



**ENGINEERING DEPARTMENT**  
**SEPTEMBER, 2007**

**GUIDELINES FOR UTILITY INSTALLATIONS**  
**Part 2 – Pipelines: Flammable and Non-Flammable**  
**Materials**  
**(Including Casings Containing Wires and Cables)**

*General Requirements*

This section applies to all public and private utilities, including water, sewer, liquid petroleum products, and gases.

Installations crossing Metra property shall be, to the extent feasible, perpendicular to the right of way. Utilities shall not be placed within culverts or under railroad bridges, buildings or other structures.

Pipelines shall be located so as to provide a safe environment and shall conform to the current *American Railway Engineering and Maintenance Association Specifications*. Where local laws or authorities prescribe a more stringent specification, that specification shall supersede the specification in this manual.

All pipe line applications shall include a plan and cross section view, at a clear and legible scale,, of the proposed installation. Plan views shall include the following:

- Date of plan, scale and north arrow
- All railroad tracks
- Distance (in feet) to nearest railroad milepost or grade crossing (centerline of road)
- Right of way dimensions
- Angle of crossing relative to right of way
- Location of all railroad signal facilities and pole lines
- Location of all existing utility pole lines and above ground utilities
- Location of proposed pipeline crossing
- Length of pipe line crossing under tracks
- Location of bridges or culverts

Cross section views shall include the following:

- Date of plan, scale
- All railroad tracks
- Right of way dimensions
- Vertical clearance from bottom of rail to top of pipe on all tracks
- Length of crossing across tracks
- Location of all existing railroad pole lines and utility lines
- Location of all grade crossing signal equipment (gates, flashers, masts, cantilevers, etc.) if located near or within a road crossing

# Specifications for Underground Pipe Lines

## *General Requirements*

### 1. Use of casing pipe:

- a. A casing pipe is required for all pipeline crossings. Casing pipes must extend the full width of the right of way. Uncased pipelines are not allowed.
- b. Longitudinal pipelines that are located within 25 feet of the track centerline shall be encased.
- c. At the discretion of Metra, a casing pipe may be required for any application regardless of the commodity carried.
- d. All underground utility crossings shall be designed to withstand Cooper's E-80 Railroad live loading.

### 2. Location:

- a. Longitudinal pipelines shall be located as far from any tracks or other railroad structures and as close to the right of way line as possible.
- b. Pipelines shall be designed, where practicable, to cross tracks at approximately right angles.
- c. Pipelines must be located a minimum of 50 feet from the end of any railroad bridge, centerline of any culvert or switch area to the centerline of the pipeline crossing.
- d. Pipelines shall not be located within the limits of a turnout (switch) when crossing tracks. Turnout limits extend from a point 20 feet ahead of the point of switch to a point 20 feet beyond the last long tie.
- e. Pipeline installations shall not be designed as an open cut installation where the pipeline is to be located within the limits of a grade crossing. If it is shown that no other method of installation is possible, the owner will be responsible for reimbursing Metra for all costs, to be paid in advance, associated with the removal and reconstruction of the grade crossing.
- f. Pipelines carrying liquefied petroleum gas shall, where practicable, cross the railroad where tracks are carried on an embankment.

3. Depth of Installation:

- a. Casing pipes shall be not less than 5.5 feet below the base of rail at the closest point. Deeper installations may be required to avoid conflicts with buried railroad facilities. Where the pipe is not directly beneath the track, the depth of ground cover shall be not less than 4 feet. A 6 inch thick reinforced concrete shall be placed over the casing pipe if 3 feet of ground cover cannot be provided between top of casing pipe and bottom of ditch.
- b. Longitudinal pipelines less than 50 feet from centerline of track shall have minimum ground cover of 6 feet. Where the pipeline is more than 50 feet from centerline of track, the minimum ground cover shall be 6 feet.

4. Pipelines Within Limits of Road Rights of Way

- a. Pipelines within the limits of roadways, both public and private shall conform to the specifications contained in this document.
- b. The limits of the road right of way must be shown on all plans.

5. Modification of Existing Facilities

- a. Any replacement or modification of an existing carrier and/or casing pipe shall be considered a new installation subject to the requirements of these specifications.

6. Pipelines on Bridges

- a. Pipelines cannot be located on any bridge carrying Metra tracks.
- b. Overhead pipelines on bridges will only be considered over Metra right of way when underground installation is not feasible. When no other alternative exists, overhead pipelines will be permitted provided the following criteria are met:
  - Pipeline bridges over Metra tracks shall be so located as to minimize the possibility of damage from railroad equipment, vehicles, vandalism, and other causes. They shall be encased as directed by Metra.
  - The vertical clearance from top of rail to the lowest part of the overhead structure shall be not less than 23 feet.
  - Supports for the overhead structure shall be located outside the right of way limits or 20 feet from the centerline of the nearest track, whichever distance is greater.
  - Supports within 25 feet of the centerline of any track shall have pier protection as provided in the AREMA Manual for Railway Engineering, Chapter 8, Section 2.1.5.
  - Complete structural plans and design calculations for the structure and foundations, signed and sealed by a Professional Engineer, shall be submitted with the application.
  - A fence topped with barbed wire, or other measures, are provided which prevents access by unauthorized personnel.

