

## **SECTION 641 PRESTRESSED CONCRETE POLES**

### **641-1 Description.**

Furnish and install prestressed concrete poles as shown in the Plans.

Obtain precast, prestressed concrete poles from a manufacturing plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

Ensure that each pole is constructed and permanently and legibly marked in accordance with Design Standards, Index No. 17725, including the date cast. Concrete closed circuit television (CCTV) poles must be constructed and permanently and legibly marked in accordance with Design Standards, Index No. 18113, unless shown otherwise in the Plans. The marking shall be visible after installation.

Ensure that the shipment of the products to the job site meets the requirements of 450-16.3 and Section 105.

### **641-2 Materials.**

**641-2.1 Poles:** Meet the following requirements:

Portland Cement Concrete .....	Section 346 Class V Special
.....	or Class VI
Reinforcing Steel .....	931-1
Prestressed Strands.....	933-1
Spiral Reinforcing .....	ASTM A 1064

**641-2.2 Camera Lowering Device:** Use lowering devices that are listed on the Department's Approved Product List (APL). Permanently mark the lowering device with manufacturer name or trademark, model or part number, date of manufacture, and serial number.

The lowering device must provide the electrical connection between the control cabinet and the equipment installed on the lowering device without reducing the function or effectiveness of the equipment. The lowering device system support arm must be capable of withstanding service tension and shear up to 1 kip minimum.

The lowering device must include a disconnect unit and power, data, and video cables (as applicable) for connecting equipment, a divided support arm, pole attachment provisions, a rotatable pole-top tenon, and a pole-top junction box, unless otherwise shown in the Plans.

All external components are to be made of corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment. All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws. All roller fairlead frames must be corrosion resistant stainless steel or aluminum. All pulleys used in the lowering device and portable lowering tool must have sealed, self-lubricated or oil-tight bearings, or sintered bronze bushings.

Provide a minimum of 100 feet of composite power and signal cable prewired to the lowering device at the factory unless otherwise shown in the Plans. Splices will not be allowed.

Use only lowering devices designed to withstand the design wind speeds defined in the Department's Structures Manual, Volume [93](#).

**641-2.2.1 Equipment Connection Box:** Include a 1-1/2 inch National Pipe Thread (NPT) pipe connection point for attaching a camera. Ensure that the equipment connection box has an ingress protection rating of no less than IP55.

**641-2.2.2 Disconnect Unit:** The disconnect units must have a minimum load capacity of 600 pounds with a 4:1 safety factor and be capable of securely holding the lowering device and any installed equipment. Fixed and movable components of the disconnect unit must have a locking mechanism between them, with at least two mechanical latches for the movable assembly. The fixed unit must have a heavy-duty cast tracking guide that allows latching in the same position each time. The load must be transferred from the lowering cable to the mechanical latches when the system is in the latched position. Interface and locking components must be constructed of stainless steel or aluminum.

**641-2.2.2.1 Disconnect Unit Housing:** The disconnect unit housing must be weather-proof with an ingress protection rating of no less than IP55.

**641-2.2.2.2 Connector Block:** Provide modular, self-aligning and self-adjusting female and male socket contact halves in the connector block. Equip the lowering device with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts and include at least two spare contacts. Provide contact connections between the fixed and movable lowering device components that are capable of passing EIA-232, EIA-422, EIA-485, and Ethernet data signals and 1 volt peak to peak (Vp-p) video signals, as well as 120 V<sub>AC</sub>, 9-24 V<sub>AC</sub>, and 9-48 V<sub>DC</sub> power. The lowering device connections must be capable of carrying the signals, voltages, and current required by the devices connected to them under full load conditions.

Use only corrosion-resistant stainless steel hardware. Lubricate all components, including the connector block and contacts, in accordance with the manufacturer's recommendations. Ensure that male contacts used for grounding mate first and break last. All contacts and connectors must be self-aligning and self-adjusting mechanical systems. Provide a spring-assisted contact assembly to maintain constant pressure on the contacts when the device is in the latched position.

Provide connector pins made of brass- or gold-plated nickel, or gold-plated copper.

Ensure that the current-carrying male and female contacts are a minimum of 0.09 inch in diameter and firmly affixed to the connector block. Ensure mated connectors do not allow water penetration.

