



**SPECIAL PROVISIONS  
FOR  
HANDHOLES, CONDUIT, AND FOUNDATIONS**

**Dubuque County  
TCSP-052-2(129)--9S-31**

**Effective Date  
June 18, 2013**

**THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS**

**1. GENERAL.**

This specification includes the furnishing of all material and equipment necessary to complete installation of underground components as necessary for future traffic signal and fiber optic equipment to be installed.

**2. MATERIALS.**

- 2.1 Fabrication or assembly process materials shall comply with the applicable parts of Section 2523 of the Standard Specifications.
- 2.2 Equipment and materials shall be of new stock unless the plans provide for the relocation of or the use of fixtures furnished by others. New equipment and materials shall be the product of reputable manufacturers of electrical equipment, and shall meet Engineer approval.
- 2.3 Six copies of shop drawings shall be furnished for steel mast arm poles to be furnished on the Project. Six copies of catalog cuts and manufacturer's specifications shall be furnished for all standard "off-the-shelf" items.  
  
Engineer review of shop drawings and catalog cuts shall not relieve the Contractor of any responsibility under the Contract Documents.
- 2.4 All electrical equipment shall conform to the standards of the NEMA, and all material and work shall conform to the requirements of the NEC, ASTM, ASA, and local ordinances. Miscellaneous electrical equipment and materials shall be UL approved.

Wherever reference is made in these specifications or in the standard provisions to the code, the safety orders, the general order, or the standards mentioned above, the reference shall be construed to mean the code, order, or standard that is in effect at the date of advertising of these specifications.

- 2.5 Certification from the manufacturers of all electrical equipment, signal supports, conduit and cable shall be supplied by the Contractor stating said material complies with these specifications.
- 2.6 Existing traffic signal equipment designated to be removed and not reinstalled on the project shall remain the property of the Contractor unless otherwise noted. The Contractor shall carefully place any removed equipment which the City wants to re-use, in the right-of-way. The Contractor shall take all reasonable precautions in protecting existing equipment. If any equipment is damaged, the Contractor shall be liable for replacement.

### **3. HANDHOLES/VAULTS.**

- 3.1 Handholes/vaults shall be installed at the locations shown on the plans, and at such additional points as the Contractor, at no additional expense to the Contracting Authority, may desire to facilitate the work.

Furnish precast concrete handhole or fiber vault, or fiberglass handhole, each with cast iron ring and cover or heavy duty fiberglass cover as shown in plans.

- 3.2 24 inch Round Handhole

The 24 inch round handhole shall be 5 inch thick concrete by 24 inches in diameter by 36 inches deep with a cover as specified in the plan details with the legend "Traffic Signal" set flush to the ground. Each HH 24-36 handhole shall have a ground rod as specified driven into the center of the handhole (for later use). The body of the pre-cast handhole shall meet the requirements for Class 1500D concrete pipe insofar as applicable. Cast iron ring and cover may be rated light duty for non-traffic areas (145 pounds minimum); but shall be rated heavy duty for traffic areas (320 pounds minimum) where shown on the plans. Deviations in weights shall not exceed  $\pm 5\%$ . The cover shall have the words "TRAFFIC SIGNAL" cast on the top of the cover. Cable hooks - four cable hooks shall be provided in all handholes as detailed on the plans. Cable hooks shall be galvanized steel with a minimum diameter of 3/8 inch and a minimum length of 5 inch and anchored in the wall of the handhole utilizing appropriate anchoring devices.

- 3.3 Fiber Vault, Square

Fiber optics junction vault shall be a square 48 inch by 48 inch outside dimension, 36 inch by 36 inch inside dimension fiber vault manhole. Vault shall be 48 inch deep (inside dimension) with a Neenah R1642 or equivalent cast iron cover with the legend "Fiber". Each vault shall include a drainage system as shown on in the plans. This vault will have four 3/4 inch drain holes in the sump pit for water to drain. The fiber vault shall include the following:

A minimum of four saddle racks, as detailed in the drawings, will be installed in each vault to support fiber optic cables. Maintain 18 inches of stone beneath and around the structure as indicated in the drawings.

