replace the filters immediately. Do not replace filters in a work area where air contaminants may be present.

NOTE 4. Use only supplied air respirators ([SAR](#)) for protection against any paint, paint stripper, solvent, thinner, or cleaner containing methylene chloride (or dichloromethane). If methylene chloride (or dichloromethane) is present in the material, call 402-544-5974. Use only supplied air respirators for protection against any paint containing any isocyanate compound.

- NOTE 5. If "[approved ventilation](#)" is available, the respirator use tables allow reduced respiratory protection or in some cases, no respiratory protection. "[Approved ventilation](#)" for welding tasks consists of a portable or fixed fume extraction system designed to remove air contaminants at the source utilizing a high efficiency particulate (HEPA) filtration system. If an "[approved fan](#)" is available, the respirator use tables allow reduced respiratory protection when welding on manganese-containing frogs or other track components. "[Approved fan](#)" for these welding tasks consists of a portable fan designed to blow the air contaminants away from the welder's breathing zone. "Approved ventilation" for solvents degreasing consists of fixed local exhaust ventilation systems designed to safely remove degreasing vapors. "Approved ventilation" for painting operations consists of local exhaust ventilation booths designed to remove paint aerosols and vapors. UPRR Safety Industrial Hygiene must evaluate all industrial ventilation systems.
- NOTE 6. Hantavirus protection requires minimum use of air-purifying respirator with P100 filter. Use of 60926 multi-use cartridges with built-in P-100 filter provides added protection against diesel exhaust air emissions.

ALTERNATIVE CLEANING PROCEDURES FOR RESPIRATORS

The PA recommends the use of the manufacturers' instructions on cleaning all respirators. If the manufacturer instructions are not feasible or unavailable, then the following may be done.

1. Remove filters, cartridges or canisters. Disassemble face-pieces by removing speaking diaphragms, valve assemblies, or hoses. Discard or repair any defective parts. Replace all parts only with the same part from the same respirator manufacturer.
2. Wash components in warm (43 degrees C. or 110 degrees F.) water with a mild detergent. A stiff bristle (not wire) brush may be used to remove dirt.
3. If the cleaner does not contain a disinfecting agent, respirator components should be immersed for two minutes in a chlorine solution made by combining one milliliter (about one teaspoonful) of laundry bleach to one liter of water at the temperature identified above.
4. Rinse components thoroughly in clean, warm (temperature identified above) water and drain. The importance of thorough rinsing can not be overemphasized. Detergents that are left to dry on respirator face-pieces may cause dermatitis.
5. Dry components with a clean, lint-free cloth or allow them to air-dry in an area where they will not become contaminated by chemicals, dusts, fumes or vapors.

6. Reassemble face-piece, replacing filters, cartridges and other components as necessary and only with the same part from the same respirator manufacturer. If the same replacement part cannot be obtained, a new respirator should be issued to the worker by the supervisor.
7. The wearer should test the respirator and all of its component parts before its next intended use.

Appendix C: MILLER POWER SOURCE SETUP

Amperage Settings for Miller Bobcat 225a

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
50 - 100	50	55	60	65	70	75	80	85	90	95	100
70 - 150	70	78	86	94	102	110	118	126	134	142	150
85 - 225	85	99	113	127	141	155	169	183	197	211	225

UPRR approved stick electrodes:

Carbon Rail Steel:

McKay M932 3/16" 210 to 230 amps
 McKay M932 1/4" 290 to 310 amps
 RailBuild 540 3/16" 170 to 200 amps
 RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

Matweld 900 1/8" 120 amps
 Matweld 900 5/32" 140 amps
 Matweld 900 3/16" 170 amps
 FrogSeal 3/16" 140 to 160 amps
 FrogBuild 570 3/16" 180 to 200 amps
 FrogBuild 570 7/32" 200 to 220 amps
 FrogSpec 3/16" 210 to 230 amps

APPENDIX C-1

Amperage Settings for Miller Bobcat 225b

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
50 - 120	50	57	64	71	78	85	92	99	106	113	120
70 - 150	70	78	86	94	102	110	118	126	134	142	150
85 - 225	85	99	113	127	141	155	169	183	197	211	225

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

APPENDIX C-2

Amperage Settings for Miller Bobcat 250

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
25 - 80	25	30.5	36	41.5	47	52.5	58	63.5	69	74.5	80
35 - 115	35	43	51	59	67	75	83	91	99	107	115
75 - 250	75	92.5	110	127.5	145	162.5	180	197.5	215	232.5	250

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

APPENDIX C-3

Amperage Settings for Miller Trailblazer 250G

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
25 - 80	25	30.5	36	41.5	47	52.5	58	63.5	69	74.5	80
35 - 115	35	43	51	59	67	75	83	91	99	107	115
75 - 250	75	92.5	110	127.5	145	162.5	180	197.5	215	232.5	250

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

APPENDIX C-4

Amperage Settings for Miller Air Pac: 400 Amp

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
85 - 210	85	97.5	110	122.5	135	147.5	160	172.5	185	197.5	210
110 - 270	110	126	142	158	174	190	206	222	238	254	270
190 - 400	190	211	232	253	274	295	316	337	358	379	400

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

APPENDIX C-5

Amperage Settings for Miller Air Pac: 500 Amp

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
90 - 190	90	100	110	120	130	140	150	160	170	180	190
140 - 330	140	159	178	197	216	235	254	273	292	311	330
200 - 500	200	230	260	290	320	350	380	410	440	470	500

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

APPENDIX C-6

Amperage Settings for Miller Air Pac: 750 Generating Power – CC/CV – DC only
 (525 Amp 100 % Duty Cycle / 550 Amp 60% Duty Cycle / 600 Amp 40% Duty Cycle)
 Estimated welding current at 0% to 100%.