**641-2.2.3 Lowering Tool:** Provide a portable metal-frame lowering tool manufactured of corrosion-resistant materials with winch assembly and a cable with a combined weight less than 35 lbs that is capable of securely supporting itself and the load. The lowering tool must include a quick release cable connector, and a torque limiter that will prevent over-tensioning of the lowering cable and be equipped with gearing that reduces the manual effort required to operate the lifting handle to raise and lower a capacity load. Ensure that the lowering tool can be powered using a 1/2 inch chuck, variable-speed reversible industrial-duty electric drill capable of matching the manufacturer-recommended revolutions per minute. Provide an adapter with a clutch mechanism and torque limiter for use with the drill.

The winch assembly must have a minimum drum size width of 3.75 inches and a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling. The lowering cable must wind evenly on the winch

drum during operation. Provide a manual winch handle that incorporates a non-shear pin type torque limiter that can be used repeatedly and will not damage the lowering system.

Provide a minimum of one lowering tool and any additional tools as required in the Plans. Deliver the lowering tool to the Department before final acceptance.

**641-2.2.4 Lowering Cable:** The lowering cable must be 0.125 inch minimum diameter Type 316 stainless steel aircraft cable (7 strands x 19 gauge) with a minimum breaking strength of 1,760 pounds. Additionally, the lowering cable assembly (as installed with thimble and crimps on one end and a cable clamp inside the latch on the lowering device end), must have a minimum breaking strength of 1,760 lbs.

All lowering cable accessories, such as connecting links, must have a minimum workload rating that meets or exceeds that of the lowering cable.

Prefabricated components for the lift unit support system must prevent the lifting cable from contacting the power or video cables.

**641-2.2.5 Wiring:** All wiring must meet NEC requirements and be installed in accordance with the equipment manufacturers' recommendations for each device connected on the pole, at the lowering device, and in the field cabinet.

**641-2.2.6 External-Mount Lowering System Enclosure for Mounting to Existing Structures:** The system must include an upper mounting/junction box, winch assembly and all external conduit and cabling necessary for mounting to existing structures.

Provide a NEMA 4 rated lower lockable pole-mounted cabinet, constructed of corrosion-resistant 5052 sheet aluminum with a minimum thickness of 1/8 inch, to house the winch assembly. The cabinet must allow for unobstructed operation of the winch, access for servicing and provide sufficient clear area for operation of the winch manually and with an electric drill. The outside surface of the cabinet must have a smooth, uniform natural aluminum finish. All inside and outside edges of the winch cabinet must be free of burrs, and all welds must be neatly formed, free of cracks, blow holes, and other irregularities. Cabinet hinges must be vandal-resistant and constructed of 14 gauge stainless steel or 1/8 inch aluminum with stainless steel hinge pins.

The cabinet door must be double-flanged and include neoprene closed-cell gaskets permanently secured on the interior door surfaces that contact the door opening. The cabinet door must not sag. Include a pin tumbler lock keyed for use with a No. 2 key and two keys, unless otherwise directed by the Plans. The cabinet door handle must include a lock hasp that will accommodate a padlock with a 7/16 inch diameter shackle.

The upper mounting/junction box must include a maintenance access door with captive attachment hardware. Provide all necessary mounting hardware, conduits, standoffs, and conduit mounts required for a complete and functional system.

The external conduit must be galvanized Schedule 40 with National Pipe Thread Taper (NPT) threads and have a minimum ID of 3 inches at the lower winch cabinet entrance and allow the lowering cable to wind evenly on the winch drum without binding. All conduit couplings and connections between the pole-mounted cabinet and upper mounting/junction box must be watertight.

### **641-3 Concrete Pole Construction.**

Construct concrete poles in accordance with Section 450. Assume responsibility for performance of all quality control testing and inspections required by Sections 346 and 450; however, the PCI personnel certifications are not required. Plant certification, in accordance with Section 105, is not required for plants that manufacture prestressed concrete poles.

#### **641-4 Installation Requirements.**

**641-4.1 General:** Furnish poles of the type and length shown in the Plans. Provide catenary cable of the size shown in the Plans. Ground poles in accordance with Section 620. Install span wire assemblies in accordance with Section 634.