Fiber optic square hand holes will be installed at the locations specified on the construction documents (Typically 500 feet apart or less).

Vaults shall be installed in a neat and workmanlike manner. Damaged vaults will not be accepted. All conduits shall enter the vault at the depth as detailed in the drawings. Any deviations from this requirement shall be approved by the Engineer. All holes cut into vaults for conduit entry/exit shall be core drilled from the inside out unless approved by Engineer. All penetrations shall be sealed with an approved polyurethane expansion joint sealing compound such as BASF Sonolastic NP1, Bostik Chem-Calk 915, Tremco Vulkem 116 or approved equal. This compound shall be readily workable soft plastic. It shall be workable at temperatures as low as 30°F, and shall not melt or run at temperatures as high as 300°F. The ends of all conduit leading into the handhole shall fit

approximately 2 inches beyond the inside wall. Any empty conduits should also be plugged as detailed in the conduit section of the specifications. A coarse aggregate drain conforming to the dimensions shown on the plan details shall be provided. Cast iron rings and covers for handholes shall be set flush with the sidewalk or pavement and 1 inch above the surface of the ground when installed in an earth shoulder or grassway away from the pavement edge. Any backfilling necessary under pavement or paved sidewalk or within 2 feet of the pavement edge shall be made with stone screening.

#### 3.4 Fiber Vault Round – 4 inch Diameter

Fiber optics junction vault round shall have an internal 48 inch diameter by 48 inch deep fiber vault manhole. This vault will have a 4 inch or larger opening in the bottom sump area to which the drain tile will be fastened; and a 48 inch lid with a Neenah R1642 or equivalent cast iron cover marked "Fiber" as shown on the details in the plans. A minimum of 8 saddle racks will be installed in each vault to support fiber optic cables. All components are to be plastic, aluminum, or stainless steel to avoid rusting. Each vault shall have a 5/8 inch by 10 feet ground rod driven into the ground near the sump pit opening. This ground and the tracer wires shall be wired into the locator station. Each vault shall include a drainage system as shown on the plans. Maintain 18 inches of stone beneath and around the structure.

Vaults shall be installed in a neat and workmanlike manner. Damaged vaults will not be accepted. All conduits shall enter the vault at a depth as detailed in the drawings. Any deviations from this requirement shall be approved by the Engineer. All holes cut into vaults for conduit entry/exit shall be core drilled from the inside out unless approved by Engineer. All penetrations shall be sealed with an approved polyurethane expansion joint sealing compound such as BASF Sonolastic NP1, Bostik Chem-Calk 915, Tremco Vulkem 116 or approved equal. This compound shall be readily workable soft plastic. It shall be workable at temperatures as low as 30°F, and shall not melt or run at temperatures as high as 300°F. The ends of all conduit leading into the handhole shall fit approximately 2 inches beyond the inside wall. If the primary conduit leading into a vault contains four smaller conduits, a quadplex plug is to be installed on the conduit. Any empty conduits should also be plugged as detailed in the conduit section of the specifications. A coarse aggregate drain conforming to the dimensions shown on the plan details shall be provided. Cast iron rings and covers for handholes shall be set flush with the sidewalk or pavement and 1 inch above the surface of the ground when installed in an earth shoulder or grass area away from the pavement edge. Any backfilling necessary under a pavement or paved sidewalk or within 2 feet of the pavement edge shall be made with stone screening.

#### 3.5 Quazite Handhole

Tubs shall be polymer concrete stackable handholes as specified in the Contract Documents with the legend "Street Light" on the lid and having a two stainless steel bolt lids (or approved equal). Hand-holes shall be constructed with no base in box bottom. Each handhole shall be supplied with one lid tool for removing covers. Covers shall support an 8000 pound load over a 10 inch square with a minimum test load of 12,000 pounds. Covers subject to heavy loads shall support a 15,000 pound load over a 10 inch square with a minimum test load of 22,568 pounds. A coarse aggregate drain shall be provided.

