Administration Building Entry Improvements For: Belvidere Township Park District 1006 West Lincoln Avenue, Belvidere, Illinois 61108



CODE ANALYSIS		SHEET INDEX
PROJECT DESCRIPTION : BELVIDERE TOWNSHIP PARK DISTRICT: ADMINISTRATION BUILDING SITE IMPROVEMENTS	REFERENCE CODES : BELVIDERE, ILLINOIS 2015 INTERNATIONAL BUILDING CODE (IBC) WITH AMENDMENTS 2018 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) 2018 ILLINOIS ACCESSIBILITY CODE (IAC) 2014 ILLINOIS STATE PLUMBING CODE 2014 NATIONAL ELECTRIC CODE 2015 INTERNATIONAL MECHANICAL CODE (IMC) 2015 INTERNATIONAL FIRE CODE (IFC)	GENERAL
		Interme Interme ARCHITECTURAL OA101 OVERALL FLOOR PLAN A101 ENTRY LEVEL FLOOR PLAN & D A201 BUILDING SECTIONS & DETAILS STRUCTURAL S100 ENTRY LEVEL SLAB & SLOPE P S101 ENTRY LEVEL FRAMING PLAN & ELECTRICAL ELECTRICAL E101 SITE ELECTRICAL & DEMO PLA E201 ELECTRICAL SCHEDULES & DE E302 ELECTRICAL SPECIFICATIONS E302 ELECTRICAL SPECIFICATIONS E302 ELECTRICAL SPECIFICATIONS E303 ELECTRICAL SPECIFICATIONS E304 ELECTRICAL SPECIFICATIONS E305 ELECTRICAL SPECIFICATIONS E306 ELECTRICAL SPECIFICATIONS E307 ELECTRICAL SPECIFICATIONS E308 ELECTRICAL SPECIFICATIONS E309 ELECTRICAL SPECIFICATIONS E301 ELECTRICAL SPECIFICATIONS E302 ELECTRICAL SPECIFICATIONS E303 ELECTRICAL SPECIFICATIONS E304 ELECTRICAL SPECIFICATIONS E305 ELECTRICAL SPECIFICATIONS



Ollmann Ernest Martin Architects & Engineers 200 South State Street Belvidere, Illinois 61008 815-544-7790 Phone Professional Design Firm License No. 184-004048

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		GENERAL NOTES		
		DO NOT SCALE DRAWINGS, WRITTEN DIMENSIONS TAKE PRECEDENCE. CONTACT ARCHITECT IF ANY		┝ <u>─</u> ─ └ ⊥ ┘
		DISCREPANCIES OCCUR. THE ARCHITECT DOES NOT SUPERVISE, WILL NOT BE		SHE
		RESPONSIBLE FOR AND WILL NOT HAVE CONTROL OF CONSTRUCTION MEANS, METHODS, TECHNIQUES, OR PROCEDURES, OR FOR SAFETY PRECAUTIONS.	Ĺ	VEK
		ALL CONTRACTORS SHALL BE RESPONSIBLE FOR WORK COMPLYING WITH LOCAL CODES.		O 202 [.]















BUILDING CODE

DESIGN LOADS:	
RISK CATAGORY	II
WIND FACTOR	1.0
SNOW FACTOR	1.0
SNOW THERMAL FACTOR	1.2
SEISMIC FACTOR	1.0
ROOF LIVE LOAD	20 PSF
GROUND SNOW LOAD	25 PSF
MINIMUM ROOF SNOW LOAD	21 PSF
WIND SPEED	115 MPH ULTIMATE
WIND EXPOSURE CATEGORY	В
	_
SEISMIC SITE CLASS:	D
SPECTRAL RESPONSE ACCELERATION SHORT	11.2%
SPECTRAL RESPONSE ACCELERATION ONE SEC	5.9%
SEISMIC IMPORTANCE FACTOR	1.0
SEISMIC DESIGN CATEGORY:	В
SPECTRAL RESPONSE COEFFICIENT - SHORT	0.119
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SEISMIC RESPONSE COEFFICIENT Cs ANALYSIS PROCEDURE USED

