



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

July 5, 2009

SUBJECT: FAP Route 389
Project BHF-0389 (004)
Section 2424.2 B-R
Cook County
Contract No. 60D61
Item No. 1, August 14, 2009 Letting
Addendum A

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised the Table of Contents to the Special Provisions.
2. Revised pages 2, 3, 98, 122 - 130 & 216 of the Special Provisions.
3. Added pages 568 - 575 to the Special Provisions.
4. Revised sheets 249, 347 & 348 of the Plans.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

Charles Ingersoll, Chief
Bureau of Design and Environment

A handwritten signature in cursive script, appearing to read "Ted B. Walschleger".

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: Diane O'Keefe, Region 1, District 1; Bill Frey; R. E. Anderson; Estimates

TBW:MS:jc

TABLE OF CONTENTS

LOCATION OF PROJECT 1
DESCRIPTION OF PROJECT 1
GENERAL 2
RECORD DRAWINGS 2
GENERAL CONSTRUCTION PROCEDURES 2
MOVABLE BRIDGE SYSTEMS COORDINATION..... 7
RELATIONS WITH COAST GUARD 7
CONSTRUCTION SITE ACCESS 8
EQUIPMENT SALVAGE 8
INCENTIVE PAYMENT PLAN - INTERIM COMPLETION DATE (STAGE ONE) 8
INTERIM COMPLETION DATE (STAGE ONE) 9
FAILURE TO COMPLETE THE WORK ON TIME (STAGE ONE) 9
INCENTIVE PAYMENT PLAN (FINAL COMPLETION DATE) 10
FAILURE TO COMPLETE THE WORK ON TIME (FINAL COMPLETION DATE) 11
FINAL COMPLETION DATE PLUS GUARANTEED WORKING DAYS 11
UTILITY COORDINATION - CITY OF CHICAGO 12
STATUS OF UTILITIES TO BE ADJUSTED 12
ENGINEER’S FIELD OFFICE TYPE A (SPECIAL) 13
MAINTENANCE OF TRAFFIC..... 17
MAINTENANCE OF ROADWAYS AND STRUCTURES 17
TRAFFIC CONTROL PLAN 17
INCENTIVE PAYMENT PLAN - INTERIM COMPLETION DATE (STAGE ONE) 18
INTERIM COMPLETION DATE (STAGE ONE) 18
FAILURE TO COMPLETE THE WORK ON TIME (STAGE ONE) 18
INCENTIVE PAYMENT PLAN (FINAL COMPLETION DATE) 18
FAILURE TO COMPLETE THE WORK ON TIME (FINAL COMPLETION DATE)..... 18
FINAL COMPLETION DATE PLUS GUARANTEED WORKING DAYS..... 18
TRAFFIC CONTROL AND PROTECTION FOR TEMPORARY DETOUR 19
TRAFFIC CONTROL AND PROTECTION FOR ALTERNATE ROUTE 19
KEEPING THE EXPRESSWAY OPEN TO TRAFFIC 19
FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC 20
TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS)..... 21
TRAFFIC CONTROL SURVEILLANCE (EXPRESSWAYS)..... 24
TRAFFIC CONTROL SURVEILLANCE 25
TEMPORARY INFORMATION SIGNING 26