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
85 - 250	85	101.5	118	134.5	151	167.5	184	200.5	217	233.5	250
125 - 400	125	152.5	180	207.5	235	262.5	290	317.5	345	372.5	400
185 - 525	185	219	253	287	321	355	389	423	457	491	525

UPRR approved stick electrodes:

Carbon Rail Steel:

McKay M932 3/16" 210 to 230 amps
 McKay M932 1/4" 290 to 310 amps
 RailBuild 540 3/16" 170 to 200 amps
 RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

Matweld 900 1/8" 120 amps
 Matweld 900 5/32" 140 amps
 Matweld 900 3/16" 170 amps
 FrogSeal 3/16" 140 to 160 amps
 FrogBuild 570 3/16" 180 to 200 amps
 FrogBuild 570 7/32" 200 to 220 amps
 FrogSpec 3/16" 210 to 230 amps

APPENDIX C-7

Amperage Settings for Miller Big Blue: 400 Amp - CC only

Estimated welding current at 0% to 100%

Use meter on power source for actual amperage output

This table is for CC welding only using the SMAW process (Stick Electrode)

Amp Range	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
90 - 225	90	103.5	117	130.5	144	157.5	171	184.5	198	211.5	225
120 - 280	120	136	152	168	184	200	216	232	248	264	280
200 - 400	200	220	240	260	280	300	320	340	360	380	400

UPRR approved stick electrodes:

Carbon Rail Steel:

- McKay M932 3/16" 210 to 230 amps
- McKay M932 1/4" 290 to 310 amps
- RailBuild 540 3/16" 170 to 200 amps
- RailBuild 540 1/4" 210 to 230 amps

Manganese Steel:

- Matweld 900 1/8" 120 amps
- Matweld 900 5/32" 140 amps
- Matweld 900 3/16" 170 amps
- FrogSeal 3/16" 140 to 160 amps
- FrogBuild 570 3/16" 180 to 200 amps
- FrogBuild 570 7/32" 200 to 220 amps
- FrogSpec 3/16" 210 to 230 amps

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APPENDIX F-2

Union Pacific Railroad

Rail Train Operating Instructions

REVISED: March 8, 2010

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Rail Train Operating Instructions

Introduction

Rail replacement is an important part of Union Pacific's track maintenance program. Each year, new Continuous Welded Rail (CWR) is unloaded system wide for installation. Likewise, secondhand CWR and bolted rail is picked-up by Rail Trains, and is either transported to system rail plants, or cascaded to other secondhand curve rail projects. System trains used in this process consist of two rail unloading cars, and four to five rail car pick-up units for secondhand rail.

Compliance with these instructions will ensure the safe and efficient operation of all Rail Train operations. The Manager Track Maintenance (MTM) or appointed supervisor will assist the Rail Train Supervisor (RTS) during all Rail Train operations.

Local management is responsible for:

- 1) Reviewing project plans before the Rail Train's arrival to ensure the efficient unloading of rail.
- 2) Obtaining and communicating the proper exclusive track occupancy (Form B, Form C, single-tracking and flag protection) to all interested parties as required. Coordinate moves with Maintenance-of-Way Operations Control (MWOC), Corridor Manager, and other Maintenance-of-Way gangs working in the area.
- 3) Providing the Rail Train Supervisor with a copy of General Orders and information about the territory that may affect the operation (i.e., location of bridges, signals, switches and other obstructions). Each RTS must have access to a complete set of System General Orders.
- 4) Assisting the Rail Train Supervisor in assigning the most capable employees for the more demanding jobs.

- 5) Arranging all aspects of train crew activities -- including calling the work train, ensuring a 3-person crew is available, scheduling meals, and transportation per local agreements.
- 6) Ensuring all required tools for Rail Train operations are inspected and safe to use.
- 7) Ensuring sufficient material is on hand (i.e., joint bars, bolts and oxygen / acetylene, propane, and wooden blocks as required).
- 8) Ensuring a welder and mechanic is available in the event of a major breakdown.

Job Briefing

- A. The local MTM and/or respective ARASA Supervisor are responsible for reviewing the project plan and determining when the Rail Train will arrive on their territory. Prior to the Rail Train's arrival, a Safety Meeting must be held to review and familiarize all employees on safe rail unloading / loading operations.

Employees assigned to any Rail Train unloading / loading operation must first attend a Safety Meeting to review the following Safe Rail Train operations video programs:

- (E-248-02) Safe Rail Train Operations
- (E-269-03) Safe Rail Train Operations – Loading
- (E-270-03) Safe Rail Train Operations – Unloading

The Rail Train Supervisor is responsible for ensuring that **Course Code V236** is entered into each employee's training history, documenting their review of the video program(s).

(The review of all Safe Rail Train Operations videos must occur within one calendar year prior to working on a Rail Train.)