GENERAL STRUCTURAL STEEL NOTES

- 1. STRUCTURAL STEEL SHALL BE ASTM A992, EXCEPT PIPE COLUMNS SHALL BE ASTM A53 GRADE B, HSS MEMBERS SHALL BE ASTM A500 GRADE B, AND WIDE FLANGE MEMBERS TO BE ASTM A992. ALL MATERIAL AND WORKMANSHIP SHALL CONFORM TO THE REQUIREMENTS OF THE AISC SPECIFICATIONS, LATEST EDITION.
- SHOP CONNECTIONS: ASTM A325 HS BEARING BOLTS, OR WELDED E70XX. FIELD CONNECTIONS: ASTM A325 HS BOLTS BEARING TYPE, OR WELDED E70XX AND AS INDICATED ON THE DRAWINGS.
- BOLTS SHALL BE 3/4" DIAMETER UNLESS OTHERWISE NOTED. 5. REFER TO ARCHITECTURAL DRAWINGS AND DETAILS FOR MISCELLANEOUS LINTELS. RAMING ANCHORS, SHELF ANGLES, DETAIL ANGLES, BRACKETS, BRACES, WALL HEAD BRACING, ETC., REQUIRED TO BE FURNISHED UNDER THIS CONTRACT.
- 6. DIMENSIONS SHOWN FOR MECHANICAL OPENINGS, EQUIPMENT, ETC., ARE APPROXIMATE AND MUST BE VERIFIED WITH THE INSTALLING CONTRACTOR. PROVIDE ROOF FRAMES FOR ROOF TOP EQUIPMENT, CURBS, FANS, ETC. SEE DETAIL FOR TYPICAL FRAME CONSTRUCTION.
- PROVIDE UNIFORM SLOPES BETWEEN ELEVATIONS SHOWN. SEE ARCHITECTURAL DETAILS. 8. SPACE BEAMS AND JOISTS UNIFORMLY BETWEEN DIMENSIONS SHOWN ON PLANS
- UNLESS NOTED OTHERWISE. 9. FASTEN STL PLATE TO STRUCTURE W/ #12 TEK SCREWS @ 12" O.C. ALL ALONG ALL SUPPORTS:
- 10. REFER TO OTHER SHEETS FOR TYPICAL DETAILS WHICH MAY HAVE NOT BEEN REFERENCED FROM THIS SHEET OR OTHER SHEETS BUT YET STILL APPLY TO TYPICAL CONDITIONS.
- 11. WELDS SHALL CONFORM TO AWS D1.1, E-70XX SERIES ELECTRODES, UNLESS NOTED. WELDING SHALL ONLY BE DONE BY CERTIFIED WELDERS. 12. UNLESS OTHERWISE GIVEN OR REQUIRED, ALL WELDS SHALL BE 1/4" FILLET TYPE.

- 13. COMPATIBILITY: PROVIDE FINISH COATS THAT ARE COMPATIBLE WITH SHOP PRIMERS AND EXISTING PAINTS. PROVIDE BARRIER COATS OVER INCOMPATIBLE PRIMERS AND PAINTS OR REMOVE AND REPRIME AS REQUIRED. AS FINISH COATS.
- 14. PRIMERS AND UNDERCOAT PAINTS: SHALL BE PRODUCED BY SAME MANUFACTURER 15. VOC: COMPLY WITH FEDERAL AND STATE REGULATIONS REGARDING VOLATILE ORGANIC COMPOUND (VOC) LEVELS. 16. MANUFACTURER'S INSTRUCTIONS: COMPLY WITH MANUFACTURER'S PRINTED
- INSTRUCTIONS AND RECOMMENDATIONS.
- 17. FIRE PRECAUTIONS: REMOVE OILY RAGS, WASTE, ETC., FROM BUILDING AT END OF EACH DAY'S WORK AND TAKE EVERY PRECAUTION TO AVOID DANGER OF FIRE. KEEP OILY RAGS, ETC. SUSCEPTIBLE TO SPONTANEOUS IGNITION, IN WATER FILLED METAL
- CANS WITH TIGHT LIDS OR IN FMRC-APPROVED CONTAINERS. 18. PROTECTION: PROTECT SURROUNDING CONSTRUCTION, FROM DAMAGE AND SOILING DUE TO THE WORK OF THIS CONTRACT. LIMIT WORK, TRAFFIC AND MATERIAL
- STORAGE TO AREAS THAT HAVE BEEN PROTECTED. 19. SURFACE PREPARATION OF NEW GALVANIZED STEEL: COMPLY WITH PAINT MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS. 19.1. REMOVE GREASE AND OIL RESIDUE FROM GALVANIZED SHEET METAL BY
- MECHANICAL METHODS TO PRODUCE CLEAN, LIGHTLY ETCHED SURFACES THAT PROMOTE ADHESION OF SUBSEQUENTLY APPLIED PAINTS. 20. APPLICATION: COMPLY WITH PAINT MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
- 20.1. APPLY BY ROLLER OR BRUSH. DO NOT SPRAY.
- 20.2. TINT THE UNDERCOATS TO A SHADE SLIGHTLY LIGHTER THAN THAT OF SUCCEEDING COAT. 20.3. APPLY MATERIAL AT NOT LESS THAN THE MANUFACTURER'S RECOMMENDED SPREADING RATE, ESTABLISHING A TOTAL DRY FILM THICKNESS FOR EACH COAT AS RECOMMENDED BY COATING MANUFACTURER. GIVE SPECIAL
- ATTENTION TO ENSURE THAT ALL SURFACES, INCLUDING EDGES, CORNERS, CREVICES, WELDS, AND EXPOSED FASTENERS, RECEIVE A DRY FILM THICKNESS EQUIVALENT TO THAT ON FLAT SURFACES.
- 20.4. EACH COAT SHALL BE THOROUGHLY DRY BEFORE APPLYING SUCCEEDING COAT. DOUBLING-BACK TO ESTABLISH ADDITIONAL COATS SHALL NOT BE ALLOWED. COMPLY WITH MANUFACTURER'S RECOMMENDED CURING TIMES, RECOAT WINDOWS AND DRYING TIMES.
- 21. ENGINEER'S INSPECTION: ALL WORK WHERE A COAT OF MATERIAL HAS BEEN APPLIED MUST BE INSPECTED AND APPROVED BY ENGINEER BEFORE APPLICATION OF SUCCEEDING SPECIFIED COAT; OTHERWISE NO CREDIT FOR THE COAT APPLIED WILL BE GIVEN AND THE WORK IN QUESTION SHALL BE RECOATED. 22. CLEANING: AFTER COMPLETION OF PAINTING OPERATIONS, REMOVE THE
- TEMPORARY PROTECTIVE WRAPPINGS AND COVERINGS. REMOVE ALL PAINT DRIPS AND SPLATTERS FROM SURROUNDING SURFACES TO REMAIN. REMOVE ALL DEBRIS CAUSED BY WORK OF THIS CONTRACT AND LEGALLY DISPOSE OF. 23. PAINTING SCHEDULE: PROVIDE THE FOLLOWING PAINT SYSTEM FOR BOTH THE
- EXISTING STEEL TO BE REPAINTED AND FOR THE NEW GALVANIZED STEEL: 23.1. PRIMER: 1 COAT OF TNEMEC CHEMBUILD SERIES 135 IN DFT FOR CONVENTIONAL BUILD. 23.2. TOPCOATS: 2 COATS OF TNEMEC CRU SERIES 290.
- 24. POLYURETHANE BASE, SINGLE COMPONENT OR MULTI-COMPONENT, CHEMICAL CURING, SHORE A HARDNESS BETWEEN 15 AND 50, NON-STAINING, NON-BLEEDING.
- ONE OF THE FOLLOWING: 24.1. SONNEBORN "SONOLASTIC NP1" OR "SONOLASTIC NP2."
- 24.2. SIKA CHEMICAL CO. "SIKAFLEX_1A" 24.3. PECORA "DYNATROL II"
- 24.4. TREMCO "DYMERIC 511" 24.5. TREMCO "VULKEM 116" OR "227"

