

- a. Sixty percent for oil pipelines.
- b. Forty percent for pipelines carrying condensate, natural gasoline, natural gas liquids, liquefied petroleum gas, and other liquid petroleum products.
- c. For gas pipelines see Section 5.2.

5.1.4 PLASTIC CARRIER PIPE CONVEYING NON LIQUID FLAMMABLE SUBSTANCES (2002) R(2017)

- a. Plastic carrier pipelines shall be encased according to Article 5.1.5.
- b. Plastic carrier pipe material includes thermoplastic and thermoset plastic pipes. Thermoplastic types include Polyvinyl Chloride (PVC), Acrylonitrile Butadiene Styrene (ABS), Polyethylene (PE), Polybutylene (PB), Cellulose Acetate Butyrate (CAB) and Styrene Rubber (SR). Thermoset types include Reinforced Plastic Mortar (RPM), Reinforced Thermosetting Resin (RTRP) and Fiberglass Reinforced Plastic (FRP).
- c. Plastic pipe material shall be resistant to the chemicals with which contact can be anticipated. Plastic carrier pipe shall not be utilized where there is potential for contact with petroleum contaminated soils or other non-polar organic compounds that may be present in surrounding soils.
- d. Plastic carrier pipe can be utilized to convey flammable gas products provided the pipe material is compatible with the type of product conveyed and the maximum allowable operating pressure is less than 100 psi (689.5 kPa). Carrier pipe materials, design and installation shall conform to Code of Federal Regulation 49 CFR Part 178 to 199, specifically Part 192 and ASME B31.3 and B31.8 and ASTM D2513. Codes, specifications and regulations current at time of constructing the pipeline shall govern the installation of the facility within the railroad rights-of-way. The proof testing of the strength of carrier pipe shall be in accordance with ASME requirements. Plastic carrier pipelines will be encased according to Article 5.1.5.

5.1.5 CASING PIPE (2002) R(2017)

- a. Casing pipe and joints shall be steel in conformance with ASTM A1097 and of leakproof construction, such as butt welded or interlocking joints which are capable of withstanding railroad loading. Pipe shall have a specified minimum yield strength, SMYS, of at least 35,000 psi (241,317 kPa). The inside diameter of the casing pipe shall be large enough to allow the carrier pipe to be removed subsequently without disturbing the casing pipe. All joints or couplings, supports, insulators or centering devices for the carrier pipe within a casing under railroad tracks shall be taken into account.
- b. When casing is installed without benefit of a protective coating or said casing is not cathodically protected, the wall thickness shall be increased to the nearest standard size which is a minimum of 0.063 inches (1.6 millimeters) greater than the thickness required except for diameters under 12-3/4 inches (323.8 millimeters).

Table 1-5-1. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading

Nominal Diameter (inches)	When coated or cathodically protected Nominal Thickness (inches)	When not coated or cathodically protected Nominal Thickness (inches)
12-3/4 and under	0.188	0.188
14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344

Table 1-5-1. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading (Continued)

Nominal Diameter (inches)	When coated or cathodically protected Nominal Thickness (inches)	When not coated or cathodically protected Nominal Thickness (inches)
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.531
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 46	0.594	0.656
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 and 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 and 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

5.1.5.1 Flexible Casing Pipe

For flexible steel casing pipe, a maximum vertical deflection of a casing pipe of 3 percent of its diameter plus 1/2 inches (12.7 millimeters) clearance shall be provided so that no loads from the roadbed, track, traffic or casing pipe itself are transmitted to the carrier pipe. When insulators are used on the carrier pipe, the inside diameter of flexible casing pipe shall be at least 2 inches (50.8 millimeters) greater than the outside diameter of the carrier pipe for pipe less than 8 in. in diameter; at least 3-1/4 inches (82.5 millimeters) greater for pipe 8 inches (203.2 millimeters) to 16 inches (406.4 millimeters), inclusive, in diameter and at least 4-1/2 inches (114.3 millimeters) greater for pipe 18 inches (457.2 millimeters) in diameter and over.

5.1.5.2 Length of Casing Pipe

Casing pipe under railroad tracks and across railroad rights-of-way shall extend to the greater of the following distances, measured at right angles to centerline of track. If additional tracks are constructed in the future or *if* the railroad determines that the roadbed should be widened, the casing shall be extended or other special design incorporated:

- a. 2 feet (0.61 meters) beyond toe of slope.
- b. 3 feet (0.91 meters) beyond ditch.