NOTE: Video programs may be obtained through UP's E-Procurement System. When placing an order, use the Item Number left of each program title shown above.

- B. Prior to movement or performing any unloading / loading operations, the RTS and local manager will conduct a thorough Job Briefing with all personnel -- including members of the train crew. When traveling with personnel that are riding on the Rail Train, **do not exceed 30 mph**. All aspects of rail unloading / loading operations will be discussed along with an in-depth briefing of the type of On-Track Safety that will be used that day. Remember, employees should never dismount or place themselves between the rail and the train.

Conduct additional meetings and Job Briefings as conditions, methods or procedures change.

When track centers are 19 feet or less, the RTS is responsible for ensuring that the in/out box chains on unloaders are attached to the stationary connection on the unloader. This will prevent boxes from fouling the adjacent track by restricting their outer / horizontal movement.

Rail Train Crew

- C. The RTS and local manager will conduct a thorough Job Briefing with the rail train crew to explain the roles and responsibilities of all personnel involved in the Rail Train unloading / loading operation (i.e., the What, Why, When, Where, How and Who will perform each task).

During Rail Train loading or unloading operations, a crew member (i.e., **Conductor or Brakeman**) will protect the rear of the train – by riding in a SAFE designated area on the Rail Train, or Rail Train equipment, as directed by the RTS.

The designated crew member will approve all shoving moves and is required to be on the ground when the train is shoving within 5 cars of any signal device, road crossing, or switch. The designated crew member (Conductor or Brakeman) will also protect the movements for all reverse moves (**unloading or pick-up operations**) when clearing for trains, or tying-up.

Before any Rail Train activity is undertaken – including all reverse moves – a Job Briefing must first be conducted with all train crew members.

NOTE: Conduct additional Job Briefings as conditions, methods or procedures change.

Work Assignments / Red Zones / Personal Safety Practices

- D. The MTM shall consider the most qualified employee when making specific work assignments. When necessary, the MTM and/or RTS should walk employees through their workstations to ensure the employee understands their specific role and responsibilities.

- E. The RTS will describe the job function, potential hazards and Red Zones associated with the employee's work assignment.

RED ZONE

That area within an arm's length of the track, or any position, which places the employee in a life-threatening situation.

Train must be "Set and Centered" per Rule 81.5.4, before entering Red Zone.

- F. Most Red Zones on a Rail Train are marked with red paint. However, those areas where it is not possible to physically mark as a Red Zone will be identified in a Job Briefing before any employee is assigned to these areas.

Comply with these safety practices when working on and around Rail Trains.

1. When riding on a Rail Train, employees will ride in locations designated by the RTS. Personnel must maintain a 3-point stance (4-point, where possible) and be prepared for sudden stops or erratic movement.
2. Stay clear of the edges of all cars, when possible.
3. Watch point and rail for unexpected movements (used by communication with the RTS.)
4. When installing or removing joint bars and the point, use lockout / communication with the RTS.
5. Before getting on or off Rail Train on the "LIVE TRACK" side, verify that no traffic is on the adjacent track before ascending or descending the Rail Car.
6. Within 10 feet of rail movement, especially at joint bars if rail becomes hung up on stanchions.
7. Use ladder and / or grab irons when ascending and descending the Crib Car.
8. Use ladder when ascending and descending the crow's nest on Crib Car – and access leading to the ladder, especially where no side platform is available.
9. The entire Crib Car is a **RED ZONE!**

When performing tie-down operations in Red Zones, exercise extreme caution.

- When tying-down rail on the train -- rail is moving toward tie-down.
- Remain alert for unexpected movement within 10 feet of any moving rail.
- Avoid tripping hazards from pneumatic, hydraulic or hand tools.
- When using ladder ascending and descending the Tie-Down Car, as well as access going to the ladder -- especially where no side platform is available.
- Remain alert to fall zones that are 6 feet or higher -- especially near entrance / exit areas where no barriers or railings exist, except for a chain, on top of Tie-Down Car and other elevated locations.
- Use the Tie-Down Car's ladder and / or grab irons from ground when ascending or descending the car.
- The authorization to enter **RED ZONES** will be received from the Rail Train Supervisor – **NO EXCEPTION!**
- Before entering **RED ZONES**, the train must be "Set and Centered" per Rule 81.5.4.

G. Employees must remain alert for Rail Train equipment defects, (e.g., bad decking, worn cables or any defect that may create an unsafe working condition). Report defects to the RTS immediately.

H. Direct all questions regarding Rail Train operations to the RTS.

The proceeding sections relate to specific operations and recommended work procedures. By reviewing these instructions prior to the arrival of the Rail Train, the Engineering Department Supervisor and the Rail Train Supervisor can produce a safe and efficient operation.