Do not consider the poles acceptable for use if the camber of the pole, measured as the maximum deviation between the centerline of the pole and a straight line connecting the centroids of the cross-sections at each end of the pole, is greater than the total pole length in inches divided by 140.

**641-4.2 Footings:** Provide footings 3 feet 6 inches in diameter and of the depth specified in the Plans for strain poles used for span wire support of traffic signals. Provide footings for concrete CCTV poles in accordance with Design Standards, Index No. 18113. Provide footings for all other pole applications as specified in the Plans. Construct the footings with concrete as specified in Section 347.

For the excavation and backfill of the footing, meet the requirements specified in 125-4 and 125-8.2 with the exception of the backfill density. In lieu of the requirements for obtaining the specified density, the Contractor may hand tamp the backfill in 4 inch maximum layers or machine tamp the backfill in 6 inch maximum layers. When performing such operations, ensure that the material is neither dry nor saturated. The Contractor may backfill with concrete.

Use forms, when required, meeting the requirements of 400-5. If the footing is cast in an oversize hole, place the concrete in the top 6 inches in a form. Trowel all exposed surfaces to a smooth finish.

**641-4.3 Orientation of Poles:** For poles supporting one catenary wire, orient the pole so that the load face is perpendicular to the catenary wire. For poles supporting two catenary wires, orient the pole so that the load face is perpendicular to a line bisecting the angle between the two catenary wires.

Rake pole back from the span wire as necessary to achieve a final rake of 1/2 inch per foot, plus or minus 1/4 inch.

**641-4.4 Camera Lowering Device:** Install the lowering device in a manner that does not place the operator directly under the device when it is being raised or lowered. Submit documentation showing connector block pin assignment for approval prior to installation.

The divided support arm and receiver brackets must self-align the contact unit with the pole centerline during installation. Additionally, the lowering device support arm must self-align the disconnect unit and attached device with the pole centerline and remain centered after installation, without moving or twisting.

House the stainless steel lowering cable inside 1.25 inch PVC conduit and provide a conduit mount adapter for the interface between the conduit and the internal back side of the lowering device.

The connection between the lowering device and tenon must be weather resistant. Use conduit straps to secure lowering cable conduit to the pole for externally mounted lowering systems. Stainless steel bands will not be allowed. Ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. All other cables must remain stable and secure during lowering and raising operations. Label all wire leads with their function, label spares as spares. Install the correct length of lowering cable to prevent cable slack and to prevent the cable from jumping off the winch spool. The lowering cable strands must not twist or unwind when the lowering device is operated.

Ensure that crimps and other cable connection hardware associated with the lowering cable do not come in direct contact with the winch tool or guides when operating the system.

Furnish the Engineer with the manufacturer recommended field installation instructions, inspection instructions (including recommended schedules and procedures), and operating instructions.

#### **641-5 Pole Removal.**

When shallow pole removal is specified in the Plans, the remaining pole, foundation and any protrusions, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, or reinforcing steel, must be removed to a minimum depth of 4 feet below existing grade.

When deep pole removal is specified in the Plans completely remove each pole including the foundation and all accessories and attachments, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, and reinforcing steel.

Disconnect span wires carefully at the pole, and salvage all usable hardware and attachment devices as determined by the Engineer. Remove all devices supported by the span wire (including wiring) prior to the removal of the span wire.

#### **641-6 Method of Measurement.**

**641-6.1 General:** Measurement for payment will be in accordance with the following work tasks.

**641-6.2 Furnish and Install:** The Contract unit price for prestressed concrete poles, furnish and install, will consist of the pole plus all labor, concrete for the foundation and other materials necessary for a complete and accepted installation as specified in the Contract Documents.

##### **641-6.3 Pole Removal:**

**641-6.3.1 Pole Removal Shallow:** The quantity to be paid for will be the removal of each pole, including the foundation and all accessories and attachments, to a depth of not less than 4 feet below existing grade.

**641-6.3.2 Pole Removal Deep:** The quantity to be paid for will be the complete removal of the pole, foundation and all accessories and attachments.

#### **641-7 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 641-	Prestressed Concrete Poles - each.
Item No. 641-	Concrete CCTV Pole – each.