VERTICAL-Not less than 25 feet (7.62 meters) above highest top of rail of the tracks to be spanned, except that cable supported spans shall have a vertical clearances of not less than 50 feet (15.24 meters).

HORIZONTAL-Not less than 25 feet (7.62 meters) from the centerline of the nearest existing main, siding, spur, or industry track, except in cases where the Engineer directs that additional clearance for future tracks must be provided. If conditions warrant, the engineer may require Pier Protection in accordance with Chapter 8, Concrete Structures and Foundations, Part 2, Reinforced Concrete Design.

New beam span, girder and truss type structures and the details of the proposed attachment shall be designed in general accordance with Chapter 15 of this *Manual of Recommended Practice*.

New cable suspended type structures shall be reviewed only upon special application to the railroad. Such application shall identify the design specifications to be used, to include the loads, allowable stresses and design considerations to be applied. Unless otherwise directed by the Engineer, cable supported spans shall include a minimum floor system with lateral bracing.

5.4.4.2.3 Attachments to Existing Overhead Bridges

Where the pipeline is to be attached to an existing overhead structure not specifically designed for pipelines, the following shall apply:

Existing structures proposed as support for a pipeline shall be investigated for the additional loads of the operating pipeline facility. Additionally, the report of the professional engineer shall contain a conclusion with respect to the effects of the additional loads on the existing structure.

Pipelines shall be installed inside the main structural members of the supporting bridge. In cases where this is not practical, the pipeline may be attached to the outside surface of the structure, but in no case shall the bottom of the pipeline be less than one foot above the elevation of the lowest main structural member of the supporting bridge.

Pipe hanger and bearing attachment device design, and their connections to the supporting structure and the pipeline, shall be based on unit stresses equal to one-half (1/2) those otherwise permitted. Attachment device design shall consider thermal expansion, live loads deflection of the existing bridge, and seismic displacements.

Pipeline and attachment designs shall consider the force and effect of seasonal temperature change, expansion and contraction, vibration, and the elements of the weather. Attachments shall be protected against corrosion in situations where chemical ice removal is utilized, or other corrosive condition is known or suspected.

5.4.5 INSPECTION AND MAINTENANCE (2017)

Overhead pipelines, attachment devices, and supporting structures should be inspected and maintained on a routine basis. Also, emergency response procedures should be developed to handle a situation in which an accident or incident might jeopardize the integrity of pipeline facility.

SECTION 5.5 GUIDELINES FOR WIRELINE CROSSINGS AND PARALLEL ENCROACHMENTS ON RAILROAD RIGHT OF WAY

5.5.1 SCOPE (2017)

- a. These general requirements and technical details are provided only as a guideline for the successful completion of wireline installations on railroad right-of-way. Individual railroads reserve the right to adopt part, all or none of these guidelines as needed without prior notice. These guidelines are not to be taken as authority to construct without prior review and approval by each of the participating railroads.

- b. Wirelines for this section are defined as electric power and communication utility systems including, but not limited to, all associated conductors, cables, support systems, and equipment.
- c. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the higher degree of protection so prescribed shall be deemed a part of these guidelines.
- d. See Section 5.6 for fiber optic installations.

5.5.2 GENERAL GUIDELINES (2017)

- a. At times, this document references the National Electrical Safety Code (NESC) not the National Electrical Code (NEC).
- b. Above-ground facilities should be located as far as possible from vehicle or pedestrian crossings and constructed in such manner to allow automobile or pedestrian traffic adequate sight lines to view approaching trains.
- c. The wireline and associated structures shall be located to allow space for future tracks as deemed necessary by the railroad.
- d. Wirelines should cross the track 90 degrees off the centerline of the track. In no case shall it cross less than 60 degrees off the centerline of the track.
- e. Locate and identify all existing utilities, including those owned and operated by the railroad, within the railroad right-of-way. Provide and show all existing utilities on the plans submitted to the railroad.
- f. A railroad signal representative must be present during installation if railroad signals are in the vicinity of the wireline crossing unless the railroad signal representative authorizes otherwise.
- g. Shoring shall comply with the individual railroads' shoring requirements.
- h. All utility crossings should have their own crossing agreement with the railroad even in existing utility corridors.
- i. Warning tape and witness posts.
 - (1) Within the railroad right-of-way and outside the track subgrade section, a 6 inch (0.15 meters) wide warning tape shall be installed 1 foot (0.30 meters) below natural grade directly over the underground wireline.
 - (2) Warning tape is not required for approved horizontal direction drilling routes located on railroad property.
 - (3) Durable witness posts must be placed to show location of the wireline at the railroad right-of-way line for crossings and placed every 500-ft (152.39 meters) for parallel wirelines.

