

**SPECIFICATIONS FOR
PIPELINE OCCUPANCY
OF THE
WHEELING AND LAKE ERIE RAILWAY COMPANY
RIGHT OF WAY/PROPERTY AND TRACKS**



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Wheeling & Lake Erie
RAILWAY COMPANY

100 East First Street | Brewster, Ohio | 44613

1. **SCOPE**

A. These specifications apply to the design and construction of pipelines carrying flammable and non-flammable substances and casing over 4-inches, containing wire and cables, under, across and along Railroad property and facilities and tracks owned by others, over which the Railroad operates its equipment.

2. **APPLICATION FOR OCCUPANCY**

A. Individuals, Corporations and Municipalities (known as Owner), desiring occupancy of the railroad property by such occupations must agree, upon approval of the construction details of the Office of the Vice President of Engineering of the Railroad, to execute an appropriate occupational agreement and pay any required fees and/or rentals outlined therein.

B. Application for an occupancy shall be by letter addressed to the Manager of Real Estate, Wheeling & Lake Erie Railway Company, 100 East First Street, Brewster, Ohio 44613, Telephone (330) 767-7284, Email jdavisjr@wlerwy.com and shall contain the following:

- (1) Name of Individual, Corporation or Municipality desiring the occupancy.
- (2) Complete mailing address of applicant.
- (3) Name and title of person who will sign the agreement.
- (4) The State in which the applicant is incorporated.

C. All applications shall be accompanied with one (1) set of all construction plans and one (1) set of computations concerning the proposed occupancy.

D. Individuals, corporations, municipalities, public utilities desiring occupancy of WLE property must agree, upon approval of the construction details by the WLE Engineering Department to:

- (1) Execute an appropriate occupational agreement.
- (2) Pay required fees and/or rentals outlined in agreement
- (3) Meet all WLE or operation railroad insurance requirements.

3. **APPROVAL OF PLANS**

A. No entry upon railroad property for the purpose of conducting surveys, field inspections, obtaining soil information, or any other purpose associated with the design and engineering of the proposed occupancy, will be permitted without proper entry permit prepared by the Vice President of Engineering of the railroad of his designated representative and executed by the applicant. It is to be clearly understood that the Issuance of such a permit does not constitute authority to proceed with the actual construction which cannot begin until a formal agreement is finally executed by the Railroad Company and permission is received by the Owner from the designated inspection agency of the Railroad to proceed.

B. Plans for proposed pipeline occupations shall be submitted to and meet the approval of the Vice President of Engineering of Railroad prior to start of construction. These plans are to be prepared in sizes as small as possible and are to be folded to an 8-1/2 inch by 11 inch size. (folded dimensions). with a 1-1/2 inch margin on the left hand side and a 1 inch margin on the top so that they can be secured in a file at the upper left hand corner and still be unfolded to full size without being removed from the file.

Also, after folding, the title block and other identification of the plans shall be visible at the lower right hand corner, without the necessity of unfolding. Each plan shall bear an individually identifying number and an original date, together with subsequent revision dates, clearly identified on the plan so as to be readily apparent as to just what revisions were made and when.

All plans are to individually folded and where more than one plan is involved, they shall be assembled into complete sets before submission to the Railroad.

- C. Plans shall be drawn to scale and show the following (see Plates I, II, III, and IV);
- (1) Plan view of proposed pipeline in relation to all Railroad facilities (see Plate I).
 - (2) Location of pipe, (in feet), from nearest Railroad Milepost, centerline of a Railroad Bridge, (giving bridge number), or centerline of an existing public thoroughfare. In all cases, the name of the County in which the proposed facilities are located. must be shown. In States Where Townships, Ranges and Sections are used, give distance in feet to the nearest Section Line and identify the Section Number, Township and Range.
 - (3) Profile of ground on centerline of pipe from field survey showing relationship of pipe and casing to ground level, tracks and other facilities (see Plat II). For Longitudinal Occupations, the profile of adjacent track or tracks must be shown, (see Plat III).
 - (4) All railroad property lines. If pipeline is in a public highway, the limits of the right of way for the highway shall be clearly indicated with dimensions from centerline.
 - (5) The angle of crossings in relation to the centerline of tracks.
 - (6) Location of valves or control station of the pipeline.
 - (7) "Pipe Crossing Data Sheet" completed and put on plan, (See Plate IV).
- D. The plan must be specific, (on Railroad property and under tracks that are not on Railroad property), as to:
- (1) Method of installation (See Paragraph 15-C).
 - (2) Size and material of casing pipe.
 - (3) Size and material of carrier pipe.

These three (3) items cannot have an alternative and any application received indicating such options will not be processed. Once an application is approved by the Vice President of Engineering, no variance from the plans, specifications, method of construction, etc., as approved in the occupancy document will be considered or permitted without the imposition by the Railroad of additional handling charges.

E. Location and dimensions of jacking, boring or tunneling pit shall be shown with details of their sheeting and shoring. If the bottom of the point excavation nearest the adjacent track intersects a line from a point 4.5 feet horizontally from center line of adjacent track at the plane of the base of rail drawn on a slope 1-1/2 horizontal to 1 vertical, the design and details of the point construction with computations prepared by a Registered Professional Engineer shall be submitted for Railroad approval. In any event, the face of the pit shall be no less than 25 feet from adjacent track, unless otherwise approved by the Vice President of Engineering of the Railroad. Pits shall be fenced, lighted, and otherwise protected as directed by the Vice President of Engineering of the Railroad or his designated representative.

F. All plans and computations shall bear the seal of a Registered Professional Engineer. If not so imprinted, they will be given no further consideration. This included plans submitted by contractors.

G. Computations for all structures involving the support or protection of Railroad track, embankment and facilities shall be prepared by and bear the seal of a Registered Professional Engineer and submitted with the construction plans.