#### 3.6 Precast Concrete Handhole (Square)

Precast handhole shall typically be placed adjacent to the traffic signal control cabinet. Precast square handholes shall have an open bottom, be 36 inch by 24 inch outside dimensions and a Neenah R6689 heavy duty cast iron lid stating "Traffic Signals". Casting shall be bolted to precast handhole. Handholes shall be installed in a neat and workmanlike manner. Damaged vaults will not be accepted. All conduits shall enter at a depth of 24 inches from the top of the handhole. Deviations from this requirement shall be approved by the Engineer. All holes cut into the handhole for conduit entry/exit shall be core drilled from the inside out unless approved by the Engineer. All penetrations shall be sealed with an approved polyurethane expansion joint sealing compound such

as BASF Sonolastic NP 1, Bostic Chem Calk 915, Tremco Vulkem 116 or approved equal. The six core drilled holes for conduit coming directly from the control cabinet are included in the cost of the precast handhole. The ends of all conduits leading into the handhole shall fit approximately 2 inches beyond the inside wall. Any empty conduits shall also be plugged as detailed in the conduit section of the specifications. A coarse aggregate drain conforming to the dimensions shown on the plan details shall be provided. Cast iron ring covers for handholes shall be set flush with the sidewalk or pavement.

- 3.7 Handholes/Vaults in the immediate intersection shall have a ground rod driven in the handhole as specified in the drawings.
- 3.8 Unless pre-approved by the Engineer, removal and replacement of any concrete sidewalk to aid in the installation of the handhole/vaults shall be incidental to the price of the vault. A full panel shall be removed and reinstalled.
- 3.9 Handholes/Vaults shall be installed in a neat and workmanlike manner. When the use of forms is required they shall be set level and of sufficient thickness to prevent warping or other deflections from the specified pattern. A means shall be provided for holding conduit runs rigidly in place while the concrete is placed. All conduits shall enter the handhole at a depth of 12 inches from the bottom of the handhole unless otherwise specified. Any deviations from this requirement shall be approved by the Engineer. The ends of all conduit leading into the handhole shall fit approximately 2 inches beyond the inside wall. A coarse aggregate drain conforming to the dimensions shown on the plan details shall be provided. Cast iron rings and covers for handholes shall be set flush with the sidewalk or pavement and 1 inch above the surface of the ground when installed in an earth shoulder away from the pavement edge. Any backfilling necessary under a pavement or paved sidewalk or within 2 feet of the pavement edge shall be made with stone screening. Damaged handholes/vaults or covers will not be accepted. Damaged handholes/vaults will need to be replaced prior to acceptance. Handholes/vaults are not to be installed in the flow lines of a ditch.

#### **4. CONDUIT SYSTEM.**

- 4.1 The number, type, and size of conduit shall be as shown on the plans. Conduit shall meet the requirements of Articles 2523.03, N, and 4185.10 of the Standard Specifications.
  - 4.1.1 Conduit shown on the plans as PVC conduit shall meet the requirements of NEMA TC-2, Type 2, and applicable UL Standards. HDPE conduit with an SDR of 13.5 will be allowed to be used in place of PVC conduit.
  - 4.1.2 Conduit for interconnect runs shall be Innerduct as shown on the plans. Innerduct conduit shall be schedule 40 HDPE.
- 4.2 Conduit shall be placed as shown on the plans. All locations subject to minor changes pending approval by the Engineer. Change in direction of conduit shall be accomplished by bending such that the conduit will not be injured or its internal diameter changed. Bends shall be of uniform curvature and the inside radius of curvature of any bend shall not be less than six times the internal diameter of the conduit.
- 4.3 When it is necessary to cut and thread steel conduit, no exposed threads will be permitted. All couplings shall be tightened until the ends of conduits are brought together so that an electrical connection will be made throughout the entire length of the conduit run. All conduit and fittings shall be free from burrs and rough places and all conduit runs shall be cleaned, swabbed and reamed before cables are installed. Nipples shall be used to eliminate cutting and threading where short lengths of conduit are required. Damaged galvanized finish on conduit shall be painted with zinc rich paint. All fittings used with rigid steel conduit shall be galvanized steel only.