5.5.3 PARALLEL WIRELINE ENCROACHMENTS (UNDERGROUND AND OVERHEAD) (2017)

- a. Submittals shall show that all options to locate the wireline off the railroad right-of-way have been exhausted and that the proposed plan is the only feasible solution. Cost shall not be the determining factor.
- b. Regardless of underlying land ownership, parallel overhead wirelines located within 200 feet (60.96 meters) of any track shall be submitted to the railroad for review.
 - (1) Provide a thorough evaluation of the proposed wireline and its effects on existing and proposed railroad signal and communication systems.

NOTE: Overhead parallel wirelines within 200 feet (60.96 meters) of a track have the potential to induce voltage in the rail which, among other negative effects, can cause road crossing warning devices and/or the railroad's

signal and communication system to fail. Mitigation of all negative effects on railroad infrastructure will be required.

c. Horizontal Clearance Requirements:

- (1) At locations adjacent to a railroad bridge, culvert, switch or other Railroad structure type, the greatest of the following minimum horizontal clearances shall be provided regardless of underlying land ownership. These minimum clearances ensure the railroads' ability to build, maintain and reconstruct Railroad infrastructure. Greater clearances may be required for reasons stated in 5.5.2.c and 5.5.3.b.
 - i 50 feet (15.24 meters) from the all edges of the railroad structure.
 - ii 2 feet (0.61 meters) beyond the toe of railroad embankment slope.
 - iii 3 feet (0.91 meters) beyond the outside edge of a ditch.

d. Vertical Clearance Requirements:

- (a) The wireline should be located a minimum of 4 feet (1.22 meters) above or below any existing drainage structure except that 8 feet (2.44 meters) is required if beyond the downstream end of the drainage structure.

5.5.4 WIRELINE CROSSINGS (CARRYING 750 VOLTS OR LESS) (2017)

5.5.4.1 Underground wireline crossings (750 volts or less)

a. Vertical clearance

- (1) Minimum vertical clearance required from base of rail to top of wireline and associated wireline structures such as casing shall be 4.5 feet (1.37 meters) for steel casings and 12 feet (3.66 meters) for non-metallic casings.
 - i All HDD installations shall be a minimum of 12 feet (3.66 meters) from the base of rail to the top of wireline and associated wirelines structures.
- (2) Minimum vertical clearance from natural grade, on other areas of the railroad right-of-way away from the track, to the top of wireline and associate wireline structures such as casing shall be 3.0 feet (0.91 meters).
- (3) Minimum vertical clearance required between wirelines structures and casing and railroad signal and communication lines shall be 4 feet (1.22 meters).

b. Horizontal Clearance

Greater clearances may be required due to site characteristics, as required by the railroad.

- (1) Wirelines shall be located no closer than:
 - i 150 feet (45.72 meters) to the nearest portion of any railroad bridge, culvert or other railroad infrastructure, as required, except as stated below in Section 5.5.5.1.b.3.
 - ii 50 feet (15.24 meters) to a switch, signal lights, signal shed or other railroad infrastructure, as required, except as stated below in Section 5.5.5.1.b.3.
- (2) Neither permanent nor temporary wirelines shall be placed within railroad culverts or under railroad bridges except as stated below in Section 5.5.5.1.b.3.

(3) For crossings within through streets which cross under Railroad bridges and at-grade crossings:

- i Railroad Bridge - The wireline should cross under the longest railroad bridge span and be located equidistant to the nearest bridge piers and/or abutments.
- ii At-grade Crossing - The wireline should be located within the street right-of-way limits while maintaining the maximum distance to railroad infrastructure such as signal cabins and crossing gates.

c. Casing (required)

(1) Casing length

- i Casing must extend a minimum of 30 feet (9.14 meters) from the centerline of the nearest existing or future track(s), measured perpendicular to the centerline of track, as required by the railroad.

(2) Casing material

- i The casing material shall be steel or rigid metal conduit and shall meet or exceed the specifications in Section 5.1.5, Table 1-5-1.
- ii Plastic (non-metallic) casing may be considered for depths below grade and base of rail greater than or equal to 12 feet (3.66 meters), as approved by the railroad.

d. Installation

(1) Acceptable methods of Installation

- i Horizontal directional drilling, see Section 5.7.
- ii Dry jack and bore.
- iii Other, as approved by the railroad.

(2) The railroad may require on site observation and top of rail monitoring during and after the installation process.

