

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**HIGH TENSION CABLE BARRIER SPARE PARTS AND REPAIRS DURING
CONSTRUCTION**

GCB:CT

1 of 9

APPR:DBP:CAL:03-18-20
FHWA:APPR:03-18-20

a. Description. This work consists of furnishing a spare parts package, as described in this special provision, and performing high tension cable barrier (HTCB) maintenance during construction. If the requirements of this special provision conflict with the requirements of the manufacturer's details, this special provision will take precedence.

b. Materials. Provide materials in accordance with subsection 105.10 of the Standard Specifications for Construction.

Provide new cable barrier components procured from the manufacturer of the HTCB system being serviced. All new cable barrier components must meet manufacturer's specifications of the cable barrier system being serviced and this special provision. Ensure new cable barrier components are similar to and compatible with the existing components in the cable barrier system being serviced. For each respective cable barrier system, intermixing different types of line posts, turnbuckles, concrete post sockets, driven sockets, cable splices, and other components is prohibited. Ensure that the end terminals are compatible with the cable barrier system installed.

1. Cable Barriers and End Terminals. Ensure cable barrier end terminals components are similar and compatible with the end terminals being serviced. Cable barrier end terminals must meet or exceed *National Cooperative Highway Research Program Report 350 (NCHRP 350)*, *Test Level 3 (TL-3)* or *Manual for Assessing Safety Hardware (MASH)*, *Test Level 3 (TL-3)* and have Federal Highway Administration (FHWA) acceptance.

2. Cables. Ensure cable is 3/4-inch (minimum) diameter, 3 x 7 construction, zinc-coated (galvanized) wire rope manufactured in accordance with AASHTO MP30M/MP30, Type I, Class A coating. Ensure each cable has a minimum tensile strength of 39,000 pounds. Ensure each cable is factory pre-stretched after manufacture with a tensile load of 50 percent (minimum) of the cable's tensile strength to prevent future strain relaxation of the cable. Ensure the cable is not damaged during the pre-stretching process. Ensure each cable has a minimum modulus of elasticity of 11,805,090 pounds per square inch after pre-stretching.

With each cable spool, the cable manufacturer must provide documentation, to the Engineer, certifying the breaking strength of the cable, the amount of force used to pre-stretch the cable, the modulus of elasticity of the cable after pre-stretching, and the pre-stretching/testing date(s).

Ensure each spool of cable has swaged fittings on each end. Ensure one end has a left-hand threaded fitting, and the other end has a right-hand threaded fitting.

3. Posts and Fittings. Ensure all posts are made of steel meeting *ASTM A36/A36M*, or

Nucor Grade SP-80 and be zinc coated (galvanized) after fabrication in accordance with *ASTM A123/A123M*. Modified cable posts and hardware for accommodating turnbuckles and fittings must meet manufacturer's specifications for the cable barrier system being serviced and must not undermine the crash worthiness of the cable barrier system.

Ensure all fittings, including but not limited to turnbuckles and connections, have a minimum diameter of 3/4 inch. Ensure all fittings develop a minimum tensile load (without yielding) of 36,800 pounds. Ensure when furnishing new fittings, the manufacturer conducts one tensile load test on each fitting type furnished. Ensure the manufacturer provides documentation, to the Engineer, certifying that all types of new fittings have been tested and meet the specified minimum load requirements. Ensure the documentation also lists the tensile yield strength and test date(s) for each fitting type.

Ensure threaded terminals are right hand or left hand threaded M24 × 3 pitch in accordance with *ANSI B1.13M*. Swaged type terminals may be shop or field swaged.

Ensure the body of the threaded terminal provides a minimum of 5.9 inches wire rope engagement depth. Ensure fully fitted ropes develop a minimum breaking load of 36,800 pounds. Ensure threaded terminals are galvanized, after threading, in accordance with *ASTM A153/A153M*.