H. When computer calculations are included with design calculations, the following documentation shall be furnished as a minimum;

- (1) A synopsis of the computer program(s) stating briefly, required input, method of solution, approximations used, second order analysis incorporated, specifications used, second order analyses incorporated, specifications or codes used, cases considered, output generated, extent of previous usage or certification of program(s) and program(s) author.
- (2) Identification by number, indexing and cross referencing of all calculations sheets, including supplemental "long-hand" calculation sheets.
- (3) Fully identified, dimensioned and annotated diagram of each member or structure being considered.
- (4) Clear identification and printing of all input and output values, including intermediate values if such values are necessary for orderly reviewal.
- (5) Identification of the processing unit, input/output devices, storage requirements, etc., if such supplemental information is significant and necessary for evaluation of the submittal.

4. GENERAL REQUIREMENTS

A. Pipeline under Railroad tracks and across Railroad operating right-of-way shall be encased in a larger pipe or conduit called the casing pipe as indicated in Plate II.

B. Casing pipe will be required for all pipelines carrying oil, gas petroleum products, or other flammable or highly volatile substances under pressure, and all non-flammable substances which, from their nature or pressure, as determined by the Vice President of Engineering, might cause damage of escaping on or near Railroad property.

C. For non-pressure sewer or drainage crossings where the installations can be made without interference to Railroad operations, as determined by the Vice President of Engineering, the casing pipe may be omitted when the pipe strength is capable of withstanding Railroad loading hereinafter specified.

D. The casing pipe shall be laid across the entire width of the right-of-way, unless the right-of-way line on either side of the tracks is less than the minimum length of casing specified in Paragraph 6J. even though such extension is beyond the right-of-way.

E. Pipelines laid longitudinally on railroad right-of-way shall be located as far as practicable from any tracks or other important structures and as close to the Railroad property line as possible. If located within 25 feet of the centerline of any track or closer than 45 feet to nearest point of any bridge, building or other important structure, the carrier pipe shall be encased (see also paragraph 10C and Plate 111).

F. Pipelines shall be located, where practicable, to cross the tracks at approximate right angles thereto, but preferably at not less than 45 degrees.

G. Pipelines shall not be placed within a culvert, under Railroad bridges, nor closer than 45 feet to any portion of any Railroad bridge, building, or other important structure, except in special cases, and then by special design, as approved by the Vice President of Engineering.

H. Pipelines carrying liquefied petroleum gas shall, where practicable, cross the Railroad where tracks carried on embankment.

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

J. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the highest degree so prescribed shall be deemed a part of these specifications.

K. Pipelines and casings shall be suitably insulated from underground conduits carrying electric wires on railroad property.

5. CARRIER PIPE

A. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas and other flammable products shall conform to the requirements of the current ANSI B 31.4, with Addenda, "LIQUEFIED PETROLEUM TRANSPORTATION PIPING SYSTEMS", ANSI B 31.8, "GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEM", and other applicable ANSI Codes, except that the maximum allowable stresses for design of steel pipe shall not exceed the following percentages of the specified minimum yield strength. (multiplied by the longitudinal joint factor), of the pipe as defined in the ANSI Codes:

- (1) Steel pipe within a casing, under Railroad tracks, across Railroad right-of-way, and longitudinally on Railroad rights-of-way. (The following percentages apply to hoop stress):
 - (a) Seventy-two percent for installation on oil pipelines.
 - (b) Fifty percent for pipelines carrying liquefied petroleum gas and other flammable liquids with low flash point.
 - (c) Sixty percent for installations on gas pipelines.
- (2) Steel pipe without a casing laid longitudinally on Railroad rights-of-way or on Railroad property. (The following percentages apply to hoop stress).
 - (a) Sixty percent for installations on oil pipelines.
 - (b) Forty percent for pipelines carrying liquefied petroleum gas and other flammable liquids with low flash point.
 - (c) Forty percent for installations on gas pipelines.

Design computations showing compliance with the requirements of Paragraphs 5A(1) and 5A(2) prepared by a Registered Professional Engineer, shall accompany the application for occupancy .

If the maximum allowable stress in the carrier pipe on either side of the occupancy of Railroad property is less than specified above, the carrier pipe on Railroad property shall be designed at the same stress as the adjacent carrier pipe.

Requisites for carrier pipe under Railroad tracks shall apply for a minimum distance of 55 feet, (measured at right angles), from the nearest rail or 2 feet beyond the toe of slope or 25 feet beyond the ends of the casing, whichever is greater.

Carrier pipes within a casing shall be designed for Railroad live loads as if they were not encased.

Polyethylene plastic pipe for pressure 60 psi or lower under tracks as a carrier pipe only is permissible. This carrier pipe must be installed within properly vented casing pipe conforming to AREA Specifications Section 5.1.5.5, latest revision.

The following PVC Pipe (PVC) may be used for telephone, communication, TV cables or similar applications:

Wall Thickness	Diameter
0.337"	0" – 4"
0.60"	4" – 6"

Grout placed in sleeves to secure carrier pipe shall be placed so as to not exceed the mid-point of the sleeve. This procedure to be performed only with the express approval of the Vice President of Engineering or Chief Engineer.

All pipes shall be designed for the external and internal loads to which they will be subjected. The dead load of earth shall be considered 120 pounds per cubic foot. Railroad live loading shall be Cooper's E-80 with 50% added

for impact. In any event on Railroad property or where Railroad loading will experienced, the following shall be the minimum requirements for carrier pipes:

- A. Reinforced Concrete Pipe – ASTM Spec. C-76, Class V Wall C
- B. Ductile Iron Pipe – ANSI Spec, A21.51, Class 6
- C. Cast Iron Pipe – for Culverts and Gravity Sewers, ASTM Spec. A-142 Extra Heavy

Cast Iron Pipe for water and other materials under pressure shall conform to the current ANSI Specifications A-21 Series, 21/45 iron strength with plain end, compression type or mechanical joints. The strength to sustain external Railroad and other loadings shall be computed in accordance with the current ANSI A--21.1 "Thickness Design of Cast Iron Pipe".