DESIGN CRITERIA:

THESE PLANS HAVE BEEN PREPARED BASED UPON THE 2018 INTERNATIONAL

SPECTRAL RESPONSE COEFFICIENT - 1 SECOND 0.094 0.020 RESPONSE MODIFICATION FACTOR, R EQUIVALENT LATERAL FORCE ANALYSIS

GENERAL MASONRY NOTES

- 1. CONCRETE MASONRY CONSTRUCTION SHALL CONFORM TO "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES", ISSUED BY THE AMERICAN CONCRETE INSTITUTE/AMERICAN SOCIETY OF CIVIL ENGINEERS/THE MASONRY SOCIETY (ACI-530/ASCE 5/TMS 402), THE "SPECIFICATIONS FOR MASONRY STRUCTURES (ACI 530.1/ASCE 6/TMS 602) AND ALL APPLICABLE CODES AND REGULATIONS.
- 2. GIVEN DESIGN DATA ASSUMES THE EXISTENCE OF ADEQUATE FIELD TESTING AND SUPERVISION OF CONSTRUCTION, FULFILLING THE "WITH INSPECTION" CRITERIA OF THE CODE.
- 3. MASONRY MATERIALS SHALL CONFORM TO THE LATEST EDITIONS OF THE SPECIFICATIONS:
- A. MORTAR AND GROUT: MORTAR-ASTM C270 PORTLAND CEMENT-LIME, TYPE "N"; GROUT--ASTM C 476. -- PORTLAND CEMENT: ASTM C 150, TYPE I OR TYPE II
 - -- HYDRATED LIME: ASTM C 207, TYPE S
 - -- AGGREGATE FOR MORTAR: ASTM C 144 -- AGGREGATE FOR GROUT: ASTM C 404
- 4. MORTAR SHALL BE TESTED BY AN APPROVED TESTING LABORATORY AS NOTED UNDER SPECIAL INSPECTIONS ON TITLE SHEET.
- 5. AIR ENTRAINMENT, CALCIUM CHLORIDE AND/OR ADMIXTURES CONTAINING SAME SHALL NOT BE INCLUDED IN MORTAR OR GROUT. 6. NO EXTERIOR MASONRY SHALL BE LAID WHEN OUTSIDE AIR TEMPERATURE IS LESS
- THAN 40 DEGREES F., UNLESS ADEQUATE PROTECTION IN ACCORDANCE WITH SECTION 1.8.C, "COLD WEATHER CONSTRUCTION", OF ACI 530.1/ ASCE 6/TMS 602, SPECIFICATIONS FOR MASONRY STRUCTURES, IS PROVIDED. FOR HOT WEATHER CONSTRUCTION REQUIREMENTS REFER TO SECTION 1.8.D.
- 7. MASONRY WALLS SHALL BE ADEQUATELY BRACED DURING THEIR ERECTION AND UNTIL THEIR DESIGN SUPPORTS ARE IN PLACE TO WITHSTAND A HORIZONTAL LOAD OF 24 PSF.
- 8. REMOVE EXCESS MORTAR AND MORTAR SMEARS FROM SURFACE OF MASONRY. CLEAN SOILED SURFACES WITH NON-ACIDIC CLEANING SOLUTION WHICH WILL NOT HARM MASONRY OR ADJACENT MATERIALS. USE NON-METALLIC TOOLS IN CLEANING PROCESS.
- 9. PROTECT CONCRETE MASONRY AND CEMENTITIOUS MATERIALS FROM MOISTURE. DO NOT USE CEMENTITIOUS MATERIALS THAT HAVE BECOME DAMP. DO NOT INSTALL CONCRETE MASONRY THAT HAS BECOME WET UNTIL IT HAS DRIED. 10. WALL STONE SHALL BE ANAMOSA STONE IN TYPE AS CALLED FOR ON PLANS QUARRIED
- FROM ANAMOSA, IOWA IN HEIGHTS RANGING FROM 2-1/2" TO 8" AND VARYING LENGTHS. COLOR SHALL BE UNIFORM BLEND TO MATCH EXISTING

