MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
LOW-TENSION CABLE BARRIER

GCB:CT 1 of 5 APPR:RWS:CAL:03-24-20
FHWA:APPR:03-30-20

a. Description. This work consists of furnishing and installing low-tension cable barrier and end terminals as shown on the plans; grading the area around the anchor footings; and disposal of construction related debris. Complete all work covered by this special provision in accordance with Standard Plan R-70 Series except as noted otherwise.

b. Materials. Use sound earth, in accordance with section 205 of the Standard Specifications for Construction, for grading and earthwork.

Provide 3/4-inch diameter, zinc-coated wire rope cable constructed of three strands, with each strand consisting of seven wires. Each cable must have a minimum tensile strength of 25,000 pounds, and must be manufactured in accordance with *AASHTO MP30M/MP30, Type I, Class A* coating.

Ensure steel posts, blocks, plates, and all components fabricated thereof are fabricated from *AASHTO M270M/M270 Grade 36 steel*. Welding for all steel components must comply with *AWS D1.5*, Bridge Welding Code.

Hot-dip zinc coat all steel posts, blocks, plates, and components fabricated thereof in accordance with *AASHTO M111M/M111*. Ensure a minimum average zinc-coating weight of 2.0 ounces per square foot. Complete all fabrication prior to hot-dip zinc coating. Unless otherwise noted, zinc coat all bolts, nuts, rods, washers, fittings, and miscellaneous hardware made of ferrous metal in accordance with *AASHTO M232M/M232*.

Fabricate spring cable end assemblies (compensating devices) and turnbuckle assemblies in accordance with Standard Plan R-70 Series.

Compensating devices must have a spring rate of 450 ±50 pounds per inch and a total available throw of 6 inches. The spring must develop a minimum compressed strength of 27,000 pounds and be made from 9/16-inch diameter steel wire with a minimum breaking strength of 25,000 pounds.

Ensure cast steel components are in accordance with the requirements of *AASHTO M103M/M103*. Ensure malleable iron components are in accordance with the requirements of *ASTM A47/A47M*.

Ensure cable wedges are in accordance with the requirements of *ASTM A47/A47M* for malleable iron castings. Do not zinc coat cable wedges.

Design fittings, including cable splices, to develop a minimum tensile strength of 25,000 pounds and use the cable wedge specified in Standard Plan R-70 Series. Ensure wedge-type cable

socket fittings are of the open-end type and permit visual inspection of the cable end and wedge after installation.

Hook bolts must develop a minimum pull-open strength of 500 pounds, applied in the direction normal to the longitudinal axis of the post. Zinc coat hook bolts in accordance with *AASHTO M232M/M232.*

Provide Concrete Grade 3500 or 3500HP for anchor footings. The concrete slump must be per Table 1004-1, notes k and l of the Standard Specifications for Construction.

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

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

Ensure reflectors are constructed from 0.080-inch thick aluminum. Use Type XI reflective sheeting meeting the requirements of subsection 919.03.B of the Standard Specifications for Construction. Attach reflective sheeting to aluminum backings in accordance with the sheeting manufacturer's recommendations.

Furnish original signed copies of certifications that the following components comply with this special provision and Standard Plan R-70 Series, to the Engineer, prior to their inclusion in the work.

1. Cables. One certification per 2,000 feet or per cable spool showing manufacturer test data.

2. Hook Bolts. One certification per lot or heat.

3. Posts, Post Slip Bases, and Breakaway Anchor Angles. One certification per lot.

4. Compensating Devices, Turnbuckle Assemblies, Cable Fittings, Cable Wedges, and Splices. One certification per lot.

c. Construction. Complete this work in accordance with Standard Plan R-70 Series, the plans and the standard specifications.

1. Protection of Existing Structures, Utilities, Culverts, and Drain Pipes. Control operations to prevent damage to existing structures, utilities, culverts, and drain pipes. Preventative measures include, but are not limited to, selecting construction methods and procedures that will prevent caving of excavations, monitoring and controlling the vibrations from construction activities, and monitoring and controlling the depth of excavation. Repair any damage to existing structures, utilities, culverts, or drain pipes, to the satisfaction of the Engineer at no additional cost to the Department, including engineering analysis and redesign, and without any extension of the completion dates for the project.

2. Excavation. Do not leave excavations open overnight. If a concrete anchor footing cannot be completed in one day, backfill the excavation with flowable fill.