REVISED 08/05/2009

TRAFFIC CONTROL FOR WORK ZONE AREAS 27

TRAFFIC CONTROL AND PROTECTION (SPECIAL) 27

WORK RESTRICTIONS 28

TYPE III TEMPORARY TAPE FOR WET CONDITIONS 28

ADJACENT CONTRACT COORDINATION 29

ROADWAY 29

EPOXY COATING ON REINFORCEMENT (DISTRICT ONE) 29

FINE AGGREGATE FOR HOT- MIX ASPHALT (HMA) (D-1) 29

USE OF RAP (DIST 1) 30

COARSE AGGREGATE FOR HOT-MIX ASPHALT (HMA) (D-1) 36

HOT MIX ASPHALT – DENSITY TESTING OF LONGITUDINAL JOINTS (D-1) 38

TEMPERATURE CONTROL FOR CONCRETE PLACEMENT (DISTRICT ONE) 39

AGGREGATE FOR CONCRETE BARRIER (DISTRICT ONE) 39

BITUMINOUS PRIME COAT FOR HOT-MIX ASPHALT PAVEMENT (FULL DEPTH) (D-1) 40

CONCRETE BARRIER REMOVAL (SPECIAL) 40

CONCRETE MEDIAN REMOVAL 40

TRAFFIC BARRIER TERMINAL, TYPE 6 (SPECIAL) 41

REMOVE SIGN COMPLETE 41

TEMPORARY CONCRETE BARRIER REMOVAL 41

TEMPORARY FENCE (SPECIAL) 41

IMPACT ATTENUATOR REMOVAL 42

CONCRETE MEDIAN (SPECIAL) 42

TEMPORARY THRIE BEAM STEEL PLATE GUARDRAIL, TYPE D REMOVAL (SPECIAL) 43

STEEL RAILING REMOVAL 43

CHAIN LINK CANTILEVER SLIDE GATE (SPECIAL) 43

BOLLARDS 44

INLET FILTER CLEANING 45

TREE WELL 45

ASBESTOS REMOVAL 46

STRUCTURES 48

CONCRETE PARAPET, 34 INCH F SHAPE (MODIFIED) 48

CONCRETE PARAPET TRANSITION, 34 INCH F SHAPE (MODIFIED) 49

TEMPORARY THRIE BEAM STEEL PLATE GUARDRAIL, TYPE D (SPECIAL) 49

STRUCTURAL STEEL REMOVAL 49

STRUCTURAL STEEL REPAIR 52

REVISED 08/05/2009

BRIDGE FLOOR REMOVAL 53

FURNISHING AND ERECTING ORTHOTROPIC DECK..... 54

F-SHAPE ALUMINUM PARAPET 56

REMOVE AND REINSTALL EXISTING ALUMINUM PARAPET 57

REMOVAL OF EXISTING CONCRETE DECK 58

TIMBER BUMPERS..... 60

CARBON FIBER REINFORCED POLYMER REPAIR 60

COUNTERWEIGHT PIT CLEANING 66

ABRASION RESISTANT POLYURATHANE WEARING SURFACE 66

RIVET REMOVAL AND REPLACEMENT 68

BRIDGE DECKING 69

SIDEWALK FLOORING..... 69

CONCRETE STAIRS REPAIRS 70

STONE MASONRY REPAIRS AND REPLACEMENT 71

METAL FABRICATIONS..... 74

WINDOW REMOVAL AND REPLACEMENT 76

ROOF REMOVAL AND REPLACEMENT 77

STAIRWELL REHABILITATION 80

METAL WALL AND ROOF PANELS 87

ALUMINUM 1 INCH WINDOW BLINDS 88

MASONRY WALL CONSTRUCTION 89

REMOVAL OF EXISTING ALUMINUM RAILING 89

RAISED REFLECTIVE PAVEMENT MARKERS (BRIDGE, SPECIAL)..... 90

REPLACEMENT OF CENTER LOCKS 90

MECHANICAL..... 94

MECHANICAL ITEMS..... 94

MECHANICAL DEMOLITION 120

OPERATING MACHINERY 122

REPLACEMENT OF CENTER LOCKS 130

NDT TESTING 133

REPLACEMENT OF TRUNNION THRUST COLLARS 135

REPLACEMENT OF TRUNNION BEARING CAP AND ANCHOR BOLTS 136

LIVE LOAD BEARINGS 137

SPAN BALANCE..... 138

TRAFFIC GATES..... 143

REVISED 08/05/2009

BARRIER GATES 147

SUMP PUMP 150

TRAFFIC SURVEILLANCE..... 155

TRAFFIC SURVEILLANCE - GENERAL 155

GALVANIZED STEEL CONDUIT ATTACHED TO STRUCTURE..... 161

ELECTRIC CABLE NO. 19 - 6 CONDUCTORS OR 12 CONDUCTORS 162

TEMPORARY AND PERMANENT INSTALLATION OF 6C NO 19 CABLE 164

ELECTRICAL 165

BRIDGE ELECTRICAL 165

INTEGRATED BRIDGE CONTROL SYSTEM..... 214

SERVICE EQUIPMENT 246

PANELBOARDS AND DISTRIBUTION BOARDS..... 251

PACKAGED ENGINE GENERATOR SET 258

AUTOMATIC TRANSFER SWITCH 276

INTERIOR AND EXTERIOR BUILDING LIGHTING AND RECEPTACLES 287

CCTV DISTRIBUTION SYSTEM 294

CCTV EQUIPMENT 296

ADDRESSABLE FIRE ALARM SYSTEM 310

SUBMARINE CABLES..... 336

VECTOR-CONTROLLED MOTOR DRIVES 345

ACCEPTANCE TESTING 357

BRIDGE TEMPORARY POWER AND CONTROLS DURING CONSTRUCTION..... 360

BRIDGE OPERATION AND MAINTENANCE DURING CONSTRUCTION..... 374

FIBER OPTIC CABLE, SINGLE MODE..... 378

FIBER OPTIC SPLICE..... 392

CLEANING AND PAINTING CONTACT SURFACE AREAS OF EXISTING STEEL STRUCTURES..... 395

CLEANING AND PAINTING NEW METAL STRUCTURES..... 400

CLEANING AND PAINTING EXISTING STEEL STRUCTURES..... 408

CONTAINMENT AND DISPOSAL OF LEAD PAINT CLEANING RESIDUES..... 427

DECK SLAB REPAIR..... 447

BRIDGE DECK LATEX CONCRETE OVERLAY..... 452

REMOVAL OF EXISTING NON COMPOSITE BRIDGE DECKS..... 461

STRUCTURAL REPAIR OF CONCRETE 462

ALKALI-SILICA REACTION FOR CAST-IN-PLACE CONCRETE (BDE) 470

ALKALI-SILICA REACTION FOR PRECAST AND PRECAST PRESTRESSED CONCRETE (BDE) 473

REVISED 08/05/2009

APPROVAL OF PROPOSED BORROW AREAS, USE AREAS, AND/OR WASTE AREAS INSIDE ILLINOIS STATE BORDERS (BDE) 475

CEMENT (BDE) 475

CONCRETE ADMIXTURES (BDE) 478

CONCRETE MIX DESIGNS (BDE) 481

CONSTRUCTION AIR QUALITY - DIESEL VEHICLE EMISSIONS CONTROL (BDE) 482

CONSTRUCTION AIR QUALITY - IDLING RESTRICTIONS (BDE)..... 483

DETERMINATION OF THICKNESS (BDE)..... 484

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE) 495

DOWEL BARS (BDE) 502

EPOXY PAVEMENT MARKINGS (BDE)..... 502

EQUIPMENT RENTAL RATES (BDE)..... 504

HOT-MIX ASPHALT - FIELD VOIDS IN THE MINERAL AGGREGATE (BDE)..... 505

HOT-MIX ASPHALT – PLANT TEST FREQUENCY (BDE)..... 506

HOT-MIX ASPHALT – TRANSPORTATION (BDE) 507

IMPACT ATTENUATORS (BDE)..... 508

IMPACT ATTENUATORS, TEMPORARY (BDE)..... 509

LIQUIDATED DAMAGES (BDE)..... 511

METAL HARDWARE CAST INTO CONCRETE (BDE)..... 511

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM / EROSION AND SEDIMENT CONTROL DEFICIENCY DEDUCTION (BDE) 512

NIGHTTIME WORK ZONE LIGHTING (BDE) 513

NOTIFICATION OF REDUCED WIDTH (BDE) 515

PAVEMENT MARKING REMOVAL (BDE)..... 515

PAYMENTS TO SUBCONTRACTORS (BDE) 515

PAYROLLS AND PAYROLL RECORDS (BDE)..... 516

PERSONAL PROTECTIVE EQUIPMENT (BDE) 517

POLYUREA PAVEMENT MARKING (BDE)..... 518

REFLECTIVE SHEETING ON CHANNELIZING DEVICES (BDE) 525

REINFORCEMENT BARS (BDE) 525

REINFORCEMENT BARS - STORAGE AND PROTECTION (BDE)..... 526

RETROREFLECTIVE SHEETING, NONREFLECTIVE SHEETING, AND TRANSLUCENT OVERLAY FILM FOR HIGHWAY SIGNS (BDE)..... 527

SEEDING (BDE) 533

SELF-CONSOLIDATING CONCRETE FOR PRECAST PRODUCTS (BDE)..... 535

REVISED 08/05/2009

SIGN PANELS AND SIGN PANEL OVERLAYS (BDE) 536

SILT FILTER FENCE (BDE) 536

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE) 537

TEMPORARY EROSION CONTROL (BDE) 537

THERMOPLASTIC PAVEMENT MARKINGS (BDE) 538

TRAINING SPECIAL PROVISIONS 539

TYPE ZZ RETROREFLECTIVE SHEETING, NONREFLECTIVE SHEETING, AND TRANSLUCENT
OVERLAY FILM FOR HIGHWAY SIGNS (BDE) 541

STEEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID) 546

CLOSED CIRCUIT DOME VIDEO CAMERA 550

JUNCTION BOX EMBEDDED IN STRUCTURE 556

SECTION 801. ELECTRICAL REQUIREMENTS 557

SECTION 810. UNDERGROUND RACEWAYS 561

SECTION 811. EXPOSED RACEWAYS 562

SECTION 819. TRENCH AND BACKFILL FOR ELECTRICAL WORK 562

SECTION 1066. WIRE AND CABLE 563

SECTION 1088. WIREWAY AND CONDUIT SYSTEM 564

FIBER OPTIC CABLE INNERDUCT 568

REVISED 08/05/2009

GENERAL

RECORD DRAWINGS

The Record Drawings for the existing Congress Parkway Bridge over the South Branch of the Chicago River are available at the Illinois Department of Transportation, District 1 Office, 201 West Center Court, Schaumburg, IL 60196. Contact: Brian Kuttub at 847-705-4431.