Manpower

Field personnel are responsible for being at the job site when needed. The recommended manpower requirements for both Rail Distribution and Rail Pick-Up operations are:

Rail Distribution (10)	
<u>No.</u>	<u>Position</u>
1	Rail Train Supervisor on Power Car
1	Engineering or field force's supervisor
2	Employee on Tie-Down Car
2	Employee on Breaker Car (one torch- qualified)
2	Employee picking-up hook-up chains, fish plates and handling cables
1	Backhoe (operator)
1	Truck Driver (pick-up chains/cables)

Rail Pick-Up (16)	
<u>No.</u>	<u>Position</u>
1	Rail Train Supervisor on Power Car
1	Foreman to assist on Crane Car
1	Assistant Foreman to assist on Breaker Car
2	Employees on Tie-Down Car
2	Employees walking point
2	Employees on Breaker Car (one torch-qualified)
4	Employees on Crane Car (one torch-qualified and one crane-qualified)
2	Employees on Speed Swing (operator and helper)
1	Truck Driver -- Transport Point Men when Right-of-Way roads are accessible. When roads are inaccessible, driver will assist on the Breaker Car.

Communication

Good communication is essential to the safe and efficient operation of the Rail Train. The RTS has been assigned seven company-issued radios which are distributed, on an as needed basis, to personnel assigned to Rail Train operations. Local forces are also encouraged to provide radios assigned to them. Company-issued radios are distributed according to the type of Rail Train operation, (i.e., Rail Distribution vs. Rail Pick-Up).

The RTS, local supervisor, and train crew are responsible for determining the safest radio

channel to be used for rail unloading and loading operations. Before any unloading or pick-up operations commence, a radio check must be performed with all company-issued radios – with special attention given to the radios assigned to Point Men assigned to the Rail Pick-Up operations.

All communications must be channeled through the RTS. All personnel have the authority to **STOP** the Rail Train when necessary. The train will be referred to as the “Rail Train.” When it is necessary to **STOP** the Rail Train, the phrase “**STOP THE RAIL TRAIN**” will be used.

Radio instructions must be clear during Rail Train operations and all radio instructions must be acknowledged. Communications should be kept to a minimum with no unnecessary radio communications. The RTS will monitor all communications and overall operations to ensure the safety of personnel.

Rail Distribution Operation (4)	
<u>Radio(s)</u>	<u>Location</u>
1	RTS on Power Car
1	Tie-Down Car
1	Breaker Car
1	Spare (extra)
Rail Pick-Up Operation (7)	
<u>Radio(s)</u>	<u>Location</u>
1	RTS on Power Car
1	Crane Car
1	Breaker Car
2	Point Men
1	Tie-Down Car
1	Spare (extra)

All company-issued radios distributed must be returned to the RTS end of each day for recharging. Radio equipment problems should be reported immediately to the RTS.

Train and Equipment Consist

The Rail Train and equipment consist includes:

- A. Two, 6-axle locomotives with 6,000 horsepower capacity are necessary for traction while the train is being pulled with the air set to reduce the slack action and improve handling.
- B. Equipment for handling CWR, or continuous lengths of bolted rail, consists of power equipment (unloading units and/or pickup units) and permanently-coupled flat cars. Couplers are blocked against slack action and are highly susceptible to damage from rough handling. When equipment is loaded with rail, a buffer is used at each end. The buffer car must not be a car containing hazardous materials, an occupied caboose or camp car. The end of the buffer car must be at least as tall as the top row of rail to restrain the rail. However, the RTS may authorize loaded equipment to be operated without a buffer to and from an unloading / loading site.
 - 1. Inspect all Rail Trains for missing slack adjusters. Before loading Rail Trains, Welding Plant personnel and / or RTS must perform an inspection – replacing missing parts to ensure safe operations. When four or more slack adjusters are missing on either side of the tie down, no rail may be loaded until the slack adjusters are replaced.
 - 2. Welding Plant and Rail Train Supervisors must ensure that rail ends are a minimum of 12-feet from the nearest support of stretched train. When necessary, rail must be adjusted prior to allowing train to move unattended between work sites.
 - 3. Welding Plant and Rail Train Supervisors are responsible for ensuring that Rail Trains comply with these instructions before allowing the train to move unattended.

- C. The RTS will determine which end of the train the power will be placed -- taking into consideration the terrain, obstructions and the type of work being performed.
- D. To unload or load rail, buffer cars may be switched to the opposite end on which the rail will be unloaded/loaded.
- E. The RTS is responsible for ensuring these switch moves occur under his direct supervision.
- F. The RTS must accompany all Rail Train movements when rail is left treaded through Power Cars.

NOTE: The Manager Track Maintenance (MTM) or appointed ARASA Supervisor will assist the RTS during all phases of rail unloading. Unloading rail without approval from the RTS is **PROHIBITED**.

Rail Unloading Operations

Complying with the following instructions will ensure safe and efficient rail unloading operations.

UNLOADING OPERATION

- A. A recommended 10 employees are required to perform rail unloading. Local management is responsible for ensuring adequate employee staffing is on hand to perform rail unloading operations -- in addition to ensuring the most capable employees are placed into the safety-sensitive positions.

Prohibited
Switching a Rail Train without the verbal permission from the Rail Train Supervisor is prohibited.

Only two employees may instruct the Engineer to move the Rail Train while in the process of unloading rail. Crib Car while making joints and RTS for all other movements.