GENERAL CONCRETE NOTES

- MATERIAL & WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", ACI 318.
- 2. CONCRETE FOR SLABS ON GRADE & SIDEWALKS SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 3500 POUNDS PER SQUARE INCH AT 28 DAYS.
- 3. AIR-ENTRAINING ADMIXTURE SHALL BE USED FOR ALL CONCRETE EXPOSED TO WEATHER.
- 4. NO CONCRETE SHALL BE POURED IN EXCAVATIONS CONTAINING WATER.
- 5. VERIFY LOCATIONS OF REQUIRED SLEEVES AND/OR BLOCKOUTS THROUGH FOUNDATION WALL WITH GENERAL CONTRACTOR AND ALL OTHER TRADES PRIOR TO CONSTRUCTION.
- 6. CONCRETE CONTRACTOR SHALL NOT POUR ANY CONCRETE IN ADVERSE WEATHER CONDITIONS OR WHEN SUCH CONDITIONS ARE FORECASTED FOR FOR THE TIME PERIOD FOLLOWING THE POUR, UNLESS PROPER CURING AND PROTECTION IS PROVIDED CONTINOUSLY UNTIL CONCRETE DEVELOPS ITS DESIGN STRENGTH.
- 4. NO ALUMINUM OF ANY TYPE SHALL BE ALLOWED IN THE CONCRETE WORK UNLESS COATED TO PREVENT ALUMINUM-CONCRETE REACTION. THIS INCLUDES PUMPING THRU ALUMINUM PIPE.
- 7. SEE ARCHITECTURAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL OPENINGS, DEPRESSIONS, CURBS, FLOOR FINISHES, INSERTS AND OTHER EMBEDDED ITEMS. VERIFY SIZES AND LOCATION OF ALL OPENINGS IN CONCRETE PRIOR TO FORMING.
- 8. ALL SLABS ON GRADE SHALL BE REINFORCED W/ WELDED WIRE MESH (WWM OR WWF) OR FIBER REINFORCEMENT PER FOUNDATION PLAN U.N.O. SEE FOUNDATION PLANS FOR AREA. POURING UNIT IS AT THE DISCRETION OF THE CONTRACTOR. SAW CUT CONTROL JOINTS AS SOON AS POSSIBLE OR WITHIN 12 HOURS MAX. OF PLACING CONCRETE.
- 9. UNLESS OTHERWISE NOTED, PRINCIPAL REINFORCEMENT SHALL HAVE THE FOLLOWING CONCRETE PROTECTION:
- SURFACES NOT FORMED......3 INCH Α. FORMED SURFACES IN CONTACT WITH SOIL OR WATER OR EXPOSED TO b. WEATHER 2 INCH SLABS, WALLS, JOISTS.....
- 1. BAR BENDING & PLACEMENT DTL'S SHALL BE IN ACCORDANCE W/ THE "ACI DETAILING MANUAL, SP-66", ACI 315, UNLESS OTHERWISE SHOWN OR NOTED.
- 2. ALL REINFORCING STEEL SHALL BE "DEFORMED NEW BILLET STEEL BARS", ASTM A615 PLUS ASTM A615 (S1), GRADE 60.
- 3. WELDED WIRE FABRIC SHALL CONFORM TO ASTM SPECIFICATIONS ASTM A1064, PLAIN BAR.
- 4. ALL LAPS FOR REBAR, WHEN NOT DIMENSIONED ON DRAWINGS, SHALL BE 52 BAR DIAMETERS. LAPS FOR WELDED WIRE FABRIC SHALL BE 8" FOR 4" CROSS BAR SPACING & 10" FOR 6" CROSS BAR SPACING. AT ALL WALL CORNERS AND WALL INTERSECTIONS PROVIDE BARS TO MATCH ALL HORIZONTAL REINFORCING, OVERLAP 2'-0" MINIMUM.