- D. Vitrified Clay Pipe – ASTM Spec. C-700, Extra Strength
- E. Corrugated Metal Pipe – AREA Spec. Chapter 11 Part 4
- F. Asbestos Cement Pipe – Non-pressure: ASTM Spec. C428, CL 5000 min.
Pressure: AWWA Spec, C-400, Cl. 150 min.
- G. **Others – as approved by Vice President of Engineering.**

All pipes, ditches and other structures carrying surface drainage on railroad property and/or crossing railroad track shall be designed to carry the run-off from a one hundred (100) year storm. Computations indicating this design and suitable topographic plans, prepared by a Registered Professional Engineer, shall be submitted for Railroad approval. If the drainage is to discharge into an existing drainage channel on Railroad right-of-way and/or under Railroad tracks, the computations should include the hydraulic analysis of any existing structures. Submitted with the computations should be formal approval of the proposed design by the appropriate governmental agency.

Carrying pipes shall be laid with sufficient slack so that they are not in tension.

6. CASING PIPE

A. Casing pipe and joints shall be of metal and of leak proof construction, designed for the earth and/or other pressures present, plus a Cooper's E-80 Railroad live loading with 50%, added for impact.

LIVE LOADS, INCLUDING IMPACT, FOR VARIOUS HEIGHTS OF COVER FOR COOPER E-80

Height/Cover (Ft.)	Load	Height/Cover (Ft.)	Load	Height/Cover (Ft.)	Load
2	3,800	10	1,100	20	300
5	2,400	12	800	30	100
8	1,600	15	600		

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
(For Information Only)

Coated or Cathodically Protected	Uncoated and Unprotected	Nominal Diameter (Inches)	Coated or Cathodically Protected	Uncoated and Unprotected	Nominal Diameter (Inches)
0.188	0.251	Under 14	0.406	0.469	28 & 30
0.219	0.282	14 & 16	0.438	0.501	32
0.250	0.313	18	0.469	0.532	34 & 36
0.281	0.344	20	0.500	0.563	48, 40 & 42
0.312	0.375	22	0.563	0.626	48
0.344	0.407	24	0.625	0.688	
0.375	0.437	26			

When a casing is installed without benefit of a protective coating, and said casing is not cathodically protected, the wall thickness shall be increased to the nearest standard size which is a minimum of 0.063 in. greater than the thickness shown for protected pipe except for diameters under 12-3/4 in.

Smooth wall pipe with a nominal diameter of over 54 inches will not be permitted.

B. Steel pipe shall have a minimum yield strength of 35,000 psi.

C. Cast iron pipe may be used for a casing, provided the method of installation is by open trench only. Cast iron pipe shall conform to the current ASTM Specifications A-142, Extra Heavy. The pipe shall be of the mechanical joint type of plain end type with compression type couplings.

D. Corrugated metal pipe and corrugated structural plate pipe may be used for casing only when employed by the open-cut method. Jacking or boring through Railroad embankment is not permitted. Pipe shall be asbestos-bonded, bituminous coated and shall conform to the current American Railway Engineering Association Specifications, Chapter 1, Part 4.

CORRUGATED METAL PIPE

Table shown permissible minimum and maximum height of cover for both riveted and helical pipe.

Nominal Diameter (Inches)	16 GAGE	14 GAGE	12 GAGE
12	4-53 (ft.)	4-80 (ft.)	—
15	4-42	4-64	—
18	4-34	4-53	—
21	4-28	4-45	4-79 (ft.)
24	5-23	4-40	4-70
30	—	4-31	4-56
36	—	5-23	4-46
42	—	4-49	4-78

E. Tunnel liner plates shall be galvanized and bituminous coated and shall conform to the current American Railway Engineering Association Specifications Chapter 1, Part 4. In no event shall the liner plate thickness be less than 0.1046 inches.

If the tunnel liner plates are used only to maintain a tunneled opening until the carrier pipe is installed, and the carrier pipe is installed and the annular space between the carrier pipe and the tunnel liner completely filled with the cement grout within a reasonably short time after completion of the tunnel, then the tunnel liner plates need not be galvanized and coated.

F. Reinforced concrete pipe may be used for a casing. All diameters of concrete pipe under main tracks shall be specified as A.S.T.M. C-76 (Latest Revision) Table V. Concrete pipe under sidings and yard tracks may be Table IV, (either Wall "B" or "C" is acceptable). It shall be used only in the open cut and jacking methods of installation.

If the concrete pipe is to be jacked into place, grout holes tapped for no smaller than 1-1/2 inch pipe spaced at approximately 3 feet around the circumference and approximately 4 feet longitudinally shall be cast into the pipe at manufacture. Immediately upon completion of jacking operations, the installation shall be pressured grouted as specified in Paragraph 15C (3)a herein.

G. The inside diameter of the casing pipe shall be such as to allow the carrier pipe to be removed subsequently without disturbing the casing or the roadbed. For steel pipe casings, the inside diameter of the casing pipe shall be at least two (2) inches greater than the largest outside diameter of the carrier pipe joints or couplings; for carrier pipe less than six (6) inches in diameter; and at least four (4) inches greater for carrier pipe six (6) inches and over in diameter.

H. For flexible casing pipe, a minimum vertical deflection of the casing pipe of 3 percent of its diameter, plus 1/2 inch, 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 the flexible casing pipe shall be at least two (2) inches greater than the outside diameter of the carrier pipe for pipe less than eight (8) inches in diameter; and at least 3-1/4 inches greater for pipe 8 inches to 16 inches, inclusive, in diameter; and at least 4-1/2 inches greater for pipe 18 inches and over in diameter. In no event shall the casing pipe be greater than is necessary to permit the insertion of the carrier pipe.

I. When steel casing pipe is used, the joints shall be fully welded completely around the circumference of the pipe.

J. Casing pipe under Railroad tracks and across Railroad rights-of-way shall extend the greater of the following distances, measured at right angles to the centerline of track:

1. Across the entire width of railroad right-of-way (See Paragraph 4D).
2. Three (3) feet beyond ditch line.
3. Two (2) feet beyond toe of slope.
4. A minimum distance of 25 feet from centerline of outside track when casing is sealed at both ends.
5. A minimum distance of 25 feet each side from the nearest rail when casing is sealed at both ends.
6. The distance $1.5 (C+D) + 4.5$ feet as indicated on Plate II.

K. If additional tracks are constructed in the future, the casing shall be extended correspondingly at the expense of the owner.

