

SUPPLEMENTAL SPECIAL PROVISIONS

APPENDIX I

UTILITIES CROSSING RAILROAD PROPERTY

Part 3 – UTILITIES CROSSING RAILROAD PROPERTY

A. General Provisions

This section of the policy applies to all public and private utilities, including electric power, telephone (including fiber optic), cable television, water, sewer, gas, oil, petroleum products, steam, chemicals, drainage, irrigation, and similar lines that are located, adjusted, or relocated within the railroad property.

Installations crossing the railroad property, to the extent feasible and practical, are to be perpendicular to the track alignment and preferably at not less than thirty (30) degrees to the centerline of track. Utilities shall not be placed within culverts or under railroad bridges, buildings, or other important structures.

Utilities will be located so as to provide safe environment and shall conform to the current “National Electrical Safety Code,” “American Waterworks Association Specification,” “Federal Pipeline Safety Regulations,” and the “American Railway Engineering and Maintenance of Way Association Recommended Practices.” Where laws or orders of public authority prescribe a higher degree of protection, then the high degree of protection prescribed shall supersede the provisions of this manual.

B. Overhead Installations

1. Minimum five (5) feet clearance required above signal and communication lines.
2. Poles must be located fifty (50) out from the centerline of main, branch, and running tracks, CTC sidings, and heavy tonnage spurs. Pole location adjacent to industry tracks must provide at least a 10-foot clearance from the centerline of track when measured at right angles. If located adjacent to curved track, then said clearance must be increased at a rate of 1-1/2 inches per degree of curved track.
3. Regardless of the voltage, unguyed poles shall be located a minimum distance from the centerline of any track, equal to the height of the pole above the ground plus 10-feet. If guying is required, the guys shall be placed in such a manner as to keep the pole from leaning/falling in the direction of the tracks.
4. Poles (including steel poles) must be located a minimum distance from a railroad signal and communication line equal to the height of the pole above the ground or else be guyed at right angles to the lines. High voltage towers (34.5 kV and higher) must be located off the railroad property.
5. Crossing will not be installed under or within 500-feet of the end of any railroad bridge or 300-feet from the centerline of any culvert or switch area.
6. Complete spanning of the property is encouraged with supportive structures and appurtenances located outside the railroad property. For electric supply and

communication lines, normally the crossing span shall not exceed 150-feet with adjacent span not exceeding 1-1/2 times the crossing span length. For heavier type construction, longer spans will be considered.

7. Joint-use construction is encouraged at locations where more than one utility or type of facility is involved. However, electricity and petroleum, natural gas, or flammable material shall not be combined. Pipe truss design and layout will need to be reviewed and approved by NCTD.
8. To ensure that overhead wire crossing are clear from contact with any equipment passing under such wires, communication lines shall be constructed with a minimum clearance above top of rail of twenty-six (26) feet and electric lines with a minimum clearance of twenty-eight (28) feet or great above top of rail when required by the "National Electric Safety Code" or state and local regulations. Electric lines must have a florescent ball marker on the low wire over centerline of track.
9. The Utility Owner shall label the posts closest to the crossing with the owner's name and telephone number for emergency contact.
10. All overhead flammable and hazardous material lines shall be NCTD approved, but should be avoided if possible.
11. For proposed electrical lines crossing track, NCTD may request that an inductive interference study be performed at the expense of the Utility Owner. Inductive interference from certain lines has the potential to disrupt the signal system in the track causing failures in the track signals and highway grade crossing warning devices.

C. Underground Installations

a. General

- a. All underground utility crossings of railroad trackage shall be designed to carry Cooper's E-80 railroad live loading with diesel impact (AMREA Cooper's loading Section 8-2-8). This 80,000-lb axle load may be distributed laterally a distance of three (3) feet, plus a distance equal to the depth from structure grade line to base of rail, on each side of centerline of single tracks, or centerline of outer track where multiple track are to be crossed. In no case shall railroad loading design extend less than twenty (20) feet laterally from centerline of track. Longitudinally, the load may be distributed between the five-foot axle spacing of the Cooper configuration. Railroad loading criteria will also apply where future track are contemplated, to the extent this information is available.
- b. All utility crossings under ditches and railroad trackage shall have a minimum depth of cover of five (5) feet below the flow line of the ditch or adjacent ground and seven and one-half (7-1/2) feet from base of rail. In fill sections, the ground

line at the toe of the slope shall be considered as ditch grade. The depth of cover shall not be less than that meeting applicable industry standards.