PIPES

- 1. RIGID INSULATION FOR BRIDGE SLAB: CLOSED CELL EXTRUDED POLYSTYRENE FOAM BOARD INSULATION, EACH LAYER 2" THICK, COMPLYING WITH ASTM C 578, TYPE IV, IN MANUFACTURER'S STANDARD SIZES MINIMUM R VALUE, PER 1" THICKNESS AT 40°F: 5.0. a.
- MINIMUM COMPRESSIVE STRENGTH: 60 PSI. MAXIMUM WATER ABSORPTION: 0.15% BY VOLUME.
- 2. INSULATION INSTALLATION FOR BRIDGE SLAB: APPLY INSULATION IN MULTIPLE COURSES, ALTERNATING AND LAPPING JOINTS AT а. LEAST 8" BETWEEN COURSES.
 - KEEP JOINTS TIGHT, INCLUDING INTERSECTIONS WITH WALLS. CAREFULLY CUT FOR PENETRATIONS, KEEPING INSULATION TIGHT TO PENETRATING

















ABBREVIATIONS

P- PRESENT TO REMAIN. PX- PRESENT TO BE REMOVED. PXN- PRESENT TO BE REMOVED, CLEANED, BROUGHT TO OPERATING CONDITIONING AND RELOCATED. PN- FINAL LOCATION OF DEVICE ASSOCIATED WITH PXN. PX-DO- PRESENT TO BE REMOVED & DELIVERED TO OWNER. AC - ABOVE COUNTER LEVEL BC - BELOW COUNTER LEVEL WP - WEATHERPROOF GFI - GROUND FAULT CURRENT INTERRUPTER ASC - ABOVE SUSPENDED CEILING CTC - CLOSE TO CEILING

SITE ELECTRICAL DEMO PLAN SCALE: 1" = 20'-0"

SNOW MELT INCLUDE PROVISIONS IN BID TO PROVIDE SNOW MELT FOR THE BRIDGE AND SIDEWALK FOR BID PURPOSES ASSUME THE AREA TO BE PROVIDED WITH (5) CIRCUITS CONSISTING OF SNOW MELT CABLE IN CONDUIT SIMILAR TO RAYCHEM EM2-XR SELF REGULATING HEAT CABLE. DESIGN WATT DENSITY TO BE 34 WATTS PER SQUARE FOOT. DESIGN WATT DENSITY TO BE 34 WATTS PER SQUARE FOOT. PROVIDE WITH ALL NECESSARY HARDWARE FOR INSTALLATION INCLUDING BUT NOT LIMITED TO CABLE CONDUIT, JUNCTION BOXES, POWER CONNECTION KITS AND END SEALS, CRACK EXPANSION JOINTS, EXPANSION JOINTS, CABLE TIES, SNOW MELT CAUTION SIGN, ETC... PROVIDE A SLAB SENSOR, 150 AMP THREE PHASE POWER DISTRIBUTION PANEL WITH GFI BREAKERS FOR EACH CIRCUIT, AUTOMATIC SNOW MELTING CONTROLLER, OVERHEAD SNOW SENSOR. PROVIDE 208 VAC POWER WIRING ((3) PHASE WITH NEUTRAL AND GROUND) FROM EXISTING SERVICE WITH A NEW 150 AMP BREAKER. INSTALLATION TO CONFORM TO MANUFACTURER REQUIREMENTS AND LAYOUT GUIDELINES. SEE ARCHITECTURAL FOR LOCATIONS OF JUNCTION BOXES & CONDUIT PATHS, COORDINGATE W/ STRUCTURAL



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EXISTING LIGHT FIXTURE TO BE RELOCATED - PROVIDE NEW CONCRETE BASE WITH REINFORCING REBAR. TIE IN POWER FROM EXISTING EXTERIOR POLE CIRCUIT AND CONTROL.

PROVIDE 120 VAC POWER FOR BACKLIT SIGN. PROVIDE CONTROL WITH A PHOTOCELL AND 24 HOUR 7 DAY TIMECLOCK. 3

2 SITE ELECTRICAL PLAN SCALE: 1" = 20'-0"



TYPICAL POLE WIRING DETAIL NO SCALE

ABBREVIATIONS

P- PRESENT TO REMAIN. PX- PRESENT TO BE REMOVED. PXN- PRESENT TO BE REMOVED, CLEANED, BROUGHT TO OPERATING CONDITIONING AND RELOCATED. PN- FINAL LOCATION OF DEVICE ASSOCIATED WITH PXN. PX-DO- PRESENT TO BE REMOVED & DELIVERED TO OWNER. AC - ABOVE COUNTER LEVEL BC - BELOW COUNTER LEVEL WP - WEATHERPROOF

WP - WEATHERPROOF GFI - GROUND FAULT CURRENT INTERRUPTER ASC - ABOVE SUSPENDED CEILING

CTC - CLOSE TO CEILING



<u>NOTE:</u> DETAIL REFERENCES A THREE PHASE FEEDER. ACTUAL INSTALLATION MAY VARY.



DIVISION 16 - ELECTRICAL

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

1.1 <u>GENERAL</u>

A. The following definitions apply to this Section:

Retain abbreviations that remain after this SLV Section has been edited.

- 1. EMT: Electrical metallic tubing.
- 2. FMC: Flexible metal conduit.
- 3. IMC: Intermediate metal conduit.
- 4. LFMC: Liquidtight flexible metal conduit.
- 5. RNC: Rigid nonmetallic conduit.
- B. Coordinate chases, slots, inserts, sleeves, and openings with Owner.