- 4.4 Connecting to existing conduit at locations as indicated on the plans. Methods to connect to the existing conduit will be the same as connecting or splicing to conduit as indicated in these specifications. Use specified methods, connectors, and couplings. The connection shall include locating the existing conduit and cleaning the end to allow appropriate connection.
- 4.5 Whenever converting from PE to PVC or PE to PE or PVC to PVC conduits splicing shall be accomplished as follows:
- 4.5.1 If splicing from PE to PE a fusion splice is required. Fusion splicing shall not cause significant interior deformation or ridges. If deformation or ridges are present the conduit needs to be cut and refused.
- 4.5.2 If splicing from PE to PVC the approved coupling is a Shurlock II system or approved equal as manufactured by AD Technologies or approved equal for the appropriate size conduit. The Shurlock system can be obtained from AD Technologies.
- 4.5.3 If splicing from PVC to PVC, an approved PVC primer must be applied along with an approved PVC glue to seal the connection.
- 4.5.4 If existing splices are in place and need to be repaired, or coupling is needed for conduits with existing infrastructure, the approved coupling is the MOR Clamp or approved equal. The MOR Clamp is manufactured by AD Technologies. The MOR Clamp shall only be used with the approval of the Engineer.
- 4.6 Conduit buried in open trenches shall be placed a minimum of 24 inches deep unless otherwise directed by the Engineer. Open trench methods of placing conduit will be permitted except where the conduit is to be placed under the existing pavement. Conduit in pavement areas shall be placed to a minimum depth of 24 inches below the finished pavement surface or as directed by the Engineer.
- 4.7 Innerduct and conduit proposed for fiber optic cable shall be buried a minimum of 42 inches.
- 4.7.1 Generally four 1 1/2 inch conduits bundled together extend between vaults, at the vault the conduit will separate into four vertical conduits installed as indicated in the drawings. The tracer wire shall be installed inside each of the 1 1/2 inch innerducts/conduits.
- 4.7.2 Two inch HDPE SDR 13.5 fiber conduit from the fiber vault to the traffic control cabinet shall make a direct path between the two structures and should be kept separate from any intersection wiring conductors and handholes. This fiber conduit shall terminate in the back left side of the traffic control cabinet.
- 4.7.3 In areas where fiber innerduct is open trenched, it shall also contain 3 inch non-detectable underground tape: "CAUTION BURIED FIBER OPTIC LINE BELOW" (Orange) at approximately 18 inches to 24 inches in depth.
- 4.7.4 Tracer wire will be tied together at all fiber vault locations.
- 4.8 The backfill material in open trenches shall be deposited in layers not to exceed 6 inches in depth and each layer shall be thoroughly compacted before the next layer is placed. Backfill material shall be free of cinders, broken concrete, or other hard or abrasive materials. All surplus material shall be removed from the public right-of-way.
- 4.9 Whenever excavation is made across parkways, driveways or sodded areas, the sod, topsoil, crushed stone or gravel shall be replaced or restored as nearly as possible to its original condition and the whole area involved shall be left in a neat and presentable

condition. Concrete sidewalks, pavements, base courses and bituminous surfaces shall be replaced with new materials. Surface restoration in grass areas shall be considered incidental to the bid items of the project and will not be paid for separately except in areas identified in the Contract Documents to be replaced.