7. PROTECTIVE AT ENDS OF CASING

A. Casings for carriers of flammable substances shall be suitably sealed to the outside for the carrier pipe. Details of seals shall be shown on the plans.

B. Casings for carriers of non-flammable substances shall have both ends of the casing blocked up in such a way as to prevent the entrance of foreign material, but allowing leakage to pass in the event of a carrier break.

C. Where ends of casings are at or above ground surface and above high water level, they may be left open, provided drainage is afforded in such a manner that leakage will be conducted away from railroad tracks and structures.

8. VENTS

A. Sealed casing for flammable substances 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 the casing a project through the ground surface at right-of-way lines or not less than 45 feet (measured at right angles) from centerline of nearest track.

B. Vent pipes shall extend not less than four (4) feet above the ground surface. Top of vent pipe shall have a down-turned elbow, properly screened, or a relieve valve. Vents in locations subject to high water shall be extended above the maximum elevation of high water and shall be supported and protected in a manner approved by the Vice President of Engineering or Chief Engineer.

C. Vent pipes shall be at least four (4) feet (vertically) from aerial electrical wires.

D. When the pipeline is in a public highway, street-type vents shall be installed.

9. SIGNS

A. All pipelines (except those in streets where it would not be practical to do so), shall be prominently marked at rights-of-way, (on both sides of track for under crossings), by durable, weatherproof signs located over the centerline of the pipe. Signs shall show the following:

1. Name and address of owner.

2. Contents of pipe.
3. Pressure in pipe.
4. Depth below grade at point of sign.
5. Emergency telephone in event of pipe rupture.

For pipe line running longitudinally on Railroad property, signs shall be placed over the pipe, (or offset and appropriately marked), at all changes in direction of the pipe line. Such signs should also be located so that when standing at one sign the next adjacent market in either direction is visible. In no event shall they be placed less than 500 feet apart unless otherwise specified by the Vice President of Engineering or Chief Engineer or the Railroad.

10. SHUT-OFF VALVES

A. Accessible emergency shut-off valves shall be installed within distances each side of the Railroad at location is selected by the Vice President of Engineering or Chief Engineer of the Railroad where hazard to life and property should be guarded against. Where pipelines are provided with automatic control stations and within distances approved by the Vice President of Engineering or Chief Engineer, no additional values will be required.

11. DEPTH OF INSTALLATION

A. Casing pipe under Railroad tracks and across Railroad rights-of-way shall be no less than 5-1/2 feet from the base of rail to the top of the casing at its closest point, except that under secondary or industry tracks, this distance may be 4-1/2 feet as approved by the Vice President of Engineering or Chief Engineer. On other portions of rights-of-way where casing is not directly beneath any track, the depth from ground surface or from bottom of ditches to top of casing shall be not less than thru (3) feet, unless otherwise specified herein.

B. Pipeline laid longitudinally on Railroad rights-of-way, 50 feet or less from centerline of track, shall be buried not less than five (5) feet from ground surface to top of pipe for pipelines carrying oil, gas, petroleum products, or other flammable or highly volatile substances under pressure and all non-flammable substances which by their nature or pressure in the judgment of the Vice President of Engineering or Chief Engineer may be hazardous to life or property. For pipeline carrying water, sewage and non-flammable substances, the distances from surface or ground, to top of pipe may be four (4) feet.

C. The pipeline is subjected to Railroad loading and it shall require a casing or be of special design approved by the Vice President of Engineering or Chief Engineer when it is within the line of track live load influence as shown on Plate 111.

D. Where pipeline is laid more than 50 feet from centerline of track, the minimum cover shall be at least three (3) feet.

12. INSPECTION AND TESTING

A. For pipelines carrying flammable or hazardous material, ANSI Codes B31.8 and B31.4, current at time of constructing the pipeline, shall govern the inspection and testing of the facility on Railroad property, except that proof-testing of strength of carrier pipe shall be in accordance with the requirements or ANSI Code B31.8 for location Classes 2, 3, or 4 or ANSI Code B31.4, as applicable, for all pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas, and other flammable substances.

13. CATHODIC PROTECTION

A. Cathodic protection shall be applied to all pipelines and casings carrying flammable substances.

B. Where casing and/or carrier pipe is cathodically protected by other than anodes, the Vice President of Engineering or Chief Engineer shall be notified and suitable test shall be made, witnessed by the Railroad to insure that other Railroad structures and facilities are adequately protected from the cathodic current in accordance with the recommendations of Reports of Correlating Committee on Cathodic Protection, current Issue by The National Association of Corrosion Engineers.

14. SOIL INVESTIGATIONS

A. For all pipe crossings 60 Inches in diameter and larger under tracks, and at other locations the Vice President of Engineering or the Chief Engineer may direct, soil borings or other soil investigations approved by the Railroad shall be made to determine the nature of the underlying material. (See paragraph 3A relative to Procedures).

B. For pipe crossings less than 60 inches in diameter under the tracks, and at other locations as the Vice President of Engineering or the Chief Engineer may direct, soil boring or other approved investigations may be required when, in the judgment of the Vice President of Engineering or Chief Engineer, they are necessary to determine the adequacy of the design and construction of the facilities.

C. Borings shall be made on each side of the tracks, on the centerline of the pipe crossing and as close to the tracks as practicable. (See Paragraph 3A relative to Procedures).

D. Soil Borings shall be in accordance with the current issue of the American Railway Engineering Association Specifications, Chapter 1, Part 1, "Specifications for Test Borings". Soils shall be investigated by the split-spoon and/or thin walled tube method and rock by the Coring method specified therein, as appropriate.

E. Soil boring logs shall clearly indicate ALL of the following: (Plate VI)

- (1) Boring number as shown on boring location plan.
- (2) Elevation of ground at boring, using same datum as the pipeline construction plans.
- (3) Description of soil classification of soils and rock encountered.
- (4) Elevations of depth from surface for each change in strata.
- (5) Identification of where samples were taken and percentage of recovery.
- (6) Location of ground water at time of sampling and, if available, subsequent readings.
- (7) Natural dry density in Lbs./Sq. ft. for all strata.
- (8) Unconfined compressive strength in tons/sq. ft. for all strata.
- (9) Water content (percent). Liquid limit (percent) and Plastic limit (percent).
- (10) Standard penetration in blows/ft.