3. Obstructions. Remove surface and subsurface obstructions encountered in the length

of excavation at concrete foundation locations. Such obstructions may include materials such as old concrete foundations or abandoned utilities, or natural materials such as boulders. In the event that the excavation cannot be advanced using conventional augers fitted with soil or rock teeth, drilling buckets and/or under reaming tools, use special procedures or tools including, but not limited to, chisels, boulder breakers, core barrels, air tools, and enlarging the excavation. Unless otherwise specified in the contract, removal of such obstructions will be paid for as extra work provided that special procedures or tools are utilized. To be considered for payment for obstruction removal, submit written notification to the Engineer no later than 24 hours after encountering obstructions and allow the Engineer to inspect the excavation and verify that special procedures or tools are required prior to undertaking the removal.

4. Concrete. Conduct concrete quality control in accordance with the contract, or as directed by the Engineer.

Construct concrete anchor footings at the locations specified on the plans. Fill over-sized excavations resulting from removing obstructions with concrete. Ensure that the top of the footing is flush with the surrounding earth. The top of all concrete foundations must have a smooth finish.

After constructing anchor footing, grade the area around the anchor footing. Grade slopes to 1:6 or flatter. Grade slopes to Class A slope tolerances. Remove all excess material and dispose of in accordance with subsection 205.03.P of the Standard Specifications for Construction.

Consolidate the concrete in all cable barrier foundations with vibrators in accordance with the requirements of subsection 706.03.H.1 of the Standard Specifications for Construction.

Cure all cable barrier foundation concrete in accordance with subsection 810.03.J.8 of the Standard Specifications for Construction.

5. Posts. Install line posts in accordance with subsection 807.03.B of the Standard Specifications for Construction and the plans. Install each line post for Type R (Roadside Barrier) cable barrier with the soil plate located on the opposite side of the post as the cables.

The Contractor may clip the bottom corners of side plates 2 inches by 2 inches in order to facilitate driving the posts into the ground. If soil plates are clipped in the field, apply zinc coating to the exposed metal surfaces in accordance with subsection 716.03.E of the Standard Specifications for Construction.

Attach the breakaway anchor angle and post slip base to the anchor footing. Assemble the post slip base and the anchor post. Torque 1/2-inch diameter bolts connecting the post slip base and anchor post to 25 foot-pounds.

Attach reflectors to line posts.

6. Cable. Connect cable splices as necessary. Do not make more than one splice per cable between end anchor assemblies. Stagger cable splices on adjacent cables a minimum of 20 feet.

Attach cables to line posts using hook bolts. Attach cables to anchor posts. Secure the cables

to the anchor post support plate by attaching 3/16-inch diameter brass clips to the anchor post support plate and bending over the ends of each clip.

At locations where two cable runs overlap, lap cables in accordance with Standard Plan R-70 Series. The center post in the intermediate anchorage section of Type M (Median Barrier) cable barrier will have cables on both sides of the middle strand; use two 1¾ inch long hook bolts for this application.

Attach spring cable end assemblies (compensating devices) and turnbuckle assemblies to the cables. Properly seat each compensating device, and then permanently mark the unloaded position. Attach all cable fittings.

Attach cable end assemblies to breakaway anchor angle. Prior to tensioning the cables, install a 16 inch (minimum length) 3/16-inch diameter brass rod through the 1/4-inch diameter holes located on the end gussets of each breakaway anchor angle. Bend the rod one inch at each end to keep cable end assembly in place.

When cable barrier assembly is complete, set the compensating devices to a spring compression of 3½ inches. Leave the springs at this setting for at least 2 weeks; then set the springs to the proper setting based on ambient temperature, in accordance with Table 1.

Provide written certification to the Engineer prior to acceptance that the cable barrier and cable barrier terminals have been installed in accordance with the plans, Standard Plan R-70 Series, and this special provision.

Table 1: Compensating Device Spring Compression

Ambient Temperature (°F)	Spring Compression from Unloaded Position in Each Spring (inch)
110 to 120	1
100 to 109	1¼
90 to 99	1½
80 to 89	1¾
70 to 79	2
60 to 69	2¼
50 to 59	2½
40 to 49	2¾
30 to 39	3
20 to 29	3¼
10 to 19	3½
0 to 9	3¾
-10 to -1	4
-20 to -11	4¼

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 Barrier, Low Tension, Type __ .....Foot
Cable Barrier Terminal, Low Tension .....Each

1. **Cable Barrier, Low Tension, Type** __, of the type specified includes constructing low

tension cable barrier as shown on the plans, Standard Plan R-70 Series, and this special provision. Furnishing and installing reflectors is included in this pay item.

2. **Cable Barrier Terminal, Low Tension** includes constructing a low tension cable terminal in accordance with the plans, Standard Plan R-70 Series, and this special provision. Furnishing sound earth and grading are included in this pay item.