## *Design Requirements*

### Pipeline Requirements

1. Pipeline designs are to specify the type and class of material, maximum working pressures 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 Metra Engineering approval.
2. 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 Piping Systems; ANSI B 31.8 Code for pressure piping - Gas Transmission and Distribution Piping Systems; other applicable ANSI codes and 49 C.F.R. 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.
3. 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.
4. Pipelines and casing pipes shall be suitably insulated from underground conduits carrying electric wires on railroad property.
5. Reinforced concrete pipe will need to 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.

## *Casing Pipe Requirements*

1. Casings are oversized load-bearing conduits or ducts through which a utility is inserted:
  - To protect the railroad from damages and to provide for repair, removal and replacement of the utility without interference to railway traffic.
  - To protect the carrier pipe from external loads or shock, either during or after construction.
  - 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.
  - All steel pipe shall be coated and cathodically protected.
  
2. 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:
  - Two (2) feet beyond toe of slope.
  - Three (3) feet beyond ditch line.
  - Twenty-five (25) feet from centerline of outside track when casing is sealed at both ends.
  - Forty-five (45) feet from centerline of outside track when casing is open at both ends.

*If additional track is planned for future construction, casing must extend far enough to meet above distances given the additional track requirement.*

3. 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.

Wall thickness designations for steel casing pipe for E-80 loading (including impact) are:

Nominal Diameter, (Inches)	Min. Thickness for Coated (Inches)	Non Coated (Inches)
14 and Under	0.188	0.250
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	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

Steel pipe shall have minimum yield strength of 35,000 pounds per square inch.

All metallic casing pipes are to be designed for effective corrosion control, long service life and relatively free from routine servicing and maintenance. Corrosion control measures must include cathodic protection.

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."

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.

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.

## *Carrier Pipe Requirements*

1. The carrier pipe shall be laid with sufficient slack so that it is not in tension.
2. Steel pipe shall not be used to convey storm water, sewage, or other liquids which may cause corrosion.
3. Reinforced concrete pipe is only allowed as a carrier pipe when properly encased, and the pipeline is operated under gravity flow. Reinforced concrete pipe will need to 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. 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 Piping Systems; ANSI B 31.8 Code for pressure piping - Gas Transmission and Distribution Piping Systems; other applicable ANSI codes and 49 C.F.R. 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.
5. Plastic carrier pipe materials include, but are not limited to, thermoplastic and thermoset plastic pipes such as PVC, ABS, HDPE, PE, and FRP. Plastic pipe shall not be used to convey any flammable liquid. Plastic pipe may be used to convey flammable gases provided the pipe material is compatible with the type of gas conveyed and the maximum allowable operating pressure is less than 100 psi.

## *Construction Requirements*

### **General Requirements**

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 twenty-five (25) feet to the centerline of track.

All pipelines shall be prominently marked at right of way lines by durable, weatherproof signs located over the centerline of the pipe. Signs shall display the following:

- Name and address of owner
- Contents of pipe
- Pipe pressure
- Emergency contact telephone number

### **Casing and Pipeline Installation**

Casing and pipeline installations should be accomplished by directional boring, jack-and-bore, tunneling or other approved methods. Tunneling construction under tracks will be permitted only under direct supervision of a Metra Engineer. Tunneling procedures and equipment, as well as structural design, must have Metra Engineering Department approval prior to starting any work on Metra property. Generally, tunneling shall not be considered where less than six (6) 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 Metra to detect any track movement. Movements of over one-quarter (1/4) inch vertically shall be immediately reported to the Metra Engineering Department. Due to the danger to rail traffic that is caused by only small amounts of track movement, Metra forces may have to be called to surface the track several times.

The following requirements shall apply to these construction methods:

- 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.
- 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.
- If excessive voids or too large a bored hole is produced during casing or pipeline installations, or if it is necessary to abandon a bored or tunneled hole, prompt remedial action should be taken by the Utility Owner.
- All voids or abandoned holes caused by boring or jacking are to be filled by pressure grouting. The grout material should 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.
- 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, or two (2) inches on pipes with an inside diameter greater than twelve (12) inches.

- Pits for boring, tunneling or jacking will not be permitted within thirty (30) feet of the centerline of track; or closer to the track than the toe of fill slopes in fill sections, or toe of shoulder slopes in ditch sections when pipes are allowed on the railroad property.

## **Vents**

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

All casing pipes shall be properly vented. Vent 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 casing, projecting through ground surface at property lines.

Vents shall be located at the high end of short casings and at both ends of casing longer than one hundred fifty (150) feet.

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 owner, and a phone number to contact in case of emergency.

Vent pipes shall extend not less than four (4) feet above ground surface. Top of vent pipes shall be fitted with a down-turned elbow, properly screened; or a relief valve.

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.

## **Shut-Off Valves**

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.

Valves shall not be located within the railroad right of way.

## **Water Lines**

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.

Where non-metallic pipe is permitted and installed, steel casings are required from right of way line to right of way line

Manholes should be located outside the railroad property. Manholes shall not be located within twenty-five (25) feet of railroad trackage, in the shoulder, shoulder slope, ditch or backslope; and shall not protrude above the surrounding ground without the approval of Metra Engineering.

The Utility Owner shall place a readily identifiable and suitable marker at each railroad property line where it is crossed by a water line.

### **Sewer Lines**

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.

Where casing pipe is used, venting and sealing of casing will be required.

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.

Manholes should be located outside the railroad property. Manholes shall not be located within twenty-five (25) feet of railroad trackage, in the shoulder, shoulder slope, ditch or backslope; and shall not protrude above the surrounding ground without the approval of Metra Engineering.