- c. For all boring and jacking installations under main and passing track, greater than 26-inches in diameter, and at a depth of 7.5 and 10.0 feet below top of tie, a geotechnical study will be required to determine the presence of granular material and/or high water table elevation, at the sole expense of the Permittee. The study shall include recommendations and a plan for a procedure to prevent failure and a collapse of the bore. Generally, core samples are to be taken near the ends of tie at the proposed location, at least as deep as the bottom of the proposed horizontal bore. Test results must be reviewed and approved by NCTD prior to boring activities commencing. NCTD reserves the rights, based on test results, to require the Permittee to select an alternate location, or to require additional engineering specifications be implemented at the sole expense of the Permittee, in order to utilize the existing location.
- d. The use of plastic carrier pipe for sewer, water, natural gas, and other liquids is acceptable under specific circumstances. The use of plastic pipe is satisfactory if the pipe is designed to meet all applicable federal and state codes, and if the carrier pipe is properly encased within a steel casing pipe per AREMA standards. This casing must extend the full width of the right-of-way. Casing may be omitted only for gaseous products if the carrier pipe is steel and is placed ten (10) feet minimum below the base of the rail per AREMA standards.

2. General Design and Construction Requirements

- a. If the minimum depth is not attainable because of existing utilities, water table, ordinances, or similar reasons, the line shall be rerouted.
- b. Locations that are considered unsuitable or undesirable are to be avoided. These include deep cuts and in wet or rocky terrain or where it will be difficult to obtain minimum depth.
- c. Underground installations may be made by open-trenching from the right-of-line to the toe of fill slopes in fill sections and to the toe the shoulder slope in cut sections but to no closer than thirty (30) feet from centerline of track. The remainder will be tunneled, augured, jacked, or directional-bored through the road as approved by NCTD. Refer to the following sections for encasement of utilities and boring requirements.
- d. Manholes shall be located outside railroad property, when possible. No manhole shall be located in the shoulder, shoulder slope, ditch or backslope, or within twenty-five (25) feet of the centerline of track and shall not protrude above the surrounding ground without approval of NCTD.

- e. Utilities shall not be attached to or routed through drainage structures and shall not be attached to other railroad structures without written approval of NCTD.
- f. Jacking pits shall be located outside of railroad property and no less than thirty (30) feet from centerline of track.

3. Pipeline Requirements

- a. Pipeline designs are to specify the type and class of material, maximum working pressure and test and design pressure. Pipelines which are not constructed, operated, and maintained under regulations established under US Department of Transportation Hazardous Materials Regulations Board, shall upon revisions in the class of material or an increase in the maximum operating pressure, must obtain NCTD approval.
- b. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas, and other flammable products shall conform to the requirements of the current AREMA, ANSI/ASME B 31.4 Code for pressure piping – Liquid Petroleum Transportation and Distribution Piping Systems; other applicable ANSI codes and 49 CFR Part 192 or Part 195 – Transportation of Hazardous Liquids by Pipeline, except that the maximum allowable stress of design of steel pipe shall not exceed the following percentages of the specified minimum yield strength (multiplied by longitudinal joint factor) of the pipe as defined in the ANSI codes.
- c. Pipelines under railroad tracks and across railroad property shall be encased in a larger pipe or conduit called “casings.” Generally, casings shall extend from right-of-way line to right-of-way line, unless otherwise approved by NCTD.
- d. Pipelines and casing pipes shall be suitably insulated from underground conduits carrying electric wires on railroad property.
- e. Reinforced concrete pipe shall be encased for a distance as wide as the embankment at the utility crossing. This is to protect against track failure due to joint separation.

4. Encasement of Utilities

- a. Casings are oversized load-bearing conduits or ducts through which a utility is inserted:
 - 1) To protect the railroad from damages and to provide for repair, remove, and replacement of the utility without interference to railway traffic.
 - 2) To protect the carrier pipe from external load or shock, either during or after construction.
 - 3) To convey leaking fluids or gases away from the area directly beneath the railroad trackage to a point of venting at the railroad property line.

- b. Casings may be omitted for gaseous products only under the following circumstances:
- 1) Carrier pipe must be steel and the wall thickness must conform to E-80 loading with a 50% impact load for casing pipe shown in the tables as included in the AREMA manual Chapter 1, Part 5 for Pipeline Crossings. The length of thicker-walled pipe shall extend from railroad right-of-way line to right-of-way line. This will generally result in thicker-walled pipe on railroad property.
 - 2) All steel pipe shall be coated and cathodically protected.
 - 3) The depth from the top of tie to top of pipe shall not be less than ten (10) feet below top of tie. The depth from ditches or other low points on railroad property shall not be less than six (6) feet from ground to top of pipe.
- c. In circumstances where it is not feasible to install encasement from right-of-way line to right-of-way line, casing pipe under railroad tracks and across railroad property shall extend to the greater of the following distances, measured at right angles to the centerline of track:
- 1) Two (2) feet beyond toe of slope.
 - 2) Three (3) feet beyond ditch line.
 - 3) Twenty-five (25) feet from centerline of outside track when casing is sealed at both ends.
 - 4) Forty-five (45) feet from centerline of outside track when casing is open at both ends.
 - 5) If additional track is planned for future construction, casing must extend far enough to meet above distances given the additional track requirement.
- d. Pipelines and casing pipe shall be suitably insulated from underground conduits carrying electric wires on railroad property.
- e. Casing pipe and joints shall be made of metal and of leakproof construction. Casings shall be capable of withstanding the railroad loadings and other loads superimposed upon them.
- f. Minimum wall thickness designations for steel casing pipe for E-80 loading (including impact) shall be:

Nominal Diameter (inches)	Minimum Thickness for Coated (inches)	Non-Coated (inches)
14 and Under	0.188	0.188
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344
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, 40, and 42	0.500	0.563
44 and 46	0.531	0.594
48	0.563	0.625
50	0.594	0.656
52	0.625	0.688
54	0.656	0.719
56 and 58	0.688	0.750
60	0.719	0.781
62	0.750	0.813
64	0.778	0.844
66 and 68	0.813	0.875
70	0.844	0.906
72	0.875	0.938

- 1) Steel pipe shall have minimum yield strength of 35,000 pounds per square inch.
 - 2) All metallic casing pipes shall be designed for effective corrosion control, long service life, and relatively free from routine servicing and maintenance. Corrosion control measures must include cathodic protection.
 - 3) Cast iron may be used for casing. It shall conform to ANSI A21. The pipe shall be connected with mechanical-type joints. Plain-end pipe shall be connected with compression-type couplings. The strength of the cast iron pipe to sustain external loads shall be computed in accordance with the most current ANSI A21.1 "Manual for the Computation of Strength and Thickness of Cast Iron Pipe."
- g. The inside diameter of the casing pipe shall be such that the carrier pipe can be removed without disturbing the casing. All joints or couplings, supports, insulators, or centering devices for the carrier pipe shall be considered in the selection of the casing diameter.
- h. For flexible casing pipe, a minimum vertical deflection clearance of the casing pipe shall be three percent (3%) of its diameter plus one-half (1/2) inch so that no loads from the roadbed, track, railroad traffic, or casing pipe are transmitted to the carrier pipe. When insulators are used on the carrier pipe, the relationship of the casing size to the size of the carrier pipe shall be:

Diameter of Carrier Pipe	Inside Diameter of Casing Pipe Equals Outside Diameter of Carrier Pipe Plus
0" – 8"	2"

10" – 16"	3-1/4"
Over 16"	4-1/2"

5. Casing and Pipeline Installation

- a. Casing and pipeline installations shall be accomplished by direction boring, jack-and-bore, tunneling, or other approved methods. Tunneling construction under tracks will be permitted only under direct supervision of NCTD. Tunneling procedures and equipment, as well as structural design, must have NCTD approval prior to starting any work on railroad right-of-way. Generally, tunneling shall not be considered where less than seven (7) feet of cover exists, or where excessively sandy, loose, or rocky soils are anticipated.

Rail elevations over the work must be monitored at intervals prescribed by NCTD to detect any track movement. Movements of over one-quarter (1/4) inch vertically shall be immediately reported to NCTD. Due to the danger to rail traffic that is caused by only small amounts of track movement, NCTD may have to be called to surface the track several times.

The following requirements shall apply to these construction methods.

- 1) The use of water under pressure jetting or puddling will not be permitted to facilitate boring, pushing, or jacking operations. Some boring may require water to lubricate cutter and pipe, and under such conditions, is considered dry boring.
- 2) Where unstable soil conditions exist, boring, or tunneling operations shall be conducted in such a manner as not to be detrimental to the railroad being crossed.
- 3) If excessive voids or too large of a bored hole is produced during casing or pipelines installations, or if it is necessary to abandon a bored or tunneled hole, immediate remedial action shall be taken by the Utility Owner under the supervision of NCTD.
- 4) All voids or abandoned holes caused by boring or jacking are to be filled by pressure grouting. The grout material shall be sand cement slurry with a minimum of two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.
- 5) The hole diameter resulting from bored or tunneled installations shall not exceed the outside diameter of the utility pipe, cable, or casing (including coating) by more than one and one-half (1-1/2) inches for pipes with an inside diameter of twelve (12) inches or less, two (2) inches on pipes with an inside diameter greater than twelve (12) inches.
- 6) Pits for boring, tunneling, or jacking shall be located no closer than fifty (50) feet from centerline of the nearest track; or closer to the track than the toe of fill slopes in fill section, or toe of shoulder slopes in ditch section when pipes are allowed on the railroad right-of-way.

c) Vents

In casing pipe installations, vents are appurtenances by which fluid or gases between the carrier and casing may be inspected, sampled, exhausted, or evacuated.