GENERAL CONSTRUCTION PROCEDURES

Description. The Contractor shall complete all construction operations according to the Contract Plans, applicable Standard Specifications, Detailed Specifications, and as directed by Engineer. The Contractor shall not commence with construction operations until the required obligations for structural stability, verification of dimensions; procedure requirements, and systems coordination as detailed in these specifications are fulfilled to the satisfaction of the Engineer.

Structural Stability. The Contractor shall be responsible for the stability of the movable spans in all phases of construction. Prior to the replacement of steel members detailed on the Structural Drawings, the Contractor shall submit a construction procedure showing each step of the removal and replacement process. The Contractor shall also submit calculations sealed by a Licensed Structural Engineer registered in the state of Illinois showing that all members will remain stable and not become overstressed during any step of the removal and replacement process. All submittals shall be approved by the Engineer prior to replacement of steel members.

Verification of Dimensions. Plan dimensions and details relative to the existing structure have been taken from existing plans and are subject to nominal construction variations. It shall be the Contractor's responsibility to verify such dimensions and details in the field and make the necessary approved adjustments prior to construction or ordering of materials. Such variations shall be submitted to the Engineer and shall not be cause for additional compensation for a change in Scope of Work. However, the Contractor will be paid for the quantity actually furnished at the unit price bid for the work.

Procedure Requirements. The Contractor shall note that to accommodate the bridge rehabilitation of the movable spans, a shoring system has to be installed to ensure that the bascule bridge leaves remain locked in an open (or raised) position for the duration of the Bascule Bridge Rehabilitation. The temporary system details are not shown in the contact plans, but will need to be developed by the Contractor and submitted for approval.

The Contractor shall complete all construction operations detailed in the Contract Plans and Specifications which includes for navigational requirements that both leaves of the bridge under construction be either locked in the open position, capable of being raised by temporary controls or any combination thereof as indicated in the plans "Staged Construction Details" or as approved by the engineer. The bridge open to traffic will remain operational.

Each of the leaves may need to be moved, re-positioned, re-balanced and shored at strategic stages during construction. When the bascule bridge leaves must be closed (or lowered) to facilitate a required construction operation or as directed by the Engineer, the

Revised 08/05/2009

Contractor shall submit bridge balancing and stress calculations sealed by a Licensed Structural Engineer registered in the state of Illinois showing that the bridge will remain stable and not become overstressed during any stage of the bridge lowering (and subsequent raising) process. The Contractor shall note that intermediate bridge lowerings may be required for select truss member rehabilitation. All submittals shall be approved by the Engineer prior to a bridge lowering.

Bridge Operations. For the duration of the project, it will be the Contractor's responsibility to maintain the entire bridge and all its systems, by a qualified master electrician to facilitate construction and to satisfy navigational requirements. The contractor shall provide adequate number of personnel and equipment for the safe operation of the bridge as directed by the Engineer. Currently, the City of Chicago Department of Transportation (CDOT) maintains and operates the bridge for the Illinois Department of Transportation (IDOT). At the onset of the project, a maintenance transfer will be conducted between the contractor, the Engineer and the City of Chicago. At that time, the City will cease operational repairs and maintenance responsibility for both bridges, which will be turned over to the contractor. CDOT responsibility is limited to the opening and closing of the bridges, or portions thereof, that is not under construction and will provide the necessary traffic control and personnel during the opening and closing of the bridges during the bridge lift season and any other times as requested by the Engineer.

Should the contractor training of client personnel for the rehabilitated bridge not be completed when the bridge under construction is open to traffic the contractor will be responsible for opening and closing the rehabilitated bridge however CDOT will coordinate the lift and provide the necessary traffic control and personnel. Attached FOR INFORMATION ONLY is a copy of the Spring 2009 Bridge Lift Schedule. . The Congress Parkway Bascule Bridge is raised and lowered approximately forty (40) times a year. The 2010 and 2011 scheduled number of lifts is not yet available, but anticipated to be similar. The Contractor will maintain the entire bridge structure until the project is accepted by IDOT. The maintenance responsibility shall include, but not be limited to, greasing, adjusting, resetting breakers, protection of open gearing from debris, balancing, structural stability, etc. Attached FOR INFORMATION ONLY is CDOT's Operation Sequence for Congress Parkway Bridge.

Submittals. The Contractor shall be required to submit all required shop drawings and other required submittals in accordance with the Standard Specification Section 105.04 and other pertinent sections except that these submittals shall commence within 3 weeks after the execution of the contract. The Engineer will provide review comments within 30 calendar days after receipt of the "COMPLETE" submittal. All electrical and mechanical submittals shall include IDOT District 1 Submittal Record & Transmittal Form No. D1 OP0006. Upon completion of the work, the Contractor shall submit to the Engineer two (2) full size Mylar sets of As-Built Plans as well as two (2) electronic copies including an index and table of contents.

Basis of Payment. The cost of complying with the requirements of this specification section shall be considered included in the cost of the pay items in this contract

Revised 08/05/2009

5. Basis of Machinery Design

The design of new machinery shall conform to the applicable requirements of AASHTO Standard Specifications for Movable Highway Bridges, 1988 (1988 AASHTO).

The design of the operating machinery is based upon the new 75 H.P A.C electric motors operating at **404** rpm and a maximum torque not exceeding 150% of rated full load torque.

6. Operating Parameter

- A. The operating machinery is designed to open both leaves of the bascule span 77 degrees with respect to the fully closed position under Load Conditions A, B and C as specified in Paragraph 2.5.3 of 1988 AASHTO.
- B. All machinery components shall be suitable for operation in ambient temperatures of minus –20 degrees Fahrenheit to plus 120 degrees Fahrenheit. This shall be accomplished by using suitable lubricants and/or heaters.
- C. All components shall be capable of functioning normally throughout the full angle of operation.

7. Measurements and Verifications

- A. Dimensions indicated on the Contract Drawings are nominal and are intended for guidance only. All variations from the nominal dimensions on the Contract Drawings shall be noted on the shop drawings.
- B. The Contractor shall verify all dimensions of the existing bridge machinery to remain, structure, and foundation relating to the new machinery and shall record them on the shop drawings.