The location of the carrying pipe and casing shall be superimposed on the boring, logs before submission to the Vice President of Engineering or Chief Engineer.

Soil investigations by Auger, Wash. or Rotary drilling are not acceptable.

F. Soil Boring Logs shall be accompanied with a plan drawn to scale, showing the location of the borings in relation to the tracks and the proposed pipe location, the elevation of ground surface at each boring, and the elevation of the base of rail of the tracks.

REQUIREMENT FOR BACKFILLING EXCAVATIONS UNDER RAILROAD TRACKS

Backfill shall consist of a compactable sand-gravel material placed in not more than six (6) inch layer and each layer compacted to 95 percent of its maximum density at optimum moisture content, as determined by A.S.T.M. Specification 0698, latest revision.

Compaction shall be suitable mechanical tamper of sufficient capacity to obtain the required compaction.

For the purpose of verifying the compaction, the services of a reliable soil testing laboratory shall be engaged and their report attesting to the compaction throughout the fill shall be submitted to the Railroad.

Settlement of the track, occurring in the vicinity of the excavation, within a period of six (6) months from completion of backfilling, will be repaired by Railroad forces and all expenses incurred by the Railroad shall be paid for by the Project.

NOTE: These requirements apply on the assumption that the removal of and replacement of the actual track over the excavation would be carried out by Railroad Track and Signal Forces.

JACKING OPERATIONS

When pipe jacking operation has commenced, continuous jacking will be performed until the lacking operation is completed and the pipe is in place.

PUBLIC ACT NO. 77-350 requires any person, contractor, public agency or public utility planning an excavation to report such activity to the central clearinghouse of "**Call Before You Dig, Inc.**", regardless of whether the excavation location is on private or public property.

A toll free number is presently listed in all telephone directories in the State under the names of the major utilities.

Please sign in the space provided below to verify calls have been made and return signed copy to this office.

NAME OF CONTRACTOR	WHERE CALLED	DATE	LOCATION OF PROJECT
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15. CONSTRUCTION

A. Casing pipe shall so be constructed as to prevent leakage of any substance from the casing throughout its length, except at ends of casing where ends are left open, or through vent pipes when ends of casing are sealed. Casing shall be installed so as to prevent the formation of a waterway under the Railroad, and with an even bearing throughout its length, and shall slope to one end, (except for longitudinal occupancy).

B. Installation by open-trench methods will be permitted only with the approval of The Vice President of Engineering and shall comply with the current American Railway Engineering Association Specifications, Chapter 1, Part 4, "Installation of Pipe Culverts".

C. Casing pipes shall be installed by the following methods:

(1) **Jacking** – This method shall be in accordance with the current American Railway Engineering Association Specifications, Chapter 1, Part 4, "Jacking Culvert Pipe Through Fills". This operation shall be conducted without hand mining, ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.

Bracing and backsteps should be so designed and jacks of sufficient rating used so that the jacking can be progressed without stoppage, (except for adding lengths of pipe), until the leading edge of the pipe is at least the distance $1.5(C+D) + 4.5$ feet (see Plate II) beyond the last tracks.

(2) **Drilling** – This method employs the use of an oil field type rock roller bit or a plate bit made up of individual roller cutter units which is solidly welded to the pipe casing being installed and which is turned as it is advanced. The pipe is turned for its entire length from the drilling machine to the head to give the bit the necessary cutting action against the ground being drilled. A high-density slurry, (oil field drilling mud), is being injected through a small supply line to the head which acts as a cutter lubricant. The slurry is injected at the rear of the cutter units to prevent any jetting action ahead of the pipe. The drilling machine runs on a set of steel rails and is advanced (thus advancing the pipe), by a set of hydraulic jacks. The method is the same whether earth or rock is being drilled. Methods of a similar nature shall be submitted to the Vice President of Engineering or the Chief Engineer for approval.

(3)a. **Tunneling** – Tunneling operations shall be conducted as approved by the Vice President of Engineering or Chief Engineer. Care shall be exercised in trimming the surface of the excavated section in order that the steel liner plates fit snugly against undisturbed material. Excavation shall not be advanced ahead of the previously installed line plates any more than is necessary for the installation of the succeeding liner plate. The vertical face of the excavation shall be supported as necessary to prevent sloughing. At any interruption of the tunneling operation, the heading shall be completely bullheaded. Unless otherwise approved by the Vice President of Engineering or Chief

Engineer, the tunneling shall be conducted continuously, on a 24-hour basis, until the tunneling liners extend at least the distance $1.5 (C+D) + 4.5$ feet, (see Plate II), beyond the centerline of the last track.

A uniform mixture of 1.6 percent cement grout shall be placed under pressure behind the liner plates to fill any voids existing between the liner plates and the undisturbed material. Grout holes tapped for no smaller than 1-1/2 inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liners, shall be provided in every third ring. Grouting shall start at the lowest hole in each grout panel and proceed upward simultaneously on both sides to the tunnel. A threaded plug shall be installed in each grout hole as the Grouting is completed at that hole.

Grouting shall be kept as close to the heading as possible, using the grout stops behind the liner plates if necessary. Grouting shall proceed as directed by the Vice President of Engineering or Chief Engineer, but in no event shall more than six lineal feet of tunnel be progressed beyond the grouting.

(3)b. **Tunneling Shields** – All pipe 60 inches and larger in diameter shall be emplaced with the use of a tunneling shield, unless otherwise approved by the Vice President of Engineering or Chief Engineer. Pipe of smaller diameter may also require a shield when, at the sole discretion of the Vice President of Engineering or Chief Engineer, soil or other conditions indicate its need.

The shield shall be of steel construction, designed to support railroad track loading as specified in Paragraph 6A herein, in addition to other loadings it must sustain. The advancing face shall be provided with a hood, extending no less than 20 Inches beyond the face and extending around no less than the upper 240° of the total circumference. It shall be of sufficient length to permit the installation of at least one complete ring of liner plates within the shield before it is advanced for the installation of the next ring of liner plates. It shall conform to and not exceed the outside dimensions of the pipe being emplaced by more than one inch at any point on the periphery unless otherwise approved by the Vice President of Engineering or Chief Engineer.