1.2 PRODUCTS

- A. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends. B. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- C. Concrete Forms and Reinforcement Materials:
- 1. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength.
- 1.3 EXECUTION
- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroon
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations
- D. Right of Way: Give to raceways and piping systems installed at a required slope.
- E. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. F. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement.
- G. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality. H. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- I. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- J. Remove demolished material from Project site.
- K. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.
- L. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- M. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

END OF SECTION 16050

DIVISION 16 - ELECTRICAL SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

- 1.1 SUMMARY
- A. This Section includes methods and materials for grounding systems and equipment.
- 1.2 SUBMITTALS
- A. Product Data: For each type of product indicated.
- 1.3 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- PART 2 PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

- 1. Solid Conductors: ASTM B 3.
- 2. Stranded Conductors: ASTM B 8.
- 3. Tinned Conductors: ASTM B 33. 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
- 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor. 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6
- mm) thick. 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected

- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
- 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- 2.3 GROUNDING ELECTRODES
- A. Ground Rods: Copper-clad steel 5/8 in diameter by 96 inches.
- PART 3 EXECUTION
- 3.1 APPLICATIONS
- A. Conductors: Install solid conductor for No.8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of vellow.
- C. Conductor Terminations and Connections:
- 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
- 2. Underground Connections: Welded connectors, except as otherwise indicated. 3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

Feeders and branch circuits.

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated
- 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit. 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate
- any adjacent parts. 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so
- vibration is not transmitted to rigidly mounted equipment.
- 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

END OF SECTION 16060

DIVISION 16 - ELECTRICAL SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - <u>GENERAL</u>

- 1.1 SUMMARY
- A. Section Includes:
- 1. Identification of power and control cables.
- 2. Identification for conductors.
- 3. Underground-line warning tape.
- Instruction signs.
- 5. Equipment identification labels. 6. Miscellaneous identification products.

1.2 SUBMITTALS

- B. Product Data: For each electrical identification product indicated.
- 1.3 QUALITY ASSURANCE
- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

- 2.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of
- color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

- 5. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- 6. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm)

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification

chemical-resistant coating and matching wraparound adhesive tape for securing ends of

1. Recommended by manufacturer for the method of installation and suitable to identify and

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up

3. Framed with mitered acrylic molding and arranged for attachment at applicable

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

thick by 1 to 2 inches (25 to 50 mm) wide.

2.3 UNDERGROUND-LINE WARNING TAPE

legend machine printed by thermal transfer or equivalent process.

locate underground electrical utility lines.

1. Comply with ANSI Z535.1 through ANSI Z535.5.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

Minimum letter height shall be 3/8 inch (10 mm).

egend label.

B. Color and Printing:

2.4 INSTRUCTION SIGNS

equipment.

A. Tape:

- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- 2.5 EQUIPMENT IDENTIFICATION LABELS
- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1
- 2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS
- F. Paint: Select paint system applicable for surface material and location (exterior or interior). G. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
- PART 3 EXECUTION
- 3.1 INSTALLATION
- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device. D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings i contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- G. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.
- 3.2 IDENTIFICATION SCHEDULE
- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase. 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed
- below for ungrounded branch-circuit conductors. a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if
- authorities having jurisdiction permit.
- b. Colors for 208/120-V Circuits:
- 1) Phase A: Black.
- Phase B: Red.
- Phase C: Blue.
- c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Limit use of underground-line warning tape to direct-buried cables.
- 2. Install underground-line warning tape for both direct-buried cables and cables in raceway. END OF SECTION 16075

DIVISION 16 - ELECTRICAL

SECTION 16120 - CONDUCTORS AND CABLES

- PART 1 <u>GENERAL</u>
- 1.1 SUMMARY A. This Section includes the following:
- 1. Building wires and cables rated 600 V and less. 2. Connectors, splices, and terminations rated 600 V and less.
- 3. Sleeves and sleeve seals for cables.
- 1.2 SUBMITTALS A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- 1.3 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70. PART 2 - PRODUCTS
- 2.1 CONDUCTORS AND CABLES

Conductors are stranded, compressed 1350-H19, H16, or H26 aluminum, insulated with vulcanized interlinked polyethylene (VIP1). Southwire's cross-linked polvethylene. Neutrals are triple vellow extruded stripe. Cables with "YES" neutrals have sequential footage markers. Conductors are durably surface printed for identification. Two phase conductors and one neutral conductor are cabled together to produce the triplex cable configuration. Conductors are also available paralleled.

- 2.2 CONNECTORS AND SPLICES
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following: 1. AFC Cable Systems, Inc.
- Hubbell Power Systems, Inc.
- 3. O-Z/Gedney; EGS Electrical Group LLC.
- 4. 3M; Electrical Products Division.
- 5. Tyco Electronics Corp.
- Ideal Industries
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- 2.3 SLEEVES FOR CABLES
- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends. B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain
- ends and integral waterstop, unless otherwise indicated. C. Coordinate sleeve selection and application with selection and application of firestopping.
- 2.4 SLEEVE SEALS
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Advance Products & Systems, Inc.
- 2. Calpico, Inc.
- 3. Metraflex Co.
- 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and
- 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and
- number required for material and size of raceway or cable. 2. Pressure Plates: Carbon steel. Include two for each sealing element.
- 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
- PART 3 EXECUTION
- 3.1 CONDUCTOR MATERIAL APPLICATIONS
- A. Feeders: As indicated on the feeder schedule.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING
- METHODS
- C. Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.
- 3.3 INSTALLATION OF CONDUCTORS AND CABLES
- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Electrical Supports."
- F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- 3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS
- A. Coordinate sleeve selection and application with selection and application of firestopping.

- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry. H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials.
- J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.
- 3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.6 FIRESTOPPING
- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.
- END OF SECTION 16120

2023 ()	
Administration Building Entry Improvements For: Belvidere Township Park District 1006 W. Lincoln Avenue, Belvidere, Ilinois 61008	
Belvidere Park District	
 Ollmann Ernest Martin Architects & Engineers 200 South State Street Belvidere, Illinois 61008 815-544-7790 Phone 	
ELECTRICAL SPECIFICATIONS Date: 6-23-202 Revision:	
2022-023	

DIVISION 16 - ELECTRICAL

SECTION 16130 - RACEWAYS AND BOXES

- PART 1 <u>GENERAL</u>
- 1.1 SUMMARY
- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- 1.2 SUBMITTALS
- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.
- 1.3 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- PART 2 PRODUCTS
- 2.1 METAL CONDUIT AND TUBING
- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 1. Fittings for EMT: Steel compression type.
- 2.2 NONMETALLIC CONDUIT
- A. RNC: NEMA TC 2, Type EPC-40-PVC, or NEMA TC-7, Type HPDE unless otherwise indicated.
- B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- 2.3 METAL WIREWAYS
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper B-Line, Inc.
- Hoffman.
 Square D; Schneider Electric.
- Description: Chest metal sized and shared as indicated NE
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
 C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- end caps, and other numps to m
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Owner.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Thomas & Betts Corporation.
- b. Walker Systems, Inc.; Wiremold Company (The).
- c. Wiremold Company (The); Electrical Sales Division.
- 2.5 BOXES, ENCLOSURES, AND CABINETS
- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- F. Cabinets:
- NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 Hinged door in front cover with flush latch and concealed hinge.
- Key latch to match panelboards.
- 4. Metal barriers to separate wiring of different systems and voltage.
- 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

- 3.1 RACEWAY APPLICATION
- G. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
- 1. Exposed Conduit: IMC.
- 2. Concealed Conduit, Aboveground: IMC.
- Underground Conduit: RNC, Type EPC-40-PVC, direct buried, or HPDE if directionally bored..
 Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT.
- 2. Exposed and Subject to Severe Physical Damage: IMC. Includes raceways in the following locations:
- a. Loading dock.
- b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
- c. Mechanical rooms.
- Concealed in Ceilings and Interior Walls and Partitions: EMT.
- 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- 5. Damp or Wet Locations: IMC.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
 B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes.
- Install horizontal raceway runs above water and steam piping. C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 16 Section "Electrical Supports."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement.
- Where at right angles to reinforcement, place conduit close to slab support.Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- Change from Type EPC-40-PVC to IMC before rising above the floor.
 Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect
- conductors, including conductors smaller than No. 4 AWG. J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb
- (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- K. Raceways for Optical Fiber and Communications Cable: Install as follows:

 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
 Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution
- frames or cabinets where necessary to comply with these requirements.
 L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
 Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings
- that accommodate temperature change listed for location:
- d. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
- e. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 f. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
- Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
- 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
 1. Excavate trench bottom to provide firm and uniform support for conduit
- Install backfill matching existing conditions.
- 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal.
- 4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.g. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3
- b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a
- minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
- 5. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits (when conduits are not directionally bored), placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.
- 3.4 FIRESTOPPING
- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly

END OF SECTION 16130

minimum of 60 inches (1500 m grounding bushings on terminatio 5. Warning Planks: Bury warning planks

DIVISION 16 - ELECTRICAL 16115 HORIZONTAL DIRECTIONAL DRILLING

PART 1 PART 1 GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and services necessary to install the conduits, and raceway system, as indicated on the drawings, and as specified herein using the horizontal directional drilling method.

B. The horizontal directional drilling method specified herein is for nominal diameter conduits of 6 inches or less.

- 1.2 RELATED SECTIONS:
- A. 16130 Raceways and Boxes.
- B. 16450 Grounding.1.3 REFERENCES
- A. National Electrical Code
- 1.4 SUBMITTALS
- A. All drilling fluids and loose cuttings shall be contained. No fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill p roject, all excess drilling fluid and material shall be removed by the Contractor.
- B. Specifications on raceway material shall be included as part of the submittal procedure.
- 1.5 QUALITY ASSURANCE
- A. Prior to beginning work, the Contractor shall review proposed boring routes and depths with the Owner. Care shall be taken to minimize impact on the existing

trees in the proposed construction area

B. The requirements set forth herein include a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined herein. Adherence to the Specifications contained herein, or the A/E approval of any aspect of any directional bore operation covered by this Specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

PART 2 PRODUCTS

- 2.1 GENERAL
- A. Directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe/wire, a drilling fluid mixing, delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this Project.

2.2 PRODUCT PIPE, JOINTS AND FITTINGS A. PIPE

 High Density Polyethylene (HDPE): Pipe shall be manufactured from a PE 3608 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D 3350 with a cell classification of 34564C. Pipe shall have a manufacturing standard of ASTM F 714. Pipe shall be schedule 40 unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification form the same raw material.