8. Substitutions

- A. If any departures from the Contract Drawings or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted in writing as soon as practicable to the Engineer for review. No such departures shall be made without written approval of the Engineer.
- B. Shop Inspection and Testing
 - 1. Visual inspection of the shop-assembled machinery and associated components shall be made by, and shop tests shall be witnessed by the Engineer. The Contractor shall give not less than ten (10) working days notice to the Engineer of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Engineer has been notified per the above.

Revised 08/05/2009

OPERATING MACHINERY

2. DESCRIPTION

The work shall consist of furnishing all labor, materials, plants and incidentals required to rehabilitate the operating machinery in accordance with the Plans, Specifications, and the directions of the Engineer.

Work shall include, but not be limited to, the following tasks:

1. Replacement of electric motor assembly, motor pinion and all associated components.
2. Replacement of motor brakes and all associated components.
3. Replacement of machinery brakes and all associated components.
4. Refurbishing pinion bearings and replacement of pinion bearing cap bolts.
5. Complete cleaning of all open gearing and all associated components.
6. Replacement of existing lubrication fittings, associated piping and supports components
7. Painting and lubrication of all existing and new operating machinery components including all machinery support framing.

3. MATERIALS

MAIN MOTOR

The drive motors shall be vector duty motors. They shall be built in strict accordance with NEMA publication MG-1 and designed for use with an IGBT AC closed loop vector control. They shall be 3 phase 60 hertz, with moisture resistance insulation, 50 degree C ambient temperature, and capable of reversing. Motor frame shall be constructed of cast ductile iron conforming to ASTM A874.

- | | |
|---------------------|-----------------|
| 1. Horsepower: | 75 HP |
| 2. Nominal Voltage: | 480 VAC primary |
| 3. Nominal speed: | 404 RPM |
| 4. Duty: | 60 minute |
| 5. Frame size: | 444T |
| 6. Insulation: | HHH |
| 7. Service Factor: | 1.0 |

- B. The motors shall be totally enclosed non-ventilated construction, with re-greaseable ball bearings, moisture resistant insulation and internal space heaters sized by manufacturer.
- C. The motor shall have a special extended shaft as shown on the mechanical contract drawings to accommodate the motor coupling on one end and a rear mounted encoder on the other. A drain hole of not less than 1/2 inch diameter shall be provided at the bottom of the motor.

Revised 08/05/2009

- D. All winding shall be copper. The motor shall be capable of having a minimum breakdown torque of 275%. Motor must have a speed range of 1000: 1 and be capable of having full torque at zero speed. Motor design shall be low inertia and slip design with a N/O temperature sensor in the windings. Motors must have a minimum construction of 8 poles.
- E. Motor encoder shall be an industrial magneto-resistive type (glass encoder wheels are not acceptable). The encoder shall have a resolution of 1024 ppr with 12 volt DC power and be compatible with the Magnetek vector control drive. Separate terminal box with terminal strip for feedback unit.
- F. The conduit boxes shall be liberally sized and located to avoid interference with the machinery. The conduit boxes shall be sized in accordance with the requirements of the NEMA MG 1-1987 PART 11.
- G. The motors shall be designed and manufactured in the United States of America. All motors must be hand wound and assembled and meet the buy American act.
- H. All motors must be manufactured to the following standards:
 - 1. IEEE Marine Standards No. 45.
- I. Modifications needed to meet the requirements of these specifications are as follows:
 - 1. All aluminum parts - chemical film (MIL-C-5541) and zinc chromate primer (MIL-P- 8595).
 - 2. Cadmium plate shaft and hardware (FED-QQ-P-416).
 - 3. Re-greasable ball bearings.
 - 4. Screens over all openings - 3 x 3 mesh - galvanized (drip-proof protected only).
 - 5. Seal all joints and eye bolt holes.
 - 6. Sealed leads in terminal box (waterproof - TENV and TEFC only).
 - 7. Shaft seals (waterproof - TENV and TEFC only).
 - 8. Removable drain plugs (waterproof - TENV and TEFC only).
 - 9. Final coat of epoxy paint
 - 10. Corrosion resistant coating - rotor and stator laminations.
 - 11. Stainless steel nameplate.

Revised 08/05/2009

12. Super 'H' insulation. Includes protection against fungus growth per MIL-V-173B.

- J. The motor frame shall be finished with a corrosion-resistant paint or coating. Exposed unpainted metal surfaces shall be of a corrosion-resistant material.
- K. Motor must be designed to operate at carrier frequencies up to 20 kHz.
- L. All motors must be dynamically balanced.
- M. One motor shall be subjected to a full load heat run test and the other to a routine test in accordance with the current requirements of the NEMA MG 1-1987 PART 12, and IEEE STD 112-1984. The data, including that required by the submission section of this specification, shall be certified and submitted to the Engineer on the IEEE forms. The Engineer shall be notified of the time and place of the testing at least three weeks in advance of the testing. The Engineer shall determine if the motors are as specified and in accordance with requirements and if the two motors are substantially identical.
- N. After entire motor, brake and control system installation, the contractor shall perform a speed/current test to demonstrate that the motor functions properly and provides the specified operating characteristics as called out in the testing section of this specification. The data shall be recorded on a chart recorder and include acceleration, deceleration, full speed, reduced speed and creep speed.

AC SPEED SWITCH

For AC speed switch specifications, see electrical specifications.

MOTOR PINION

Motor pinion shall be as shown on contract plans and elsewhere in these special provisions for mechanical items.

- A. The motor pinion shall have a 14-1/2 degree full-depth, involute cut teeth in accordance with the proportions of ANSI/AMGA 201.02.
- B. The motor pinion shall have 17 teeth, 5.6667 pitch diameter, 3 diameter pitch.
- C. The teeth shall be cut from solid rims or blanks. The sides of all pinions shall be furnished and the pitch circle shall be inscribed on both sides not less than 0.02 inch deep with a v-pointed tool. The walking surfaces of all pinion teeth shall be true to the proper outline, accurately spaced on the true pitch circle, exceptionally smooth, and free from planning or milling cutting ridges. Cutter burrs shall be removed from all edges of the teeth and the top of the edges shall be rounded to a 1/32-inch radius.

Revised 08/05/2009

- D. All gears shall be cut and mounted to meet the requirements for accuracy of AGMA Standard 390.02, AGMA Gear Classification Manual. The pinion shall conform to AGMA Quality No. 6.
- E. The motor pinion shall be ASTM A668 Class J Forging, SAE 41L40 heat treated (quenched, tempered and stress-relieved). The CVN impact toughness of the pinion in the radial direction of the bar (not the longitudinal direction) shall be 25ft-lbs at 40°F.
- F. The pinion shall have 63 micro-inch surface finish on contacting surfaces of all gear teeth.