Ensure one end of each turnbuckle is threaded right hand and the other end left hand according to *ANSI B1.13M*, M24 × 3 to accept threaded rope terminals. Ensure turnbuckles are of the solid or closed body type with two inspection holes to determine threaded rope terminal penetration. Ensure turnbuckles allow for a minimum of 6 inches of penetration from each end.

Ensure all fittings, including but not limited to turnbuckles and connections, are either zinc coated (galvanized) in accordance with *ASTM A153/A153M* after threading, or made of stainless steel. Ensure all other components made of ferrous metal, excluding stainless steel components, are zinc coated (galvanized) in accordance with *ASTM A123/A123M* after fabrication.

4. Reflective Sheeting. Ensure Type XI reflective sheeting is attached to all reflectors as specified in subsection 919.03.B of the Standard Specifications for Construction. Ensure reflectors meet manufacturer's specifications. Ensure reflectors match color of edge line adjacent to approaching traffic. Ensure each reflector has a minimum of 13 square inches of reflective sheeting facing approaching traffic.

5. Concrete/Foundation Materials. Provide Grade 4000 concrete in accordance with section 701 of the Standard Specifications for Construction for all foundations, except that concrete slump must be modified in accordance with subsection 718.02 of the Standard Specifications for Construction.

Provide concrete curing materials in accordance with subsection 903.07 of the Standard Specifications for Construction.

Provide temporary casing material in accordance with subsection 919.10 of the Standard Specifications for Construction unless otherwise shown on the plans.

Provide slurry in accordance with subsection 718.03.E of the Standard Specifications for

Construction. Use only polymer type slurries.

6. Steel Reinforcement. Provide epoxy coated steel reinforcement for concrete foundations in accordance with section 905 of the Standard Specifications for Construction.

7. Miscellaneous Materials.

A. Provide low-density polyethylene or polypropylene excluder caps meeting manufacturer's specifications.

B. Provide marine-grade anti-seize lubricant acceptable for use on galvanized steel for threaded fittings.

C. Use sound earth meeting the requirements specified in section 205 of the Standard Specifications for Construction for grading and earthwork.

D. Provide sockets for concrete post foundations fabricated from 11 gauge (minimum), hot rolled mild steel galvanized in accordance with *ASTM A123/A123M*, after fabrication, and meeting manufacturer's specifications.

E. Provide driven sockets (i.e., sockets not encased in concrete) for line posts in accordance with the plans, the manufacturer's specifications and the following:

(1) Ensure the rectangular tube portion of the driven socket has a minimum thickness of 3/16 inch and a minimum length of 60 inches (5 feet).

(2) Ensure the inner cross-sectional dimensions of the rectangular tube (i.e., the area for inserting the line post into the driven socket) meets manufacturer's specifications.

(3) Ensure the soil plate attached to the rectangular tube has a minimum thickness of 8 gauge, and meets the dimensional requirements shown on the plans, or as directed by the Engineer.

(4) Ensure the soil plate is attached to the rectangular tube as shown on the plans, or as directed by the Engineer.

(5) Ensure each driven socket has a post stop, meeting manufacturer's specifications, in order to keep the post at its intended height. Ensure the post stop allows water to pass through.

(6) Ensure the bottom of the driven socket has an opening for water to drain out of the rectangular tube.

(7) Ensure driven sockets, including soil plates and other hardware attached to the driven socket, are made of steel meeting *ASTM A36/A36M*, or *Nucor Grade SP-80*.

(8) Ensure the driven socket assembly (rectangular tube, soil plate, post stop, and any other hardware attached to the driven socket) is zinc coated (galvanized) in accordance with *ASTM A123/A123M*, after fabrication.