- B. When CWR will be laid in road crossings for a project, crossings must be prepared to receive the rail by first removing the outside crossing boards or roadbed material. To eliminate any unnecessary torch cutting of rail and expedite unloading, ensure asphalt (cold mix) or ballast is available to fill-in the road crossing.
Note: Comply with all Local / State government permit and notification requirements prior to removing a road crossing from service. Conduct a thorough Job Briefing to address road crossings and ensure personnel are present to provide protection while a crossing is OUT OF SERVICE.
- C. The majority of Rail Trains are designed to untie rail from top outside pockets working toward the middle pockets. On custom welded trains, tie-down personnel will untie the rail and follow the sequence as instructed by the RTS.
- D. On other trains, when a rail is removed and the adjacent rail is to be tied-down, a "Dutchman" or "Half Plate" must be added to provide the proper tightening surface for the adjacent rail.
- E. The employees working on the Breaker Car will pull out the winch cables on each side of the Unloading Car and attach hook cables to the appropriate rails. All employees must exercise caution and stand clear of the cables as the RTS begins pulling the rail down through all threader boxes.
- F. All walkways, except those between cars, will be picked-up and placed in the travel position.
- G. Rail must be cabled to the track -- preferably to a secure anchored crib with pull-off cables. Once securely attached, employees must maintain a 30 foot minimum distance from the cables before the Rail Train is allowed to move.
Note: When extra rail anchors are used, they should be applied to the field side of the track.
- H. When plows are used to create a furrow on the track shoulder for rail placement, all employees on the Tie-Down and Breaker Cars should remain alert for obstructions in the direct path of the plows, (e.g., bridges, flange oilers, crossings, switches, long

ties and other objects). Alert the RTS immediately of obstructions to ensure plows are moved into the clear.

- I. Exercise caution when releasing tension on drag line cables to prevent cables from rolling or sliding downhill.

When the free rail end passes through the Tunnel Car, ensure no train movement is present on the adjacent track until the rail end is placed on the ground.

- J. When establishing a new rail joint on the Crib Car, employees must stand either on top of, or on the side of the Crib Car, until rail movement is stopped.

- K. When "Fish plates" or "Stabber Chains" are connected, employees must move to a place of safety by returning to the top of the Crib Car before rail is moved. Always use the ladder and/or grab irons when moving up or down the Crib Car.

- L. Ensure OXYGEN /PROPANE or ACETYLENE cylinders are safely secured (tied-down) in an upright position at all times. After installing cylinder gauges, hoses and torch, perform a thorough daily inspection and leak test prior to use.

When Oxygen /Acetylene or Propane cylinders equipped with outlet valves are not in use, all cylinder outlet valves must be kept fully closed. During transport, tie-down cylinders, remove regulator assemblies with gauges and apply cylinder caps - unless valves require a DOT approved safety cap. Properly store and secure regulator assemblies to prevent damage, and theft.

- M. Employees must keep their work area clean and clear of obstructions, (i.e., OTM, ballast, tools, etc). Tools and equipment must be secured to prevent falling off the Rail Train.

- N. Upon the completion of daily rail unload operations, employees must ensure that:

1. All tie-down plates are returned and secured in place by installing the nut or bolt.
2. All tools, equipment and hoses are safely secured by lock to prevent theft.
3. All Stabber Chains, Fish Plates and Drag Line Cables are returned to their respective cars on the Rail Train.
4. Walkways between Unloader Cars are picked-up and secured for travel.
5. The ends of CWR placed on the ground, are separated to prevent the rail from bunching and avoid potential fouling or interfering with rail traffic.
6. Rail laid across open deck bridges is secured either by spiking rail to bridge timbers, tying-off with wire rope or chain. When rail is unloaded, ensure all rail ends do not come in contact with one another. Place wooden blocks to separate rail ends and prevent rail end to rail end contact. Ensure an adequate quantity of wooden blocks is on hand for the project.

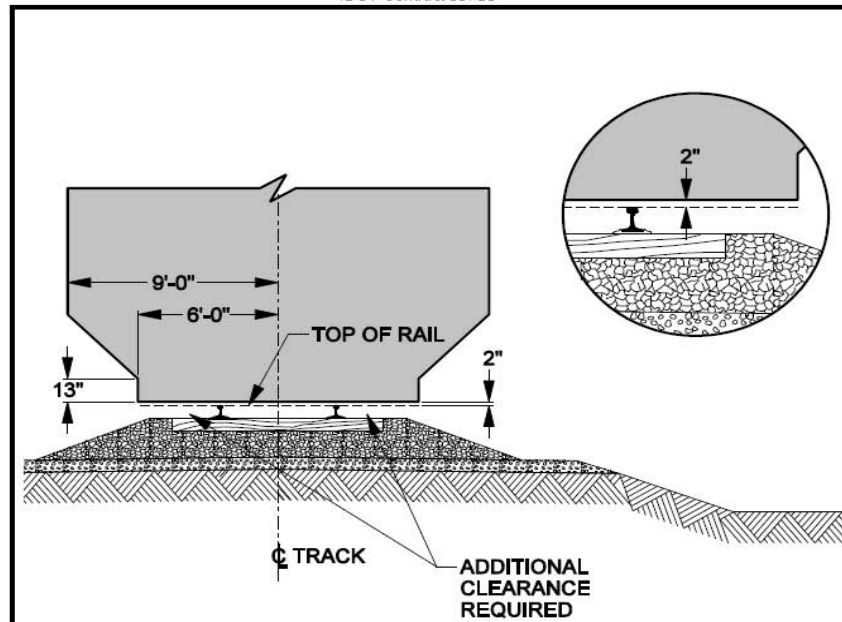
Note: If rail is not properly secured, place a 25 mph Slow Order on the track. Place rail out of the way in walking areas such as yards and other switch locations. Ensure train dispatcher issues a Form C, "Bad Footing Order" – if necessary

7. When both locomotive power and the Rail Train are tied-up with rail threaded through the Power Cars, precautions must be taken to prevent unexpected movement without the RTS present.