COUPLINGS

- A. The couplings connecting the motor brakes to the AC motor speed switch, shall be Jaw In-Shear type LS095, Style 1 with a 5/8" bore, as manufactured by Lovejoy, Inc. or Engineer approved equal.
- B. The coupling retaining ring shall be cast stainless steel.
- C. The couplings shall be provided as a complete assembly from the manufacturer including all Coupling lubricant and its maintenance shall be specified by the manufacturer.
- D. The faces of all couplings shall be machined fitted. The parts of each coupling shall be fitted together and match-marked prior to shipment. Couplings shall be installed on their shafts by the manufacturer of the connecting equipment.

MACHINERY BRAKES

- A. Brakes shall be 35 3/8-inch type SBZ 14.31-900 x 30-ED 501/8 Dual Caliper Disc Brake with an external torque spring.
- B. Brake hubs shall be Type N360-900 x 30. The brake disc shall be fully machined to the dimensions and tolerances required for the application. The hubs and disc shall be fully compatible with the required brake performance and guaranteed by the Contractor.
- C. Brake actuators shall be Eldro type ED 501/8 as manufactured by Bubenzer Bremsen or Engineer approval equal. All requests for substitutions shall be clearly called out and technical data, catalogue information, drawings, cut-away view and maintenance manuals shall be provided with bid proposal.
- D. The brakes shall include but not limited to the following features:
 - 1. Adjustable external torque spring with a maximum torque setting of 20,283 ft-lbs. Brakes shall be set in the field at 17,000 ft-lbs.

Revised 08/05/2009

2. Manual hand release lever.
3. Limit switches for brake release control, set control and manual release control.
4. Nitride corrosion protecting finish for all steel components.

MOTOR BRAKES

- A. Brakes shall be 13-inch, type EBN 315-80/6 heavy duty rated industrial drum brake with an external torque spring.
- B. Brake wheels shall be supplied with the motor brakes and manufactured from ASTM A732 Grade 5N cast steel with a CVN impact toughness of 25 ft-lbs at 40°F. The wheels shall be fully machined to the dimensions and tolerances required for the application. The wheels shall be fully compatible with the required brake performance and guaranteed by the Contractor.
- C. Brake actuators shall be Eldro type ED 80/6. All requests for substitutions shall be clearly called out and technical data, catalogue information, drawings, cut-away view and maintenance manuals shall be provided with bid proposal.
- D. The brakes shall include, but not limited to the following features:
 1. Automatic wear compensation of shoes.
 2. Adjustable external brake torque spring with a maximum torque setting of 1217 ft-lbs. Brakes shall be set in the field at 700 ft-lbs.
 3. Manual hand release lever.
 4. Limit switches for brake release control, set control and manual release control.
 5. Nitride corrosion protection finish for all steel components.

PINION BEARINGS

The pinion bearing cap bolts and nuts shall be replaced in-kind.

The Contractor shall prepare a detailed procedure and drawings for removal and replacement of the main pinion bearings for approval by the Engineer.

OPERATING MACHINERY SUPPORTS

- A. The new operating machinery supports for the main motor, motor brakes and the AC Speed Switch shall be steel weldments fabricated according to the Contract Plans.
- B. The new operating machinery supports shall be tested according to the welding requirements specified herein prior to installation.

Revised 08/05/2009

LUBRICATION FITINGS AND PIPINGS

- A. Standard lubrication fittings and associated piping for pressure system of the lubrication shall be provided for all components and surfaces requiring external lubrication. Giant button head fittings shall be used except where otherwise specified here-in or as directed by the engineer.
- B. Pressure fittings shall be rated at a minimum of 10,000psi.
- C. Fittings shall contain a stainless steel check valve that will receive grease and close against back pressure.
- D. Fittings and piping shall conform to the requirements as previously described within these specifications.

4. CONSTRUCTION REQUIREMENTS

General

- A. All requests for submission shall be clearly called out and technical data, catalog information, drawings and the maintenance manuals shall be provided with the bid proposal.
- B. Sufficient notice shall be given to the Engineer at the beginning of work at foundries, forge and machine shops so that an inspection may be arranged. It shall be the responsibility of the Contractor to provide free access to all premises where the preparation, manufacture or assembly is conducted.
- C. Such inspections are to facilitate work and help avoid errors, but such inspections do not relieve the Contractor of his obligation to assure compliance to Plans and Specifications, nor do these inspections relieve him of his obligation to replace defective materials and workmanship.

Motor Pinion

- A. The Contractor shall provide a 63 micro-inch surface finish on contacting surfaces of all gear teeth.
- B. The motor pinion shall have an FN2 fit with the custom motor shaft.
- C. Contractor shall furnish new cap plate for motor pinion. Cap plates shall be second to the motor pinion by set screws.
- D. The contractor shall furnish and install new keys for the motor pinions.
- E. The motor, pinion, cap motors and set screws shall be mounted in the machine shop.

Revised 08/05/2009

Couplings

- A. The couplings shall be installed on shafts and aligned within the coupling manufacturer's recommendation for gap, parallel offset and angular offset.

Motor Brakes

- A. Brake wheels shall be provided with keys. Keys shall be sized to fit new brake wheel and the new motor shaft. Key dimensions shall be verified in the field before machining of the brake wheel and key. Keys shall conform to ASME/ANSI B17. 1
- B. All brakes shall be installed according to the manufacturer's recommendations.
- C. The brakes shall be adjusted to the torque settings specified on the Plans.
- D. The new brake support dimensions shall be verified by the contractor prior to the fabrication of supports.
- E. The locations for the new brake supports connections to the existing machinery support shall be as shown on the contract plans.
- F. The new shims are to be installed to aid in the positioning and the brakes to the proper height.
- G. Shims shall conform to the requirements as previously described within these specifications.

Machinery Brakes

- A. The brakes shall be adjusted to the torque settings specified on the Plans.
- B. All brakes shall be installed according to the manufacturer's recommendations.
- C. The contractor shall remove the existing cam limit switch gear set on the existing brake shafts before brake installation, The cam limit switch gear set shall be cleaned completely with solvents, lubricated and re-installed.
- D. Cam limit switch gear set shall be reinstalled after cleaning and brake installation.
- E. Brake hubs and discs shall be provided with keys. Keys shall be sized to fit new brake wheel and the new motor shaft. Key dimensions shall be verified in the field before machining of the brake wheel and key. Keys shall conform to ASME/ANSI B17. 1
- F. All new brake support dimensions shall be verified by the Contractor prior to fabrication.
- G. The contractor shall cut the brake support plates to fit the existing Cam Limit Switch supports at locations where applicable. The contractor shall cut the existing grating to fit the brake support at each location.