It shall be adequately braced and provided with necessary appurtenances for completely bulk heading the face with horizontal breast boards and arranged so that the excavation can be benched as may be necessary. Excavation shall not be advanced beyond the edge of the hood, except in rock.

Manufacturer's Shop Detail plans and manufacturer's computations showing the ability of the tunnel liner plates resist the jacking stresses shall be submitted to the Vice President of Engineering or Chief Engineer for approval.

For jacking reinforced concrete pipe, the shield shall be fabricated as a special section of reinforced concrete pipe with steel cutting edge, hood, breasting attachments, etc., cast into the pipe. The wall thickness and reinforcing shall be designed for the jacking stresses.

Grout holes tapped for no less than 1-1/2 inch pipe, spaced at approximately 3 feet centers around the circumference of the shield, (or the aforementioned special reinforced concrete section), and no more than 4 feet centers longitudinally shall be provided.

Detail plans sufficient to determine the adequacy of the shield, accompanied with design calculations prepared by a Registered Professional¹ Engineer, shall be submitted. to the Vice President of Engineering or Chief Engineer for approval and no work shall proceed until such approval is obtained.

(4) **Boring** – This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the soil. When auger, or similar devices, are used for pipe placements, the **front of the pipe** shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavating ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed to outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.

A. The use of water or other liquid to facilitate casing emplacement and spoil removal is prohibited.

B. Plan and descriptions of the arrangement to be used shall be submitted to the Vice President of Engineering or Chief Engineer for approval and not work shall proceed until such approval is obtained.

C. Any method which employs simultaneous boring and jacking or drilling and jacking over 8 inches in diameter which does not have the above approved arrangement **WILL NOT BE PERMITTED**. For pipes 8 inches and less in diameter, augering or boring without this arrangement may be considered for use only as approved by the Vice President of Engineering or Chief Engineer.

D. If an obstruction is encountered during installation to stop the forward action of the pipe and it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe shall be abandoned in place and filled completely with grout.

E. Bored or jacked installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe, (plus coating), by more than approximately 1 inch, grouting or other methods approved by the Vice President of Engineering or Chief Engineer shall be employed to fill such voids.

F. Pressure grouting of the soils or freezing of the soils before jacking, boring, or tunneling may be required at the direction of the Vice President of Engineering or Chief Engineer to stabilize the soils, control water, prevent loss of material and prevent settlement or displacement of embankment. Grout shall be cement, chemical or other special injection material selected to accomplish the necessary stabilization.

G. The materials to be used and the method of injection shall be prepared by a Registered Professional Soils Engineer, or by an experienced and qualified company specializing in this work and submitted for approval to the Vice President of Engineering or Chief Engineer before the start of work. Proof of experience and competency shall accompany the submission.

H. When water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site and upon approval of the Railroad to operate them, they shall be in constantly attended operation on a 24-hour basis until, in the sole judgment of the Railroad, their operation can be safely halted. When dewatering, close observation shall be maintained to detect any settlement or displacement of railroad embankment, tracks and facilities.

I. All operations shall be conducted so as not to interfere with, interrupt or endanger the operation of trains nor damage, destroy or endanger the integrity of railroad facilities. All work on and near railroad property shall be conducted in accordance with railroad safety rules and regulations. The contractor shall secure and comply with the Railroad safety rules and shall give written acknowledgement to the Railroad that they have been received, read and understood by the contractor and his employees. Operations will be subject to Railroad inspection at any and all times.

J. All cranes, lifts or other equipment that will be operated in the vicinity of the Railroad's electrification and power transmission facilities shall be electrically grounded as directed by the Railroad's Vice President of Engineering or Chief Engineer.

K. At all times when the work is being progressed, a field supervisor for the work with no less than 12 months experience in the operation of the equipment being used shall be present. If boring, or similar machines are being used, the machine operator also shall have not less than 12 months experience in the operation of the equipment being used.

L. Blasting Will not be permitted under or near railroad tracks and facilities.

M. Whenever equipment or personnel are working closer than 15 feet to the centerline of an adjacent track, that track shall be considered as being obstructed. Insofar as possible, all operations shall be conducted no less than this distance. Operations closer than 15 feet to the centerline of a track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.

N. **Crossing of tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the Railroad's Vice President of Engineering or Chief Engineer.**

16. SUPPORT OF TRACKS

A. When the jacking or the tunneling method of installation is used, and depending upon the size and location of the crossing, temporary track supporting structures shall be installed at the direction of the Chief Engineer.

B. The type of temporary track supporting structures to be installed shall be approved by the Vice President of Engineering or Chief Engineer.

C. Unless otherwise agreed, all work involving rail, ties and other track material will be performed by the Railroad's employees.

17. PIPELINES ON BRIDGES

A. Pipelines carrying flammable substances or non-flammable substances, which by their nature might cause damage if escaping on or near railroad facilities or personnel shall not be installed on bridges over railroad tracks or bridges carrying railroad tracks.

B. In special cases when it can be demonstrated to the Vice President of Engineering or Chief Engineer's satisfaction that such an installation is necessary and that no practicable alternative is available, the Vice President of Engineering or Chief Engineer may permit the installation and only by special design approved by him.

C. Pipelines on bridges shall be so located as to minimize the possibility of damage from vehicles, railroad equipment, vandalism and other external causes. They shall be encased in a casing pipe as the Vice President of Engineering or Chief Engineer may direct.

18. BONDING AND GROUNDING OF PIPELINES IN ELECTRIFIED TERRITORY

A. Carrier pipe shall be enclosed in a metal casing that is isolated from carrier pipe by approved insulators having a dielectric value of not less than 25 k.v. that provide an air gap between carrier pipe and casing of not less than 2 inches.

B. Carrier pipe supporting hanger, mounting or cradles shall provide an insulation value of not less than 25 k.v. and an air gap of not less than 2 inches between casing and any portion of mounting assembly.