- 4.10 "Pushed or Bored" conduit shall be placed by jacking, pushing, boring or any other means necessary to place the conduit without cutting, removing, or disturbing existing pavement. The size of a bored hole shall not exceed the outside diameter of the conduit that is to be placed. Tunneling under the pavement or water jetting will not be permitted. Pits for boring shall not be closer than 2 feet to the back of curb unless otherwise directed by the Engineer.
- 4.11 All conduit openings in the controller cabinet, handholes, and bases shall be sealed with an approved polyurethane expansion joint sealing compound such as BASF Sonolastic NP1, Bostik Chem-Calk 915, Tremco Vulkem 116 or approved equal. This compound shall be readily workable soft plastic. It shall be workable at temperatures as low as 30°F, and shall not melt or run at temperatures as high as 300°F.
- 4.12 All empty conduits to have flat polyester pull-tape (1250 pounds tensile) with footing markings, including each of the 1 1/2 inch innerducts/conduits. This pull-tape is to be attached to the expandable plug and sealed within conduit with a minimum of 48 inches of slack in the pull-tape on each end (96 inches total).
- 4.13 Conduits entering handholes or vaults shall enter with no more than 4 inches nor less than 1 inch of exposed conduit inside of the handhole. All conduits shall contain an orange 10-gauge tracer wire and be plugged with an expandable rubber plug.
- 4.14 Trenches need to be excavated straight and true with bottom uniformly sloped to low points. Excavate trenches to a depth of 3 inches below invert of pipe, unless otherwise indicated. Backfill with porous backfill 2 feet over water lines and conduit followed by native material (no organic material or rocks larger than 1 inch or debris) in all areas where no pavement would be placed. Course sand backfill material with hydraulic compaction can be used in trenches that are too narrow to be compacted by mechanical compactors. Trenches under all paved surfaces will be backfilled with compacted limestone to sub-grade elevation. In lawn areas, any settling that occurs shall be repaired and re-graded before seeding is done.
- 4.15 The length measured for payment shall be the plan distance along a straight line measured between changes in direction and the center of terminal structures.
- 4.16 General Guidelines (unless otherwise specified).

Generally, two 2 inch PVC or HDPE (if bored) will be used between the traffic controller and signal base. A 2 inch PVC or HDPE will be used to connect to the upright pedestal signals. Conduit placed under the street will be assumed to be bored unless otherwise noted. Typically mast arm installations need a 2 foot diameter manhole with a cast iron lid labeled "Traffic Signal" near each mast arm location except at the mast arm adjacent to the control cabinet.

Street lighting conduit will be installed from the service pedestal into the handhole located next to the traffic controller. The metered service feed for the traffic controller will be fed directly into the front right side of the controller base. The metered service for the FH-332 (Fiber Hub) cabinet will be fed directly from the meter pedestal to the right side of the fiber hub base unless a battery backup is installed in which case it will come from the battery backup.