Revised 08/05/2009

- H. Connection of the new brake support to the existing machinery frame shall conform to high strength ASTM A 325 bolts. Connection of the brake to the new brake support shall be high strength turned bolts conforming to ASTM A 490.
- I. The new machinery support shall be installed as shown on the Plans. The contractor shall notify the engineer of any conflict during connection of the new machinery supports and the existing machinery frames.
- J. The new shims are to be installed to aid in the positioning and the brakes to the proper height.
- K. Shims shall conform to the requirements as previously described within these specifications.
- L. Contractor shall cut the brake support to fit the brake disc.

Pinion Bearings

- A. The pinion bearings, associated bearing blocks and cap bolts are corroded at several locations. The Contractor shall disassemble each pinion bearing cap. The bearing blocks shall be match marked and sent to an approved machine shop for complete cleaning and restoration.
- B. Cleaning of the bearing block outer surfaces shall be cleaned to bare metal.
- C. The bore bushings shall be cleaned and inspected.
- D. Lubrication piping and fittings shall be replaced in-kind.
- E. The Contractor shall prime and paint the non-contact surfaces. New bearing liners (shims) and new turned bolts shall be replaced in-kind.
- F. The Contractor shall re-install align, and adjust the pinion bearings at each match marked location.
- G. All shims required shall be furnished to align the pinion bearings.

Cleaning of Open Gearing

All surfaces shall be cleaned of all dirt, rust, scale, grease and other foreign matter first with solvents and then by wire brushing or other approved means prior to lubrication.

- A. Contractor shall completely clean all open gearing teeth surfaces to bare metal. The cleaning shall include also include the include the racks, tooth surfaces and the sides of all gears And other areas directed by the engineer. Cleaning shall initially be done with approved solvents and brushes.

Revised 08/05/2009

- B. The tooth surfaces shall then be restored by hand grinding and hand polishing to a surface finish of 63 micro-inch. The contractor shall then re-apply an approved lubricant to the surfaces, when polishing and restoration surfaces work has been approved and accepted by the Engineer.
- C. The procedure to restore the open gear tooth surfaces shall be submitted to the Engineer for approval.

5. METHOD OF MEASUREMENT

Payment of this Item shall be made on a Lump Sum Basis.

6. BASIS OF PAYMENT

The contractor shall submit to the Engineer a detailed breakdown of costs under this Item. The Engineer shall evaluate this breakdown and the basis of payment be made in the following manner:

- A. Upon completion and acceptance by the Department of shop fabrication, inspection and testing as well as delivery of materials to site, the Contractor will be paid 30%
- B. Upon completion and acceptance by the Department of al disassembly, refurbishing, installation, inspection and testing of all Operating Machinery Items, the Contractor will be paid 20% of the bid price for the Item.
- C. Upon Completion and final acceptance by the Department of the Installation and field testing, the Contractor will by Paid 30% of the bid price for the Item.
- D. Upon completion, acceptance and final submittal of the Operation and Maintenance Manual, training of Maintenance personnel, the Contractor will be paid the remaining 20% of the bid price for this Item.

The lump sump price for the Item, "**OPERATING MACHINERY**" shall include the cost of furnishing all labor, materials, spare parts, plant, testing adjusting and equipment required including all necessary incidentals for the work herein described and as shown on the Contract Plans for complete Installation.

Progress payment for satisfactory work shall be in accordance with Standard Specification, IDOT standard payment practices and the direction of the Engineer.

REPLACEMENT OF CENTER LOCKS

6. DESCRIPTION

The work under this item shall consist of removal and disposal of all existing center lock components and associated electrical components furnishing, installation aligning, adjusting, testing and painting of new center locks. The center lock components to be removed shall include but not limited to the following:

Revised 08/05/2009

F. Quality Assurance

1. The complete control system shall be functionally tested, in the manufacturer's shop, to assure completeness and correct operation. The shop test shall be conducted prior to shipment. The shop test shall be witnessed by the Engineer. Following testing, the Engineer shall determine if the system is approved for shipping, or if corrections and further testing is needed.
2. Testing shall include simulation of all control functions. Inputs from field devices shall be simulated with toggle switches and outputs shall be simulated with indicator lights or relays.
3. The Contractor shall prepare and submit for approval a shop test procedure and schedule. Thirty (30) calendar days' advance notice shall be given to the Engineer so that the arrangements may be made. The shop test procedure shall be a step-by-step description of manual actions or simulations and the expected control response, output, or sequence of outputs. The shop test procedure will not be acceptable for the final acceptance test procedure.

G. References:

1. The fabrication materials and methods shall comply with the following codes and NFPA 79 Electrical Standard for Industrial Machinery and NFPA 70.

II. MATERIALS

A. Enclosures

1. Control Desks (E-CC-1, W-CC-1 & Bridge Power, Lighting & CCTV Control Desk)
2. **Desk shall be a 12-gauge steel enclosure with doors in the front and a hinged sloping top. Enclosure dimensions shall measure as shown on plans. The enclosure top/operating panel shall be 10-gauge, 316 stainless steel with a brushed non-reflective finish. The supporting and enclosing structure shall be welded steel construction reinforced with angles and channels in the interior to form a rigid, freestanding console unit.**
3. The interior framework shall provide support for instruments and permit control desk lifting without racking, distortion or deterioration of the structural integrity of the completed assembly. Removable lifting rings shall be furnished, designed to facilitate simple safe rigging and lifting of the enclosure during transportation and installation. Plugs shall be furnished and installed to unobtrusively fill the lifting rings holes when substituted for the lifting rings after installation is complete.

Revised 08/05/2009

FIBER OPTIC CABLE INNERDUCT

1. DESCRIPTION.

This item shall consist of furnishing, installing, splicing, connecting and demonstrating continuity of fiber optic cable innerduct of sizes specified herein and as shown on the contract drawings. The innerduct shall be High Density Polyethylene.

2. MATERIALS.

2.1 General:

The duct shall be a spiral ribbed 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 ribbed duct shall have internally designed longitudinal ribs for reduced pulling frictions and increased lubrication effectiveness

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 3035. The innerduct material shall be composed of high density polyethylene meeting the requirements of PE334470E/C as defined in ASTM D3350.

Submittal information shall demonstrate compliance with the details of these requirements.

2.2 Dimensions:

Duct dimensions shall conform to the standards listed in ASTM D3035, SDR-11. Submittal information shall demonstrate compliance with these requirements.