Provide written certification from the manufacturer that all spare parts supplied by the manufacturer meet manufacturer's specifications and this special provision to the Engineer prior to acceptance.

c. Construction. Repair and maintain the HTCB system in accordance with the following:

1. General. Repair and maintain the cable barrier system until final cable tensioning is done on all cable runs in the project. If specified in the proposal or directed by the Engineer, continue repairing and maintaining the cable barrier system beyond the date of final cable tensioning, up to the date of project completion and acceptance.

Prior to conducting any repair, inspect and assess the damages, and submit a detailed invoice to the Engineer listing the parts and the labor/equipment cost required to complete the repair. Submit the detailed invoice no later than 3 days after observing damages to the cable system or being notified by the Department of damages to the cable system. Do not commence cable barrier repair without authorization from the Engineer. Complete cable barrier repairs no later than 5 days after receiving authorization from the Engineer. If unable to meet these timeframes due to weather conditions, notify the Engineer and agree upon an alternate schedule.

Conduct all cable barrier repairs in accordance with manufacturer's specifications and as directed by the Engineer.

Remove and dispose of any damaged or non-functional cable barrier components, driven sockets, and cable barrier foundations in accordance with subsection 204.03.B of the Standard Specifications for Construction, unless otherwise directed by the Engineer.

Salvage used, damaged, or non-functional cable barrier components for use by the Department, as directed by the Engineer. Collect and stockpile salvaged components at a location, determined by the Engineer, within the project limits.

Remove snow and ice, including ice located inside post sockets, as required for repairing the cable system.

Complete slope grading and slope restoration, as required to restore the slope to its original condition or as directed by the Engineer, on all cable barrier repairs.

Monitor and adjust cable barrier tension. Check cable tension after all repairs and as directed by the Engineer.

Maintain traffic during repairs as directed by the Engineer.

2. Spare Parts. Furnish and deliver the spare parts for the selected cable barrier system to the project site location, as directed by the Engineer, prior to cable barrier installation.

Submit written notification to the Engineer at least 7 days prior to delivery of the spare parts package, specifying the delivery date of the spare parts package, and an itemized list identifying the parts and the quantity of each part in the package.

Store and handle all spare parts. Replace missing or damaged parts at no additional cost to the Department.

Use spare parts procured through this special provision exclusively for conducting cable barrier repairs authorized by the Engineer. Use of spare parts for cable barrier repairs due to Contractor negligence or for unauthorized repairs is prohibited. Damages or repairs due to Contractor negligence must be repaired by the Contractor at no additional cost to the Department.

Keep a log identifying the date of each repair, and the parts and quantities used. Furnish copies of this log no later than 24 hours after requested by the Engineer.

After final cable tensioning of all cable runs, or when directed by the Engineer, all remaining parts in the spare parts package will become Department property. Provide at least 7 days notice to the Engineer and submit an itemized list of the remaining quantities of spare parts. Confirm the delivery date and delivery location within the Region determined by the Engineer. Deliver all remaining spare parts from the project site location to the location determined by the Engineer.

Ensure the spare parts package is furnished and delivered to the Department in new condition. The Engineer will reject damaged items and items that do not appear to be in new condition. Replace rejected items at no additional cost to the Department.

3. Fittings. Unless otherwise directed by the Engineer, use only one open-type wedge lock terminal or two closed-type wedge lock terminals per cable per run (between end anchor foundations). Use closed-type wedge lock terminals that use a threaded-end socket to secure the wedge by compression. Use a single wedge lock terminal type (open-type or closed-type).

Unless otherwise directed by the Engineer, limit cable splice kits to two per cable per run (between end anchor foundations). Use cable splice kits only for repairing severed or damaged cables not caused by Contractor negligence. Ensure all other fittings are of the swaged type. Swaged type fittings may be shop or field swaged.

Wedge-lock type fittings, including wedge-lock type cable splices, must have a minimum of one wire crimped a minimum length of 3/16 inch over the base of each wedge to hold it firmly in place.

Lubricate all threaded fittings with marine-grade anti-seize lubricant.