## 5. CONCRETE BASES AND FOUNDATIONS.

- 5.1 Concrete bases for mastarm poles shall be poured to form a monolithic foundation and shall conform to the dimensions shown on the plans. Precast foundations for mastarms will also be acceptable (with prior approval from Engineer). Excavations for these bases shall be made in a neat and workmanlike manner. The bottom of all foundations shall rest securely on firm undisturbed ground. The material for the forms shall be of sufficient thickness to prevent warping or other deflections from the specified pattern. The forms shall be set level or sloped slightly to blend with the adjacent ground level and means shall be provided for holding them rigidly in place while the concrete is being deposited. Care must be taken to assure that foundations are correctly located in the field, and anchor bolts placed so that two act in compression and two in tension, according to the maximum load vector. All conduits shall be installed and held rigidly in place before concrete is deposited in the forms. Grounds for the poles shall also be tied together at a common hand-hole, where they shall also be tied to the cabinet ground. Anchor bolts for the signal poles or the controller cabinet shall be set in place by means of a template constructed to space the anchor bolts in accordance with the manufacturer's requirements. The center of the template and the center of the concrete base shall coincide unless the Engineer shall direct otherwise. Concrete shall be consolidated by vibration during placement.
- 5.2 Prefomed expansion material shall be provided between the base and the other paved area. When installed in an earth shoulder away from the pavement edge, the top of the concrete base shall be approximately 4 inches above the surface of the ground, but shall not be installed with more than 4 inches above the ground. The exposed surface of the base shall have a rubbed surface finish.
- 5.3 After the foundation or base has been poured, absolutely no modification of any sort may be made. If the anchor bolts, conduit, or any part of the foundation or base is installed in an incorrect manner as determined by the Engineer, the entire foundation or base shall be removed and a new foundation or base installed at the Contractor's expense unless a repair is approved by the Engineer.
- 5.4 Prior to setting poles, the anchor bolts shall be covered in such a manner as to protect them against damage and to protect the public from possible injury. The foundations must be given a minimum of 7 days to cure before poles are erected.
- 5.5 Footings shall be Class C structural concrete meeting the requirements of Section 2403 of the Standard Specifications.
- 5.6 Reinforcing steel shall be the type and size as shown on the plans and shall conform to the requirements of Section 2404 of the Standard Specifications.
- 5.7 Traffic signal pole footings shall be installed with the conduit shown on the plans plus additional 2 inch PVC conduit(s) stubbed out of the footing for future use as shown on the plans. Traffic signal controller footings shall be installed with the conduit shown on the plans plus one additional 2 inch and one additional 3 inch PVC conduit stubbed out of the footing for future use. The ends of the conduit stubs shall be capped.
- 5.8 Concrete bases/foundation for traffic control cabinets, fiber hub cabinets, light poles, pedestal poles, electrical services and battery backups should be precast from a pre-approved vendor.
- 5.9 During removal, all existing signal foundations shall be removed and disposed of. If there are circumstances that prevent their removal, the exposed concrete must be removed to 12 inches below the ground surface level.

**6. GROUNDING.**

Ground rods shall be high strength steel rods with chemically bonded copper coverings to provide high-conductivity and to prevent electrolytic action. Rods shall be full length as shown on the plans and shall have a nominal diameter of 5/8 inch (.56 inch minimum) unless otherwise specified. Ground rods shall conform to the requirements of IMSA Specification No. 62-1956. Ground rods shall be of the length specified on the plans.

**7. REPLACING DAMAGED IMPROVEMENTS.**

7.1 Improvements such as sidewalks, curbs, driveways, roadway pavement and any other improvements removed, broken, or damaged by the Contractor shall be replaced or reconstructed with the same kind of materials found on the work or with materials of equal quality. The new work shall be left in serviceable condition satisfactory to the Engineer. Whenever a part of a square or slab of existing concrete sidewalk, driveway, or pavement is broken or damaged, the entire square or slab shall be removed and the concrete reconstructed.

7.2 Surface restoration shall be considered incidental to the bid items of the project and will not be paid for separately unless specified to be replaced and a bid item is provided.

**8. METHOD OF MEASUREMENT & BASIS OF PAYMENT.**

8.1 Contract unit prices shall include all costs for each item of work. The Engineer shall measure the units of each item installed. Installed lengths incorporated into an operation system shall be included for measurement and payment, lengths not incorporated into the final system shall not be included for payment. The length measured for payment for conduit shall be the distance along a straight line measured between changes in direction and the center of terminal structures.

8.2 Conduit will be paid for at the contract price per linear foot, which price shall be full compensation for furnishing all equipment, materials, labor, and all other work necessary for installation of the conduit.

8.3 Handholes and vaults shall be paid for by the contract unit price each, which includes furnishing all equipment, material, labor, and all other work necessary for the installation of handholes or vaults as specified.

8.3 Foundations shall be paid for by the contract unit price each, which includes furnishing all equipment, material, labor, and all other work necessary for the installation of foundations as specified.