Ensure rail that is unloaded does not foul the running rail per Track Maintenance Field Handbook, section 4.4.3 Rail Placement. (Refer to Engineering – Critical Incident Alert 14-2009, dated 11/24/2009.) When rail is unloaded at the end of ties, rail must be at least 2-inches lower than top of the running rail. Where high ballast or other obstructions exist, place rail at least 6-feet from the track center to alleviate this rail from fouling the running rail. Ensure unloaded rail is properly prepared to not interfere with the running rail if temperature changes. Place rail a sufficient distance from the running rail to ensure rail ends do not touch.

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8. All company-issued radios are returned to the RTS for daily recharging.

If locomotive power may be required for higher priority trains, the RTS must advise the assigned crew to separate the Rail Train equipment from the locomotive power. Place Red Flags to protect Rail Train and equipment from movement. Prior to departing tie-up location, the RTS will brief the Yardmaster / Dispatcher or local Transportation Manager of train and equipment status.

Rail Pick-up Operations

Following new rail replacement or track abandonments, the Rail Train will load and transport the secondhand CWR and/or bolted secondhand rail removed from track. Comply with the following instructions to ensure the safety and efficiency of rail pick-up operations.

NOTE: During all phases of rail pick-up operations, the Manager Track Maintenance or an appointed ARASA Supervisor will assist the Rail Train Supervisor.

Under no circumstances, may rail pick-up operations proceed without the Rail Train Supervisor's direct supervision.

I. Rail Preparation (Rail Gangs / P811)

- A. Place rail in an upright position in the furrow created by the plow along the track shoulder.
- B. Rail should be placed on both sides of the track.
- C. Rail should be cut squarely at a 90-degree angle.
- D. Holes in rail ends must be drilled or torch-cut to specs (9-½" and 15-½").
- E. All rail anchors must be removed.
- F. Rail must be left together in strings and rail ends must be separated.

II. Initial First String Rail Pick-Up

- A. Position Crane Car near the end of the rail to start pick-up operation. Raise rail end using the Knuckle Crane to attach a starter point. Repeat procedure on both sides of the Crane Car.
- B. When train is advanced, rail is pushed through the telescopic boxes, stationary boxes, Companion Car boxes and pusher wheels. Once rail passes through the pusher wheels, the RTS will oversee pulling the rail through the rear Companion car boxes and Breaker Car boxes. Once this is accomplished, all rail movement is stopped. Remove starter points and attach grab handles and rail points. Move all employees into the clear -- either on the side or on the top of the Crib Car. Adjust rail boxes and guide rail into the rail pocket.

III. Operation

- A. As rail advances onto the Rail Train, position two employees -- one each side of the Crane Car -- to remove rail anchors attached to base of the rail and inspect rail joints. Employees must remain alert for loose or broken joint bars that, if not tightened or repaired, may allow rail to roll free in the train.
1. When the first rail section is picked-up, the Rail Train advances to the next rail section on the ground and the train is stopped near the rail end. Apply two joint bars to the rail end on the train.
 2. Using the Knuckle Crane, raise the rail end from the ground and align the two rail ends between the joint bars -- the RTS will coordinate moving the rail into position. Apply bolts (2 per rail end -- 4 per joint) and tightened with an impact wrench.
NOTE: Joint bars connecting rail ends must conform to the proper design and dimension specifications for rail section.
 3. As rail strings are loaded on the Rail Train, they will resemble the shape of a pyramid. The two middle strings are loaded first, from the bottom tier to the top tier. Additional strings will be loaded from the outside up using the middle strings as guides.
- B. The Point Men are responsible for guiding rail through the train while maintaining continuous communication with the RTS. Point Men inform the RTS when:
1. Any situation that may interfere with the safe loading of rail through the pockets on the Roller Cars, (e.g., speed, obstructions and walkways).
 2. The rail approaches the tie-down and Breaker Car -- RTS is provided a countdown to gauge speed and distance.

3. Rail is out of the crib on the Breaker Car – RTS is advised of rail's distance from the crib.

Once rail is loaded, the RTS will communicate the following instructions to tie-down employees:

- If no obstructions are present to prevent friction plates from being applied, tie-down personnel will tie-down the rail -- tightening bolts or nuts to refusal with an impact wrench or a ratchet and multiplier.
- If obstructions are present that prevent tie-down, (i.e., joint bars, field weld or field weld straps) the rail must be re-positioned before rail is tied-down.

- C. Once rail is spotted, employees on the Crib Car will remove joint bar nuts/bolts by torch cutting, or by torch cutting the rail.

NOTE: When this operation is undertaken, the hydraulic controls in the operator's cab will be lock-out to prevent rail movement.

1. Before making a cut, employees must ensure they position themselves between either the:
 - Joint bar and the crib; **or**
 - Joint bar and on the crib.

Employees will torch the bolts from above the joint -- at no time shall any employee place any of their body between two rails. Once bolts are cut, employees will remove joint bars by using a sledge hammer or bar.