When a cable barrier run is completely assembled, threaded terminals must penetrate a minimum of 3 inches and a maximum of 4 inches into the turnbuckle, measured from the ends of the turnbuckle.

4. Concrete Foundations. Repair cracked and damaged cable barrier foundations in accordance with the cable barrier manufacturer's specifications or as directed by the Engineer.

Remove and replace cable barrier foundations that are damaged beyond repair, subject to the Engineer's authorization. Construct the new cable barrier foundation to the same dimensions and with the same steel reinforcement layout and quantity as the old cable barrier foundation.

5. Driven Sockets. Realign driven sockets that have moved from their original locations.

Remove and replace driven sockets that cannot be realigned or are damaged. New driven sockets must have the same dimensions as the old driven socket.

Unless otherwise approved by the Engineer, set new driven sockets in augered holes. Auger holes large enough to accommodate the driven socket and soil plate. Thoroughly ram the bottom of augered holes to provide a stable foundation. Install new driven sockets in augered holes plumb to within 1 percent in all directions. Ensure that the top of the driven socket does not protrude more than 1 inch above ground level, and the soil plate is at least 1 inch below ground level at all locations. Backfill the new driven socket with sound earth thoroughly rammed in 12-inch maximum layers. Ensure that the entire length of the inner portion of the rectangular tube is free of soil and debris after installation. Thoroughly compact loose soil and fill all voids around driven sockets after installation.

Obtain the Engineer's approval prior to driving sockets into the ground. Demonstrate to the Engineer that the socket can be driven into the ground without soil and debris entering the inner portion of the rectangular tube and without damaging the socket assembly. Drive sockets to the same tolerances and backfill as for driven sockets set in augered holes.

Replace driven sockets damaged during installation or as a result of the Contractor's operations, at no additional cost to the Department.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	Pay Unit
Cable, 1000 foot Spool	Each
Cable Barrier, Intermediate Line Post	Each
Cable Barrier, Misc Hardware, Intermediate Line Post	Each
Cable Barrier, Modified Line Post and Hardware	Each
Cable Barrier, Socket, Conc Fdn	Each
Cable Barrier, Driven Socket	Each
Cable Barrier, Turnbuckle	Each
Cable Barrier, Reflector	Each
Cable Barrier, Excluder Cap	Each
Cable Barrier, Wedge Lock Fitting	Each
Cable Barrier, Cable Splice Kit	Each
Cable Barrier Terminal, Materials	Each
Cable Barrier, High Tension, Repr Labor	Dollar

The Department will not provide payment for damages or repairs due to Contractor negligence or for repairs that are unauthorized by the Engineer.

1. **Cable, 1000 foot Spool** will be measured per individual cable spool. **Cable, 1000 foot Spool** includes furnishing, storing, handling, and delivering a cable spool containing 1,000 feet of pre-stretched cable with swaged fittings on each end, as described in this special provision.

2. **Cable Barrier, Intermediate Line Post** will be measured per individual post. **Cable Barrier, Intermediate Line Post** includes furnishing, storing, handling, and delivering an intermediate line post, as described in this special provision. Miscellaneous hardware

attached to the intermediate line post is not included in this pay item.

3. **Cable Barrier, Misc Hardware, Intermediate Line Post** will be measured per individual post. **Cable Barrier, Misc Hardware, Intermediate Line Post** includes furnishing, storing, handling, and delivering all miscellaneous hardware attached to an intermediate line post. This pay item includes, but is not limited to: clips, hairpins, lockplates, hooks, brackets, straps, spacers, post caps, nuts, bolts, and washers. Reflectors and excluder caps are not included in this pay item.

4. **Cable Barrier, Modified Line Post and Hardware** will be measured per individual post. **Cable Barrier, Modified Line Post and Hardware** includes furnishing, storing, handling, and delivering a modified line post and hardware for accommodating turnbuckles and/or fittings, as specified in this special provision.