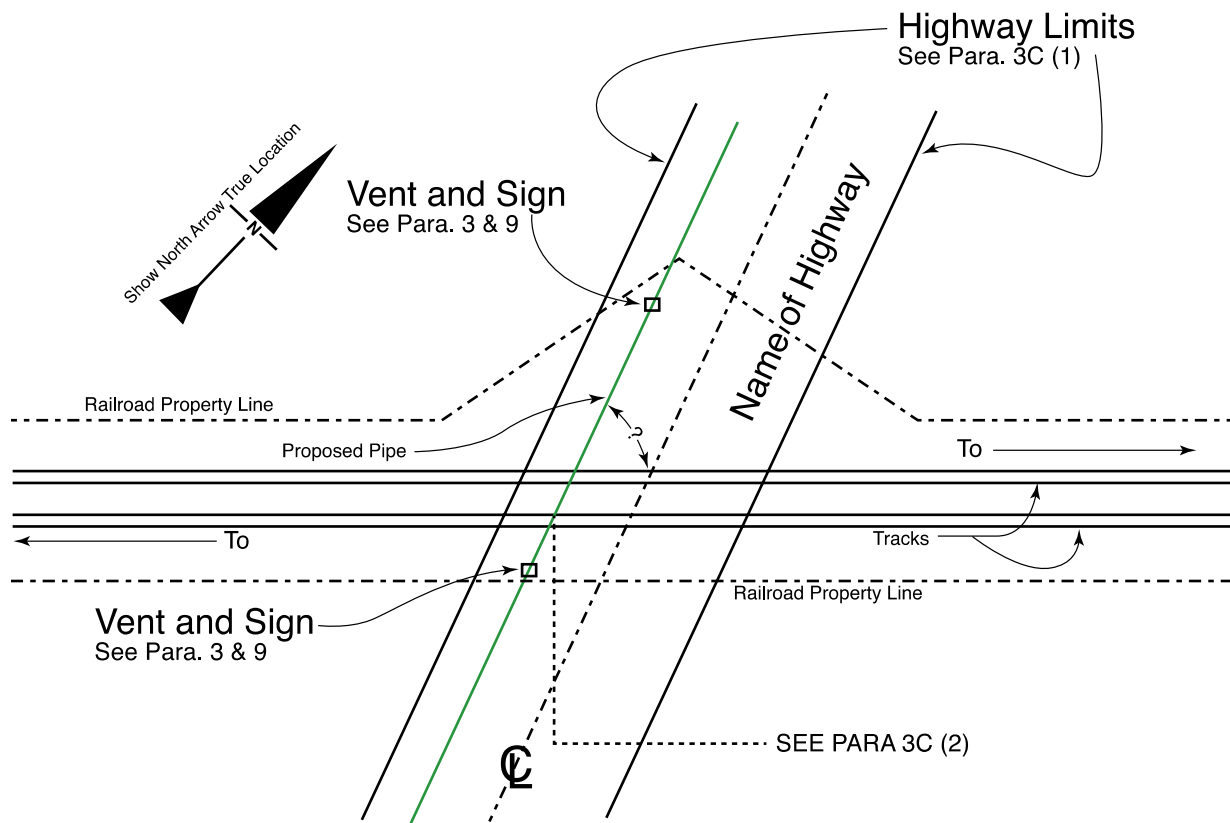
C. Casing shall be bonded to Railroad's return at each end through bridge steel or direct when girders are of non-conductive material, conforming to E.T. 1120C-12, (Details for Power Bonding of Structures), and Plate V.

19. ABANDONED PIPELINES

A. For all abandoned pipe crossings under track and for such other occupancies as the Railroad may direct, the owner of the pipeline shall notify, in writing, the Vice President of Engineering or Chief Engineer of the Railroad of the intention to abandon and shall remove the facilities or shall completely fill by cement grout, compacted sand, or other methods approved by the Vice President of Engineering or Chief Engineer, all pipes and voids resulting from the presence of the abandoned pipeline.

20. DRAINAGE

A. Occupancies shall be designed, and their construction shall be accomplished, so that adequate and uninterrupted drainage of Railroad right-of-way is maintained. If, in the course of construction, it may be necessary to block a ditch, pipe or other drainage facility, temporary pipes, ditches or other drainage facilities shall be installed to maintain adequate drainage, as approved by the railroad. Upon completion of the work, the temporary facilities shall be removed and the permanent facilities restored.



Note:

If man holes are placed on railroad property, details of same with clearances to near rails are to be shown in the drawings.

If the proposed pipe is to serve a new development, a map showing the area in relations to established areas and roads is to be sent with the request. If the proposed pipe is not wholly within highway limits, the same information is required shown on this Plate.

PLATE I

Information to be shown on plan section of drawings.