NOTE: Employees must position themselves above the joint clear of falling joint bars and keep body parts out of pinch points.

2. Once grab handle and self-guiding point, or rail point, are attached, employees must move into the clear.
3. During loading operations, ground personnel cannot be more than 10-feet away from the 1st threader box on the Crane Car. In the event the rail

binds, rail could strike a person in a position that is greater than 10-feet from the 1st threader box.

4. Threader boxes are be adjusted and the rail is be slowly loaded into another pocket. All personnel on Breaker Car move into the clear on the Crow's Nest until the next string is started.
 5. All employees are responsible for ensuring work areas are clean and clear of obstructions, (e.g., OTM, ballast and tools).
- D. Upon completion of daily pick-up operation, employees must ensure:
1. Point Men communicate with the RTS about the location of the point and secure the point on the rail.
 2. Crane Car: Pin adjustable boxes and secure walkways. Return tools and torches to the locked box. Secure joint bars, bolts and air/hydraulic hoses to prevent loss – falling off the Rail Train.
 3. Breaker Car: Return wrenches and torches to the locked box. Secure points and handles to prevent loss – falling off the Rail Train.
 4. Tie-Down Car: Return tools, air hoses and wrenches to the locked box. Secure tie-down plates, nuts and bolts to prevent loss – falling off the Rail Train.
 5. All company-issued radios are returned to the RTS for recharging for the following day's operation.

Rev. 3/14/2008

Ultrasonic Test (UT) of Rail Welds

All thermite rail welds installed as part of the project shall be hand tested ultrasonically for defects or inclusions before track is placed into service. Prior to ultrasonic inspection, each weld will be ground to a finish that eliminates grooves, heavy facets, or debris that could interfere with hand test operation. All test surfaces will be free of debris, scale, grease and heavy rust, which may inhibit inspection.

The operator in charge of the testing crew shall have a minimum of American Society of Nondestructive Testing (ASNT) Level II training and experience. Documentation of each qualified operator's certification and a proposed written procedure for testing will be provided to Railroad for approval. The written procedure shall be prepared and the approved testing program shall be administered by a certified ASNT Level III or comparable individual. The written procedure shall describe the program for the control and administration of the testing personnel training, examination and certification. Qualifications shall be specific to the equipment and method used. The Railroad reserves the right to disqualify an operator from testing on Railroad property because of previous experience with operator's performance or operator's ability without further explanation. Any exceptions to these rail testing qualifications shall be pre-approved in writing by the Railroad.

Functionality of the UT hand testing instrumentation shall be checked, and the equipment shall be calibrated and normalized by use of a calibration standard at the beginning and end of the daily testing operation, after inactivity or delay if practical, and any time when a malfunction is suspected. If any malfunction is discovered, all material shall be reexamined to the previous valid calibration and normalization.

Each weld will be hand tested with each of the following transducer angles: 70 degree, 37.5 or 45 degree, and 0 degree.

The 70 degree (+/-) sound envelope hand test transducer, full railhead coverage (gage, center and field) shall be capable of detecting transverse flaws, with calibration and detection minimums of a 1/32 inch flat bottom hole.

The 37.5 (+/-) degree or 45 (+/-) degree transducer will inspect fillet, web and base of rail with calibration and detection minimums of a 1/32-inch flat bottom hole.

The 0 degree transducer will inspect the head, web and base. Detection capabilities for web, head web flaw minimums 1/32 inch. In addition to detection of transverse or horizontal flaws from top of rail, the 0 degree transducer will be employed to inspect the head from side of the rail, at 90 degrees to vertical, for vertical split head separations. 0-degree detection minimums shall be 1/32-inch flat bottom hole.

All testing shall be performed by personnel qualified and certified in accord with the approved written procedure. The testing operator will locate and mark defects found according to Railroad specifications and accuracy requirements. Each defective weld shall be marked with a highly visible marking on both sides of the rail web and base. The Railroad also reserves the right to independently re-test suspect welds at the Contractor's expense.

Welds with single 1/16 inch or greater reflective surface shall be rejected. Welds with three or more 1/32 inch reflective surfaces within range of transducer scan shall be rejected also. Defective welds will be reported and subsequently repaired at Railroad's direction.

The Railroad will be provided all test records following the UT inspection. The Contractor shall certify all test records and maintain a copy of all test records for a minimum of four years following the test.



Soil Import Specifications

**Adopted by the
Union Pacific Engineering Department**

March 1, 2016

Import Soil Specifications - Illinois

If import soil is needed, analytical testing shall be performed to ensure that the import soil is free from contamination. Costs associated with analytical testing of import soil are the responsibility of the Contractor.

Soil samples shall be collected in accordance with US Environmental Protection Agency (EPA) Publication No. SW-846, "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," and shall be analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-Accredited laboratory approved to perform analytical testing in Illinois.

One representative soil sample shall be collected for every 5,000 cubic yards (in place), or fraction thereof, of import soil. If import soil will be derived from more than one source or location, import soil qualifications must be attained from each source in accordance with the sampling frequency mentioned in this section. Approximate geographic coordinates (latitude/longitude) of the import soil sample location(s) shall be provided to Union Pacific Railroad (UPRR) in addition to the analytical data detailed below.

