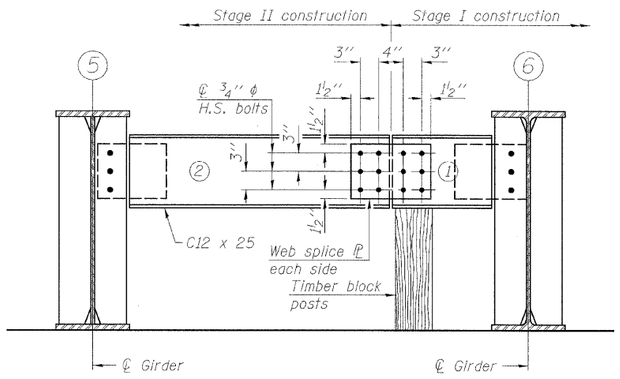
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

| ROUTE NO. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
|---|---|---|---|---|
| F.A.P. 301 | 21-VBR 21RS-2 | STEPHENSON | 112 | 67 |
| FED. ROAD DIST. NO. 7 | ILLINOIS | FED. AID PROJECT- | | |

SHEET NO. 19
32 SHEETS

Contract #64D15

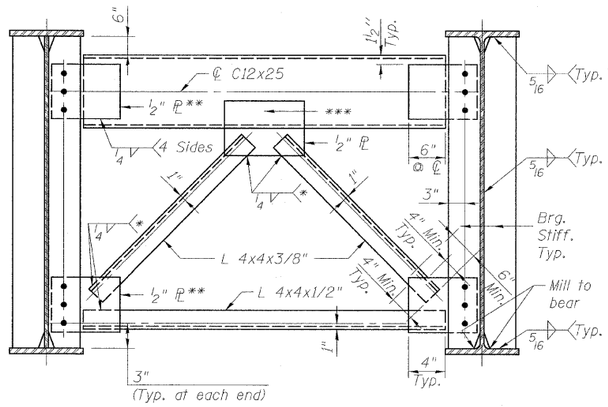



## END DIAPHRAGM

## END DIAPHRAGM STAGE CONSTRUCTION SEQUENCE

1.) Order Diaphragm in two sections.
2.) Attach section (1) of Diaphragm to Girder 6.
3.) Place Timber Block Posts between section (1) of diaphragm and abutment bearing section.
4.) Attach section (2) of diaphragm to both Girder 5 and section (1) of diaphragm during Stage II Construction with splice plates.
5.) Remove Timber Block Posts.

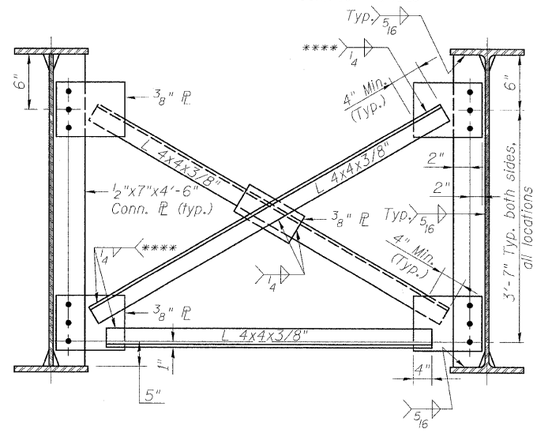
NOTE:
Cross Frame not shown for clarity.
See Typical End Cross Sections for Details.
Cost of Timber Block Posts is included with Structural Steel.
Install C12 x 25 in Stage I and lower portion of EF after Stage II construction.




## TYPICAL END CROSS FRAME (EF)

NOTES:
Detail 15/16 "ϕ holes for all 3/4"ϕ bolts.
Two hardened washers required for each set of oversized holes.
Place diaphragm with channel flanges and outstanding angle legs outward from abutment wall.

* Weld near side of 1/2" flange
** 1/2" plates to be bent for skew
*** Use bolted connection for stage construction




## TYPICAL INTERIOR CROSS FRAME (CF)

**** Fillet weld angles along 3 sides on one face of gusset plate.

NOTES:
Detail 15/16 "ϕ holes for all 3/4"ϕ bolts.
Two hardened washers required for each set of oversized holes.
All Structural steel shall be AASHTO M270 Grade 50 except the bearing plates, diaphragms, cross frames, connecting plates and angles that shall be AASHTO M270 Grade 36.
Interior cross frames at Stage construction between Girders 5 and 6 shall have standard long slot holes 13/16 " x 1 7/8" for 3/4"ϕ bolts for both 3/8" and 1/2" connection plates at Girder 5 for Stage II construction. Bolts in slots shall be finger tight until the second Stage pour is complete. Position slots so that bolts start at one end with no concrete load and finish near the opposite end under deck load. All holes shall have hardened or 3/8" plate washers.