5.5.4.2 Overhead wireline crossings (750 volts or less)

a. Vertical clearance

- (1) Minimum vertical clearance required from top of rail to lowest hanging overhead wireline shall be as required by NESC + 3 feet (0.91 meters).
- (2) Minimum vertical clearance required between wirelines and railroad signal and communication lines shall be 4 feet (1.22 meters).

b. Horizontal clearance

(1) Minimum horizontal clearance from overhead wireline crossings to railroad infrastructure.

- i 300 feet (91.44 meters) from the near edge of any railroad bridge or culvert.
- ii 50 feet (15.24 meters) from the near edge of any switch or other railroad infrastructure as required by the railroad.

- (2) Minimum horizontal clearance from the centerline of the nearest track, measured perpendicular to the centerline of track, to near face of the wireline support structure.
- i 50 feet (15.24 meters) for tracks other than industry tracks.
 - ii 15 feet (4.57 meters) for industry tracks.
 - iii Unguyed support structures.
 - 1 From railroad signal and communication lines located above and below grade shall be located a minimum distance equal to the height of the wireline structure above the groundline.
 - 2 From centerline of near track shall be located a minimum distance equal to the height of the pole above the groundline plus 10 feet (3.05 meters).
 - iv In curved track the above clearances shall be increased either 6 in. (0.15 meters) total or 1.5 in. (0.04 meters) for every degree of curve, whichever is greater.
- c. Guy wires
- (1) Guys wires shall be placed in such a manner as to keep the pole from leaning or falling in the direction of the tracks.

5.5.5 WIRELINE CROSSINGS (CARRYING MORE THAN 750 VOLTS) (2017)

5.5.5.1 Underground wireline crossings (more than 750 volts)

a. Vertical clearance

- (1) Minimum vertical clearance required from base of rail to top of wireline and associated wireline structures such as casing shall be 4.5 feet (1.37 meters) for steel casings and 12 feet (3.66 meters) for non-metallic casings.
- i All HDD installations shall be a minimum of 12 feet (3.66 meters) from base of rail to top of wireline and associated wireline structures.
- (2) Minimum vertical clearance from natural grade, on other areas of the railroad right-of-way away from the track, to the top of wireline and associate wireline structures such as casing shall be 4.0 feet (1.22 meters).
- (3) Minimum vertical clearance required between wirelines and railroad signal and communication lines shall be 4 feet (1.22 meters).

b. Horizontal Clearance

Greater clearances may be required due to site characteristics, as required by the railroad.

- (1) Wirelines shall be located no closer than:

- i 150 feet (45.72 meters) to the nearest portion of any railroad bridge, culvert or other railroad infrastructure, as required, except as stated below in Section 5.5.5.1.b.3.
- ii 50 feet (15.24 meters) to a switch, signal lights, signal shed or other railroad infrastructure, as required, except as stated below in Section 5.5.5.1.b.3.

(2) Neither permanent nor temporary wirelines shall be placed within railroad culverts or under railroad bridges except as stated below in Section 5.5.5.1.b.3.

(3) For crossings within through streets which cross under railroad bridges and at-grade crossings:

- i Railroad Bridge - The wireline should cross under the longest railroad bridge span and be located equidistant to the nearest bridge piers and/or abutments.
- ii At-grade Crossing - The wireline should be located within the street right-of-way limits while maintaining the maximum distance to railroad infrastructure such as signal cabins and crossing gates.

c. Casing (required)

(1) Casing Length

- i Encasement is required across the entire width of the railroad right-of-way.

(2) Casing Material

- i The casing material should be steel or rigid metal conduit.
- ii Plastic (non-metallic) casing may be considered by the railroad with the following conditions:
 - 1 The depth below grade to the top of the casing shall be greater than or equal to 12 feet (3.66 meters), as approved by the railroad.
 - 2 It is not allowed within 50 feet (15.24 meters) from the centerline of existing or future tracks, as approved by the railroad.
 - 3 It shall be encased in a minimum of 12 inches (0.30 meters) of concrete across the entire width of the railroad right-of-way.

d. Installation

(1) Acceptable methods of Installation

- i Horizontal directional drilling, see Section 5.7.
- ii Dry jack and bore.
- iii Other, as approved by the railroad.

(2) The railroad may require on site observation and top of rail monitoring during and after the installation process.

5.5.5.2 Overhead wireline crossings (more than 750 volts)

a. Vertical clearance

- (1) Minimum vertical clearance required from top of rail to lowest hanging overhead wireline shall be as required by NESC + 3 feet (0.91 meters).
- (2) Minimum vertical clearance required between all wirelines and railroad signal and communication lines shall be 4 feet (1.22 meters).