The following laboratory analyses shall be performed to document that imported soil is free from contamination:

- Volatile Organic Compounds (VOCs) by EPA Method 8260B
- Polynuclear Aromatic Hydrocarbons (PAHs) by EPA Method 8270C
- Resource Conservation and Recovery Act (RCRA) Metals by EPA Method 6010C/7471B
- Organophosphorus Pesticides by EPA Method 8141
- Chlorinated Herbicides by EPA Method 8151A
- Polychlorinated Biphenyls (PCBs) by EPA Method 8082A
- Organochlorine Pesticides by EPA Method 8081A
- Cyanide by EPA Method 9010
- pH/Corrosivity by EPA Method 9040
- Nitrate as Nitrogen by EPA Method 4500

Imported soils shall be deemed acceptable for use if concentrations of all analytes from the representative soil sample(s) are below the following criteria:

- The most conservative soil remediation objectives (SROs) presented in Illinois EPA Tiered Approach to Corrective Action Objectives (TACO), Appendix B, Table A, *Tier 1 Soil Remediation Objectives for Residential Properties*, located in 35 IAC 742.

The most conservative TACO SRO values are presented in Illinois EPA *Maximum Allowable Concentrations (MACs) of Chemical Constituents in Uncontaminated Soil Used as Fill Material at Regulated Fill Operations*, as defined in 35 IAC 1100 Subpart F. A summary table of the MACs can be found at the following website: <http://www.epa.state.il.us/land/ccdd/new-max-allowable-concentrations-table.pdf>.

- In the event that metal constituents exceed SROs, the maximum value of the county-specific USGS dataset for naturally-occurring elements will be used for comparison. These values can be obtained at the following website:

<http://mrdata.usgs.gov/geochem/doc/averages/countydata.htm>

Analytical data shall be compared to the above standards to preliminarily evaluate if the import soil contains any potential chemicals of concern (COCs) above the IEPA criteria. Laboratory analytical reports shall be provided to UPRR for all imported soil to verify the soil is free from contamination. To qualify a given volume of soil for use as import soil, a copy of the associated laboratory report must be sent to UPRR for review and approval.

Policy for Contractor Material Delivery on Union Pacific Property

- When entering Union Pacific work site, driver is required to understand what type of On Track Safety is being provided and be under the direction of General Contractor.
- Cell phone use is prohibited while driving on Union Pacific Property
- Obey all railroad crossing signage and warnings.
- If crossing is posted with a flagman, do not cross until cleared to do so.
- When traversing the job site, keep vehicles as far away from railroad tracks as practicable.
- If a driver exits their truck on Union Pacific Property, they must be wearing Personal Protective Equipment including steel toed safety shoes, hard hat, orange vest, safety glasses, and ear plugs. If driver does not possess these items, they must not exit truck on UP property.
- Do not foul any closer than 25' to any track unless authorized by a designated employee. When a train is cleared through working limits, all trucks within 25' of active tracks must stop movement until train has cleared location.
- Obey any direction given by UP employee or General Contractor onsite.
- Look, Listen, and Live....expect a train on any track, at any time, and in any direction.
- Do not try and beat a train to a crossing.
- Failure to follow these guidelines may result in employee being banned from entering Union Pacific property.

Union Pacific wants all who work with us to go home safely each day. Safety begins with you!



BUILDING AMERICA®

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If

the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color,

religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. Davis-Bacon and Related Act Provisions

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such

action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for

debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such

contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded,"

as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with

commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the

certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

Contract Provision - Cargo Preference Requirements

In accordance with Title 46 CFR § 381.7 (b), the contractor agrees—

“(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.”

Provisions (1) and (2) apply to materials or equipment that are acquired solely for the project. The two provisions do not apply to goods or materials that come into inventories independent of the project, such as shipments of Portland cement, asphalt cement, or aggregates, when industry suppliers and contractors use these materials to replenish existing inventories.

**MINIMUM WAGES FOR FEDERAL AND FEDERALLY
ASSISTED CONSTRUCTION CONTRACTS**

This project is funded, in part, with Federal-aid funds and, as such, is subject to the provisions of the Davis-Bacon Act of March 3, 1931, as amended (46 Sta. 1494, as amended, 40 U.S.C. 276a) and of other Federal statutes referred to in a 29 CFR Part 1, Appendix A, as well as such additional statutes as may from time to time be enacted containing provisions for the payment of wages determined to be prevailing by the Secretary of Labor in accordance with the Davis-Bacon Act and pursuant to the provisions of 29 CFR Part 1. The prevailing rates and fringe benefits shown in the General Wage Determination Decisions issued by the U.S. Department of Labor shall, in accordance with the provisions of the foregoing statutes, constitute the minimum wages payable on Federal and federally assisted construction projects to laborers and mechanics of the specified classes engaged on contract work of the character and in the localities described therein.

General Wage Determination Decisions, modifications and supersedes decisions thereto are to be used in accordance with the provisions of 29 CFR Parts 1 and 5. Accordingly, the applicable decision, together with any modifications issued, must be made a part of every contract for performance of the described work within the geographic area indicated as required by an applicable DBRA Federal prevailing wage law and 29 CFR Part 5. The wage rates and fringe benefits contained in the General Wage Determination Decision shall be the minimum paid by contractors and subcontractors to laborers and mechanics.