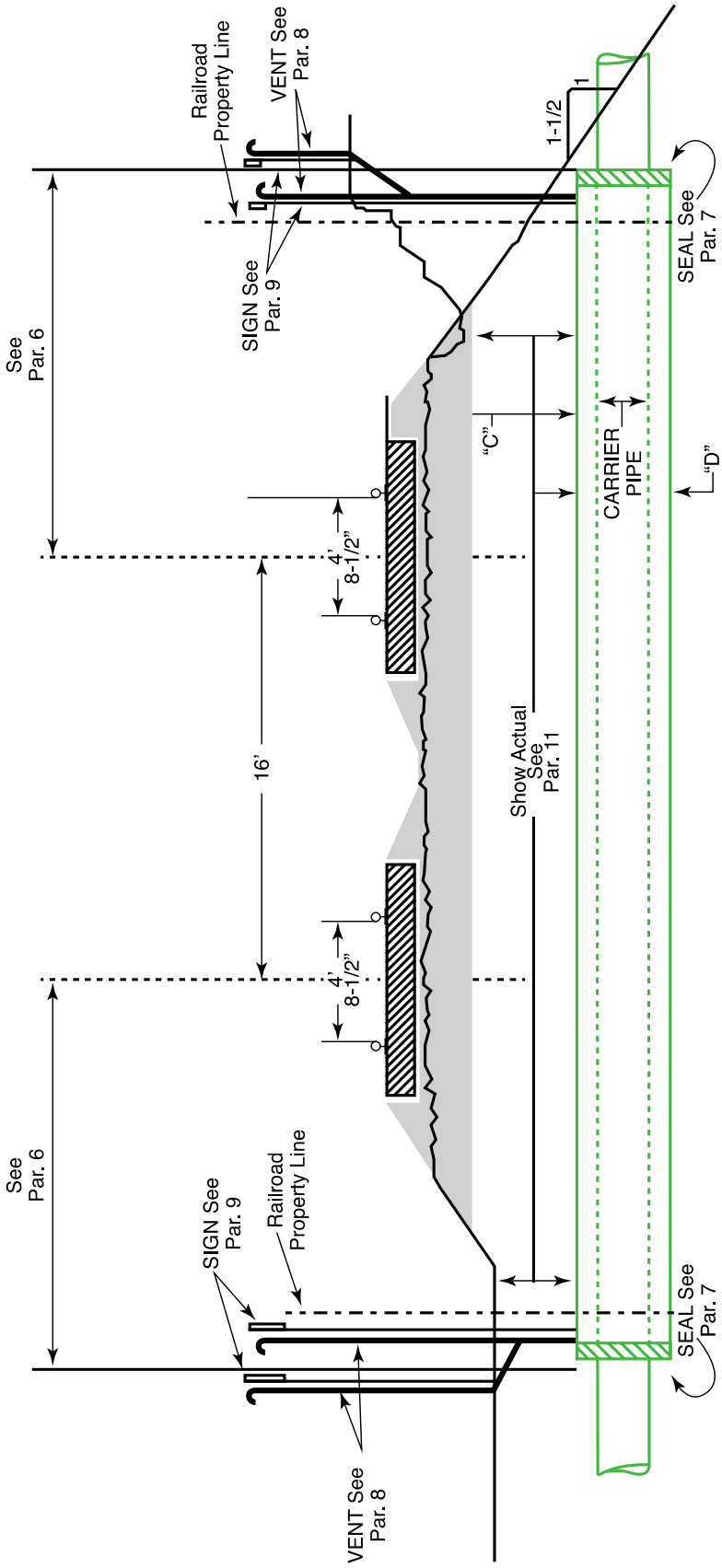
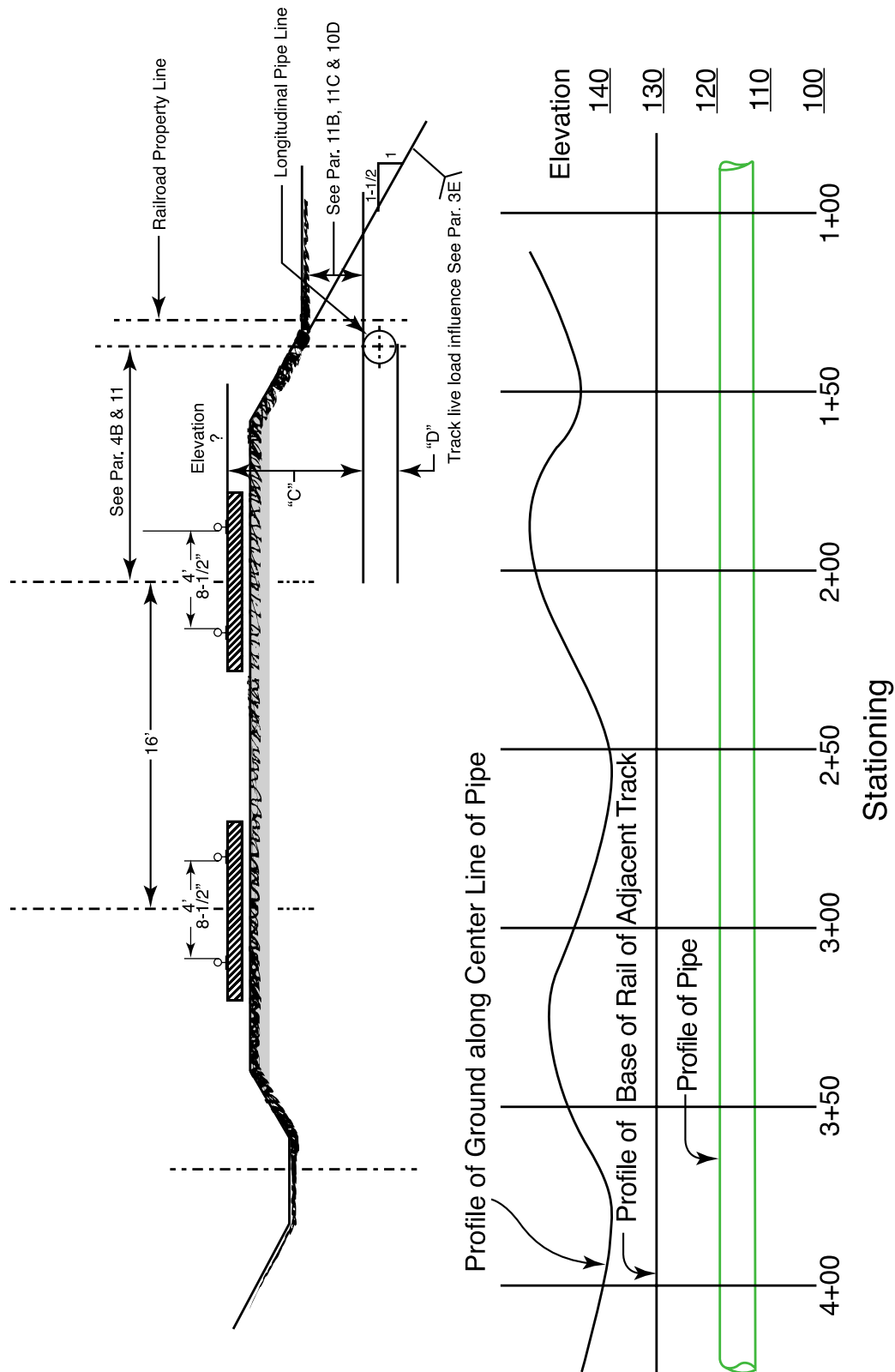


PLATE II



Profile - See Par 3C (3)
 Scale Horiz:
 Vert:

PLATE III