- 1) Vents shall be located at the high end of the short casings and at both ends of casings longer than one hundred (100) feet.
- 2) Vent standpipes shall be located and constructed so as not to interfere with maintenance of the railroad or to be concealed by vegetation. Where possible, they shall be marked and located at the property line. The markers shall give the name and address of the Utility Owner and a phone number to contact in case of emergency.
- 3) Casing pipe, when sealed, shall be properly vented. Vents pipes shall be of sufficient diameter, but in no case less than two (2) inches in diameter and shall be attached near each end of the casing, projecting through the ground surface at the property lines.
- 4) Vent pipes shall extend not less than four (4) feet above the ground surface. The top of the vent pipes shall be fitted with a down-turned elbow and screened or a with a relief valve.
- 5) For pipelines carrying flammable materials, vent pipes on casings shall be at least 16 feet (vertically) from aerial electric wires. Casings shall be suitably insulated from underground conduits carrying electric wires on railroad right-of-way.

c. Shut-off Valves

- 1) The Utility Owner shall install accessible emergency shut-off valves within effective distances on each side of the railroad. Where pipelines are provided with automatic control stations, no additional valves will be required.
- 2) Locating a shut-off valve on railroad property should be avoided. However, if approved by NCTD, a guardrail and other means of protection shall be installed around the shut-off valve.
- 3) When a guardrail is required, its height shall be four (4) feet above the ground line. All four corner posts shall be driven to a minimum depth of four (4) feet below the ground line. There shall be a minimum clearance of two (2) feet from the valve to the guardrail. The steel pipes for the four corner posts and guardrail shall have a minimum diameter of four (4) inches. All joints will be welded with a one-quarter (1/4) inch fillet weld at around.

6. Water Lines

- a. Where casing pipe is used, venting is not required; however, sealing will be required if the ends of the casing are not above high water.

- b. Where non-metallic pipe is permitted and installed, steel casings are required from right-of-way line to right-of-way line.
- c. Valves, blow-offs, air vacuums, and other waterline appurtenances shall be located outside of railroad property.
- d. The Utility Owner shall place a readily identifiable and suitable marker at each railroad property line where it is crossed by a water line.

7. Sewer Lines

- a. New and relocated sewer lines shall be constructed with satisfactory joints, materials, and designs which will provide protection and resistance to damage from sulfide gases and other corrosive elements to which they may be exposed.
- b. Where casing pipe is used, venting and sealing of the casing will be required.
- c. Where non-metallic pipe is permitted and installed, a durable metal wire shall be concurrently installed or other means shall be provided for detection purposes.
- d. Manholes, cleanouts, and other sewer appurtenances shall be located outside of railroad property. Should NCTD approved these appurtenances within the railroad property, they shall not be located within twenty-five (25) feet of the railroad track, in the shoulder, shoulder slope, ditch, or backslope, and shall not protrude above the surrounding ground without the approval of NCTD.

8. Electric Power Lines

- a. A minimum depth of 5.5 feet below the base of rail (BBR) will be maintained.
- b. A minimum depth of 3.0 feet below natural grade (BNG) will be maintained for 750 volts and less, and 4.0 feet BNG for greater than 750 volts.
- c. The wireline must be encased completely across the railroad right-of-way with a rigid metallic conduit.
- d. Crossing will not be installed under or within one-hundred (100) feet of the end of any railroad bridge, drainage facilities, turnouts, grade crossings, and signals.
- e. NCTD signal personnel must be present during the installation if railroad signals are in the vicinity of wireline crossings.
- f. Markers that identify the Utility Owner shall be placed at both property lines for utilities crossing the railroad property. For parallel lines markers shall be placed above the cable at intervals no less than 300' apart. The markers shall identify the owner, type of cable, and emergency telephone number. A 6-inch wide warning

tape shall be installed, 12" BNG directly over the underground power line where located on railroad right-of-way outside the track ballast section.

- g. Above-ground utility appurtenances installed as a part of an underground installation shall be located at or near the railroad property line and shall not be any closer than fifty (50) feet from the centerline of track.

9. Fiber Optic Lines

- a. The same requirements for electric power line crossings will apply for fiber optic line crossings except for the following:
 - 1) A minimum depth of 4.0 feet BNG for fiber optic cable wirelines.
 - 2) NCTD must approve any specialized equipment used to install cable. No rail plow will be allowed for installation purposes.