Nominal Size (Diameter)	Inside Diameter (minimum)	Outside Diameter (Average)	Wall Thickness (Min.)	Bend Radius (minimum)	Pull Strength	Weight Average (Lbs/100 ft.)
1"	1.030"	1.315"	0.120"	14"	500	19
1.25"	1.313"	1.660"	0.151"	17"	750	31
1.5"	1.506"	1.900"	0.173"	19"	1000	40
2"	1.885"	2.375"	0.216"	24"	1600	60

2.3 Marking:

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 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.

Added 08/05/2009

2.4 Color:
 Innerduct shall be colored as follows or as directed by the Engineer.

Usage Designation	Color
Fiber Optic Trunk Cable (Ducts containing cables of 96 fibers)	Orange
Fiber Optic Distribution Cable (Ducts containing cables of 6 or 4 fibers and 96 fiber ducts designated as distribution fibers)	Blue

3. INSTALLATION.

3.1 Pulling Tension.

Pulling tension of the duct shall be monitored throughout the pull and pulling tension shall not exceed those listed in the table or the specific manufacturer maximum pulling tensions as indicated in the catalog cut submittals. Failure to monitor the pulling tension will result in non-payment of that particular duct span and the span may be reinstalled with new duct at no additional cost to the State. Lubricants used shall be compatible with the duct.

3.2 Junction boxes.

Where duct passes through junction and/or pull boxes, the duct shall remain continuous unless a break is specifically indicated in the plans or as directed by the Engineer.

3.3 Handholes.

Where duct passes through handholes, the duct shall be looped uncut within the handhole unless otherwise indicated on the Plans or directed by the Engineer.
 Bends.

Minimum bending radius shall be in accordance with the above table or the manufacturer's recommended radius, whichever is larger. Bends shall be made so that the duct will not be damaged and the internal diameter of the duct will not be effectively reduced. The degrees of bend in one duct run shall not exceed 360° between termination points.

3.4 In Trench

Where duct is installed in trench, it shall be placed in the bottom of the trench after all loose stones have been removed and all protruding stones have been removed or covered with backfill material as directed by the Engineer.

Added 08/05/2009

Where duct is shown to be installed in trench, it shall be installed at a depth not less than 30 inches unless otherwise indicated or specifically directed by the Engineer.

Where the specification for trench and backfill permits plowing in lieu of trench and backfill, the unit duct may be plowed into place. Unless otherwise indicated or specifically approved by the Engineer, plowing of unit duct shall lay the duct in place and shall not pull the duct through the length of the cut behind a bullet-nose mandrel or similar apparatus. In all cases, plowing operations shall be non-injurious to the duct.

3.5 In Raceway

Where duct is installed in raceways, lubricating compounds shall be used where necessary to assure smooth installation.

3.6 Encased in Concrete

Concrete shall be class SI complying with Section 720 of the Standard Specifications.

Steel Reinforcement Bars. Steel reinforcement bars shall comply with Section 706.10 of the Standard Specifications.

Underground concrete-encased conduit shall be supported on interlocking plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct bank shall be not less than 2 inches. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3 inches all around the encased run. Space below the conduit and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

Conduit encased in concrete shall have steel reinforcing where installed below roadway or other paved vehicle areas (including shoulder) and the reinforcement shall extend not less than 5 feet additional from the edge of pavement unless otherwise indicated. Steel reinforcement shall not be less than No. 4 bars at corners and otherwise spaced on 12-inch centers, tied with No. 4 bars on 12-inch centers.

The Engineer shall examine all conduit joints for compliance with section 5 of this specification before concrete is poured.

Added 08/05/2009

3.7 Embedded

Conduit embedded in structure shall be supported on interlocking plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common structure shall be not less than 2 inches. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3 inches all around the embedded run. Space below the conduit and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

The Engineer shall examine all conduit joints for compliance with section 5 of this specification before concrete is poured.

4. Joints

4.1 All HDPE duct to HDPE duct joints shall be made with an approved duct fusion splicing device.

4.2 HDPE coilable non-metallic conduit to non-HDPE coilable non-metallic conduit joints shall be either made with an approved mechanical connector or with a chemical compound. Both methods must be specifically designed for joining HDPE coilable non-metallic conduit. Minimum pullout force for the chemical compound shall be as listed in the following table.

Nominal Size		Pullout Force	
mm	in	N	Lbs
31.75	1.25	2400	540
38.1	1.50	2535	570
50.8	2.0	3335	750
63.5	2.5	4445	1,000
76.2	3.0	6225	1,400
101.6	4.0	8890	2,000

Equipment Racks

Equipment racks shall conform to EIA-310 Standard for Cabinets, Racks, Panels, and Associated Equipment and accept equipment designed to mount in standard 19" wide with vertical heights in multiples of 44.65 mm (1.75") ("U") without modification or adaptation of either the rack or the equipment to be mounted therein. The racks shall be furnished without casters or rollers. The rack dimensions shall be a minimum of 1931 mm (76") high, 864 mm (34") deep, and a maximum of 610 mm (24") wide. The rack shall accommodate a total of 40U (70") of vertical equipment. All rack components,

Added 08/05/2009

excluding handles, hinges or other components made from corrosion-resistant materials or furnished with a plated or anodized coating, shall be fabricated from a steel of 20 gauge minimum, and primed and painted using an electrostatically applied polyester or enamel coating after welding is completed. A solid top shall be part of the frame, and the sides shall be solid, removable and lockable. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. Both front and back doors shall open to a full 90 degree angle from the face of the rack, and shall permit equipment to be inserted and removed from the rack without tilting it from the installed orientation. Front and back doors of racks installed side to side shall be able to open fully and simultaneously. Equipment rack shall be APC Model AR500HD or approved equal.

Equipment racks shall be equipped with all hardware required to mount standard 19" rack mounted equipment, and where a camera PTZ selector-controller is required, a pull-out shelf designed for use with such a controller shall be furnished as part of the equipment rack. Where equipment in the rack requires the use of a keyboard, mouse, or both, the rack shall be furnished with a pull out shelf for the keyboard, mouse, or both. Pull-out shelves for equipment control shall be mounted at a working height of 812 to 1067 mm (34 to 42").

Power Wiring

All 120 VAC distribution wiring that is entirely within the communication hut shall be made with NEC Type THHN/THWN cable rated for 600V, with a minimum wire gauge of 12 AWG. All conduits shall be a minimum of electrical metallic tubing (EMT), and all EMT conduit fittings shall be compression, not set-screw type. Outlet and junction boxes shall all be galvanized steel with galvanized steel faceplates or covers. All switches, receptacles, and other wiring devices shall be industrial specification grade.

Two 20-Ampere circuits from the UPS panel shall be dedicated to each equipment rack, and provide a minimum of 3 duplex receptacles per circuit at evenly spaced intervals for the entire height of the each rack. Plug Strips may be used within the equipment racks, but shall not reduce the number of duplex receptacles required per circuit. The plug strip housing shall be all metal and shall mount in the rack using the standard 19" rack and occupy no more than 1U in height. Plug Strips shall be Tripp-Lite PDU-1220 or approved equal.