B. FITTINGS:

 Butt Fusion Fittings: Fittings shall be PE3608 HDPE, minimum cell classification of 345464C as determined by ASTM D 3350. Molded fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger.

Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. 2. Electrofusion Fittings: Fittings shall be PE3608 HDPE, minimum cell classification of

- 345464C as determined by ASTM D 3350. Electrofusion fittings shall have a manufacturing standard of ASTM F 1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
- Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D 3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

C. DRILLING FLUID (MUD) SYSTEM:

- 1. Drilling fluid shall be composed of a carrier fluid (water) and drilling fluid
- additives (bentonite and/or polymers). Bentonite is a naturally occurring clay mineral that forms a mud when mixed with water.2. The composition of the drill fluid is determined by the results of geological investigation executed in line with the framework of the project
- planned before construction.3. The principal functions of drilling fluids used in horizontal directional drilling are:
- Transporting drill cuttings to the surface by suspending and carrying them in the fluid stream flowing in the annulus between the borehole
- wall and the drill pipe/product.
 Cleaning build-up on drill bits or reamer cutters by directing fluid streams at the cutters.
- c. Cooling the down-hole tools and electronic equipment.
- d. Lubricating to reduce the friction between the drill pipe/product pipe and the borehole wall.
 e. Stabilizing the borehole, especially in loose or soft soils by building a low permeability filter cake, and exerting a positive hydrostatic
- pressure against the borehole wall. The filter cake along with positive hydrostatic pressure reduces collapse of the borehole and prevents formation fluids (i.e. groundwater) from flowing into the borehole or drilling fluids from
- exiting the borehole into the formation (loss of circulation).
- f. The Contractor shall provide hydraulic power to the bore-hole with a down-hole mud motor.

2.3 DRILLING SYSTEM

- A. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.
- B. The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.
- C. Mud motors shall be of adequate power to turn the required drilling tools.
- D. The drill pipe shall be constructed of high quality 4130 seamless tubing, grade D or better with thread.
- 2.4 GUIDANCE SYSTEM
- A. The method of guidance utilized in locating and steering the pilot string from entry to exit shall be state of the art. Readings shall be recorded after the advancement of each successive drill pipe and the readings plotted.
- 2.5 DRILLING FLUID (MUD) SYSTEM
- A. A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. Mixing system shall continually agitate the drilling fluid during drilling operations.
- B. Drilling fluid shall be composed of clean water and bentonite clay. W ater shall be from an authorized source The water and bentonite clay shall be mixed thoroughly and be free of any clumps or clods.
- The Bentonite mixture used shall have the minimum viscosities as measured by a March Funnel:
- 1. Rock, Clay 60 sec.
- 2. Hard Clay 40 sec.
- Soft Clay 45 sec.
 Sandy Clay 90 sec.
- 5. Stable Sand 80 sec.
- Loose Sand 110 sec.
 Wet Sand 110 sec.
- Additives to drilling fluid such as drill soap, polymers, etc. shall be "environmentally safe"
 and be approved for such use. No diesel fuel will be allowed.
- 2.6 OTHER EQUIPMENT
- A. Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe. Rollers shall be used as necessary to assist in pull back operations and in layout/fusing of material.
- B. Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used.
- PART 3 EXECUTION
- 3.1 GENERAL
- A. Contractor shall notify the Owner at least forty-eight (48) hours before commencing any of the following activities:
- 1. The setup of a drilling pit.
- The start of drilling operation.
 The installation of service pipe.
- B. Upon completion of the pilot hole phase of the operation, the contractor shall maintain a complete set of As-built records. These records shall include copies of the plan and profile drawing, as well as directional readings recorded during the drilling operation.
- 3.2 PERSONNEL REQUIREMENTSA. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two years directional drilling experience. A competent and experienced supervisor representing the Contractor and Drilling Subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual
- directional bore operation.
- Work site as indicated on drawings, within right-of-way, shall be graded or filled to provide
 a level working area. No alterations beyond what is required for operations are
- to be made. Contractor shall confine all activities to designated work areas.
- B. Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on Drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geo- magnetic variations or anomalies.
- D. Pipe shall be welded/fused together in one length. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.
- E. Pilot hole shall be drilled on bore path with no deviations greater than five percent of depth over a length of one hundred (100) feet.
- F. The open borehole may be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill pipe and through openings in the reamer. The slurry will also serve as an agent to carry the loose cuttings to the surface through the annulus of the borehole. These cuttings and bentonite slurry are to be contained at the exit hole or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation or it shall be hauled by the Contractor

to an approved dump site and properly disposed.

- G. Excess pipe shall be removed and the bore hole associated with this excess pipe shall be filled with flowable fill or grout, unless the area of the excess pipe is excavated and backfilled as part of the tie-in operations.
- 3.4 SITE RESTORATION
- A. Following drilling operations, Contractor shall demobilize equipment and restore the work- site to original condition. Any noticeable surface defects due to the drilling operation shall be repaired by Contractor.
- 3.5 RECORD KEEPING
- A. Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to A/E at completion of work.

END OF SECTION