5. **Cable Barrier, Socket, Conc Fdn** will be measured per individual socket. **Cable Barrier, Socket, Conc Fdn** includes furnishing, storing, handling, and delivering a steel socket for a concrete (line post or terminal post) foundation, as specified in this special provision.

6. **Cable Barrier, Driven Socket** will be measured per individual driven socket. **Cable Barrier, Driven Socket** includes furnishing, storing, handling, and delivering a steel driven socket, as specified in this special provision.

7. **Cable Barrier, Turnbuckle** will be measured per individual turnbuckle. **Cable Barrier, Turnbuckle** includes furnishing, storing, handling, and delivering a turnbuckle, as specified in this special provision.

8. **Cable Barrier, Reflector** will be measured per individual unit, regardless of whether the unit consists of a uni-directional reflector or bi-directional reflector. **Cable Barrier, Reflector** includes furnishing, storing, handling, and delivering a reflector.

9. **Cable Barrier, Excluder Cap** will be measured per individual excluder cap. **Cable Barrier, Excluder Cap** includes furnishing, storing, handling, and delivering an excluder cap.

10. **Cable Barrier, Wedge Lock Fitting** will be measured per individual open-type or closed-type wedge lock fitting. **Cable Barrier, Wedge Lock Fitting** includes furnishing, storing, handling, and delivering a wedge lock type fitting. An individual wedge lock type fitting will consist of:

- A. One cable end casting;
- B. One cable wedge;
- C. One nut;
- D. One left-hand threaded stud/rod;
- E. One right-hand threaded stud/rod; and
- F. Any other miscellaneous items required to create a fitting between a turnbuckle and a cable end.

11. **Cable Barrier, Cable Splice Kit** will be measured per individual Torpedo Cable Splice or other manufacturer recommended cable splice kit, including all miscellaneous hardware necessary for splicing cables. **Cable Barrier, Cable Splice Kit** includes furnishing, storing, handling, and delivering a Torpedo Cable Splice or other manufacturer recommended cable splice kit.

12. **Cable Barrier Terminal, Materials** includes furnishing, storing, handling, and delivering a complete set of components required to construct a cable barrier end terminal in accordance with this special provision. **Cable Barrier Terminal, Materials** will be measured per individual cable barrier terminal. Concrete and steel reinforcement required for constructing concrete foundations will be measured and paid for separately using related pay items.

A complete set of cable barrier terminal components includes, but is not limited to:

- A. Posts;
- B. Anchor posts;
- C. Cable release posts;
- D. Anchor terminal fittings;
- E. Terminal assemblies;
- F. Brackets;
- G. Cables;
- H. Cable end fittings;
- I. Sockets;
- J. Sleeves; and
- K. Any other miscellaneous hardware (clips, hairpins, lockplates, pins, straps, spacers, keeper wires, hooks, bolts, nuts, and washers).

13. **Cable Barrier, High Tension, Repr Labor** includes all labor and equipment required to maintain and repair the HTCB system being serviced in accordance with this special provision. **Cable Barrier, High Tension, Repr Labor** will be measured and paid for in accordance with subsection 109.05.D of the Standard Specifications for Construction.

Cable Barrier, High Tension, Repr Labor includes all labor, equipment, and materials required to:

- A. Complete slope grading and slope restoration required as part of HTCB repair and maintenance;
- B. Remove snow and ice;

- C. Remove, repair, and/or replace cable barrier foundations;
- D. Apply anti-seize lubricant to all threaded terminal fittings;
- E. Monitor and adjust cable tension;
- F. Maintain traffic as required for HTCB repair and maintenance; and
- G. Remove, dispose, salvage, transport, and handle damaged or non-functional cable barrier components.

Cable Barrier, High Tension, Repr Labor does not include cable barrier components for performing HTCB repairs and maintenance. Cable barrier components used for repairs and maintenance, subject to the requirements of this special provision, are included in the other pay items listed in this special provision.