Power Supplies for equipment requiring other than 120 VAC shall be manufactured by or approved in writing for that use by the maker of the equipment they are to serve. Power supplies shall be rack-mounted, or shall be bolted or otherwise mechanically attached to shelving designed for mounting in the equipment rack. Connections between the power supplies and the equipment they serve shall be made with PVC-jacketed cables. Unjacketed individual conductors shall not be permitted.

Added 08/05/2009

Coaxial Cable and Connectors

The coax cable shall be a Belden 1694A precision video cable, or approved equal complying with the following specifications. The coax cable shall be an 18 AWG, Solid Bare Copper conductor, Foam PE - Gas Injected Foam High Density Polyethylene insulation, Aluminum Foil-Polyester Tape-Aluminum Foil shield with 100% shield coverage plus tinned copper Braid Shield with 95% shield coverage, PVC - Polyvinyl Chloride jacket, RG Type 6/U, suitable for indoor and outdoor aerial applications.

Applicable Specifications: UL/NEC CMR, C (UL) CEC CMG.
 Flame Resistance: UL 1666 Vertical Shaft, CSA FT4.
 100% sweep tested, RG-6/U Type Precision Low Loss Serial Digital Video Coax. Coaxial. Brilliance. 75 ohm Precision Video Cables. SDI Digital video.

Electrical Characteristics:

Impedance:	75 +/- 1.5 OHMS
Nom. Inductance:	.106 MICRO-H/FT.
Nom. Capacitance Conductor Shield:	16.2 PF/FT.
Nom. Velocity of Propagation:	82 %
Nom.Delay:	1.24 NS/FT.
Nom. Conductor Dc Resistance @ 20 Deg. C:	6.4 OHMS/1000 FT.
Nom. Shield Dc Resistance @ 20 Deg. C:	2.8 OHMS/1000 FT.
Return Loss:	23DB MIN, 5 - 850 MHZ 21DB MIN, 851 – 3000 MHZ
Max. Operating Voltage:	300 VRMS (UL)

Nominal. Attenuation:

MHZ	DB/100 FT.	MHZ	DB/100 FT.
1	.24	180	2.42
3.58	.45	270	2.97
5	.54	360	3.43
7	.63	540	4.25
10	.72	720	4.95
67.5	1.57	750	5.00
71.5	1.60	1000	5.89
88.5	1.75	1500	7.33
100	1.84	2000	8.57
135	2.10	2250	9.14
143	2.16	3000	10.67

Added 08/05/2009

Physical Characteristics:

Temperature Rating:	- 30 TO + 75 DEG. C
Min. Bend Radius:	2.75"
Max. Pulling Tension:	69 LBS.
Nom. Weight/1000 Ft:	40 LBS.
Conductor Material & Dia:	18 AWG SOLID BARE COPPER .040" NOM.
Insulation Material & Dia:	GAS INJECTED FOAM HIGH DENSITY POLYETHYLENE .180" NOM.
Shield Type & % Coverage:	1ST LAYER - DUOFOIL(R) SHIELD TAPE, 100% COV. 2ND LAYER – TINNED COPPER BRAID, 95% COV.
Jacket Material & Dia:	PVC .275" NOM.
Jacket Color:	BLACK
Applicable Specifications:	UL/NEC: CMR C (UL)/CEC: CMG
Flame Resistance:	UL: 1666 VERTICAL SHAFT CSA: FT4

Coaxial connectors shall be BNC or as required by the equipment to which the cables connect. The connectors shall attach to the cable by crimping or by a cord-grip clamping action. Connectors shall be plated for corrosion resistance and good electrical connections. Connectors shall be Amphenol part number 31-70000 or approved equal.

Communications Cable and Connectors

Ethernet Cable shall be ANSI/TIA/EIA-568-B.2 Category 5e, UL verified to Category 5e, 4 twisted pair, 24 AWG bare copper with polyolefin insulation. The cable shall be unshielded with polyvinyl chloride (PVC) insulation. The cable shall be Belden part number 1500A or approved equal. The terminations shall be crimp-on RJ-45, Ideal Industries 85-396 or approved equal.

Single-mode fiber optic cable shall be furnished, installed, and terminated under the pay items for the single-mode fiber optic cable. Single mode fiber optic terminations inside the communication huts shall be made with Amphenol 942 series terminations or approved equal, or as required in the fiber optic cable special provision, whichever is more stringent. Single-mode fiber optic patch cables shall be absolutely minimized. If required, Single-mode fiber optic patch cables shall be Amphenol 942 series, ultra-polished, or approved equal.

Multi-mode fiber optic cable shall be used only for inter-equipment signal transmission within a particular subsystem. All multi-mode fiber optic cable shall be furnished as pre-manufactured patch cables, Amphenol 943 with 62.5/125 cable and 3mm jacket, or approved equal. Multimode fiber optic cable is included in the cost of this pay item and will not be paid for separately.

Cable Identification Materials

All cables, fiber optic cables, and individual conductors and fiber strands when broken out from a cable assembly shall be uniquely labeled in accordance with the Contractor's interconnection diagram. Labels shall be computer-printed and shall be waterproof and non-smearing. Labels shall be polyester adhesive wrap labels produced by the W. H. Brady Company or approved equal.

Added 08/05/2009

Interconnecting Wiring

All wiring, cabling, and other provisions necessary to connect the installed system package to power panel boards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location sub-system package.

All wiring and cabling, including fiber optic cabling, shall be suitably labeled, using the designation scheme as developed by the Contractor and approved by the Engineer.

Conduit and Electrical Cable

All exposed conduit, conduit attached to structures, shall be rigid galvanized steel PVC coated conduit of the size 2" and 4" or as indicated in the plans.

Conduit buried underground: Conduit in trench or conduit pushed shall be rigid galvanized steel conduit of the size 2" and 4" or as indicated in the plans.

Electrical cable shall be EPR-TYPR RHW of the size #6 AWG (phase, neutral and ground) or as indicated on the plans.

METHOD OF MEASUREMENT:

The Fiber Optic Cable Innerduct will not be measured. Payment will be made based on the amount bid for the item in the proposal.

BASIS OF PAYMENT:

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit.</u>
CCTV SYSTEM	Lump Sum

Payment for the Fiber Optic Cable Innerduct shall cover the cost of all labor, materials, plants, equipment and incidentals required to completely furnish, install, test, acceptance by local municipalities and place in satisfactory condition the components detailed in accordance with the Plans, Specifications, and directions of the Engineer.

Added 08/05/2009