| INTERIOR GIRDER MOMENT TABLE | | | | |
|---|---|---|---|---|
| | | 0.4 Sp. 1 or 0.6 Sp. 3 | Pier 1 & 2 | 0.5 Sp. 2 |
| $I_s$ | ($in^4$) | 32404 | 45173 | 38096 |
| $I_c(n)$ | ($in^4$) | 72516 | - | 88530 |
| $I_c(3n)$ | ($in^4$) | 52857 | - | 63099 |
| $S_s$ | ($in^3$) | 1157 | 1585 | 1497 |
| $S_c(n)$ | ($in^3$) | 1584 | - | 2024 |
| $S_c(3n)$ | ($in^3$) | 1425 | - | 1827 |
| Z | ($in^3$) | - | - | - |
| DC1 | (k/') | 1.092 | 1.147 | 1.117 |
| $M_{DC1}$ | ('k) | 357 | 1693 | 1121 |
| DC2 | (k/') | 0.191 | 0.191 | 0.191 |
| $M_{DC2}$ | ('k) | 77 | 258 | 219 |
| DW | (k/') | 0.338 | 0.338 | 0.338 |
| $M_{DW}$ | ('k) | 152 | 513 | 437 |
| $M_{L+Imp}$ | ('k) | 1060 | 1163 | 1597 |
| $M_u$(Strength I) | ('k) | 2626 | 5244 | 5125 |
| $\phi_f M_n$, $\phi_f M_{nc}$ | ('k) | 8200 | 7448 | 9656 |
| $f_s$ DC1 | (ksi) | 3.70 | 12.82 | 8.98 |
| $f_s$ DC2 | (ksi) | 0.65 | 1.95 | 1.44 |
| $f_s$ DW | (ksi) | 1.15 | 3.88 | 2.59 |
| $f_s$ 1.3(L+I) | (ksi) | 0.87 | 0.95 | 1.03 |
| $f_s$ (Service II) | (ksi) | 6.37 | 19.61 | 14.04 |
| $f_s$ (Total)(Strength I) | (ksi) | 8.69 | 25.96 | 18.71 |
| Vr | (k) | 22.48 | - | 26.93 |

| INTERIOR GIRDER REACTION TABLE HL93 Loading | | | |
|---|---|---|---|
| | | Abut. | Pier |
| $R_{DC1}$ | (k) | 29.21 | 143.04 |
| $R_{DC2}$ | (k) | 5.76 | 25.84 |
| $R_{DW}$ | (k) | 10.19 | 45.63 |
| $R_{L+Imp}$ | (k) | 80.61 | 159.29 |
| $R_{Total}$ | (k) | 125.77 | 373.90 |

$I_s$, $S_s$: Non-composite moment of inertia and section modulus of the steel section used for computing $f_s$ (Total-Strength I, and Service II) due to non-composite dead loads ($in.^4$ and $in.^3$).

$I_c(n)$, $S_c(n)$: Composite moment of inertia and section modulus of the steel and deck based upon the modular ratio, "n", used for computing $f_s$ (Total-Strength I, and Service II) due to short-term composite live loads ($in.^4$ and $in.^3$).

$I_c(3n)$, $S_c(3n)$: Composite moment of inertia and section modulus of the steel and deck based upon 3 times the modular ratio, "3n", used for computing $f_s$ (Total-Strength I, and Service II) due to long-term composite (superimposed) dead loads ($in.^4$ and $in.^3$).

Z: Plastic Section Modulus of the steel section in non-composite areas. Omit line in Moment Table if not used in design calculations ($in.^3$).

DC1: Un-factored non-composite dead load (kips/ft.).

$M_{DC1}$: Un-factored moment due to non-composite dead load (kip-ft.).

DC2: Un-factored long-term composite (superimposed excluding future wearing surface) dead load (kips/ft.).

$M_{DC2}$: Un-factored moment due to long-term composite (superimposed excluding future wearing surface) dead load (kip-ft.).

DW: Un-factored long-term composite (superimposed future wearing surface only) dead load (kips/ft.).

$M_{DW}$: Un-factored moment due to long-term composite (superimposed future wearing surface only) dead load (kip-ft.).

$M_{L+Imp}$: Un-factored live load moment plus dynamic load allowance (impact) (kip-ft.).

$M_u$ (Strength I): Factored design moment (kip-ft.).
$1.25\ (M_{DC1} + M_{DC2}) + 1.5\ M_{DW} + 1.75\ M_{L+Imp}$

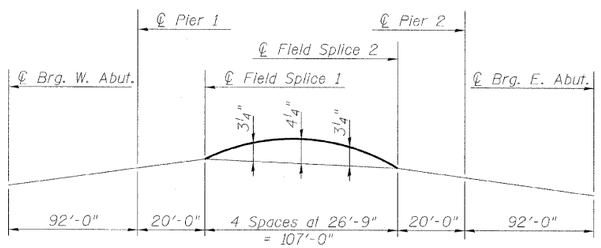
$\phi_f M_n$: Compact composite positive moment capacity computed according to Article 6.10.7.1 (kip-ft.).

$\phi_f M_{nc}$: Compact non-composite negative moment capacity computed according to Article A6.1.1 (kip-ft.).

$f_s$ (Service II): Sum of stresses as computed from the moments below (ksi).
$M_{DC1} + M_{DC2} + M_{DW} + 1.3\ M_{L+Imp}$

$f_s$ (Total)(Strength I): Sum of stresses as computed from the moments below on non-compact section (ksi).
$1.25\ (M_{DC1} + M_{DC2}) + 1.5\ M_{DW} + 1.75\ M_{L+Imp}$

Vr: Factored shear range computed according to Article 6.10.10.




## CAMBER DIAGRAM

| | |
|---|---|
| DESIGNED | MMH |
| CHECKED | CEN |
| DRAWN | R.VEJAR |
| CHECKED | CEN |

## STRUCTURAL STEEL DETAILS - SHEET 2
## US 20 OVER ILLINOIS CENTRAL RAILROAD
## F.A.P. RTE. 301 - SEC. 21-VBR & 21RS-2
## STEPHENSON COUNTY
## STATION 569+56.19
## STRUCTURE NO. 089-0077

HOH HARRY O. HEFTER-ASSOCIATES, INC. DESIGN AND CONSULTING ENGINEERS
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PROJECT NUMBER 2945