UTILITY INSTALLATION GUIDELINES

ENGINEERING DEPARTMENT

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Part I – Introduction

These guidelines apply to all public and private utilities, including water, sewer, liquid petroleum products, gases, electric power, telephone, fiber optics, telegraph, cable television, and other communication and data transmission facilities, both overhead and underground within NICTD's right-of-way.

All utility installations shall be located so as to provide a safe environment and shall conform to the current American Railway Engineering and Maintenance Association (AREMA) Specifications, as well as the current National Electric Safety Code (NESC) or American National Standards Institute (ANSI) Standard C2, when applicable. Where local laws or authorities prescribe a more stringent specification, that specification shall supersede the requirements described in these guidelines.

It should be understood that NICTD owns its right-of-way for the primary purpose of operating a railroad. All occupancies shall therefore be designed and constructed so that rail operations and facilities are not interfered with, interrupted, or endangered. Any encumbrance onto NICTD's right-of-way shall be minimized to greatest extent possible, so that the railroad has unrestricted use of its property for current and future operations.

NICTD reserves the right to update, modify, or expand these criteria without notice.

Part II – General Requirements

A. Application and Approvals

Any utility installation within railroad right-of-way requires the Utility Owner to submit an application to NICTD for our review. NICTD has an application procedure that can be provided upon request. NICTD's application procedure may change from time to time, so it is advised that Utility Owners always secure the latest procedure and forms from NICTD before anything is submitted.

All Utility Owners desiring occupancy from NICTD must receive railroad approval on all engineering and construction details, execute an appropriate agreement or an amendment to an existing agreement, and remit payment for any required fees that are specified.

Applications shall be completed in full and submitted with all of the required information, in order for NICTD to process it. Applications shall be submitted as described in NICTD's application procedure.

B. Waiver Requests

If a Utility Owner is unable to comply with the requirements listed herein, a waiver request shall be submitted with the application. Each deviation from these criteria requires a separate waiver and shall be independently numbered. The waiver request, at a minimum, should reference the specific criteria, the location of the deviation, the drawing or sheet number, and an explanation of why the waiver is needed. During the application review period, NICTD will review each waiver request and either approve it or deny it.

C. Right of Entry

Entry on to railroad property for the purpose of conducting surveys, field inspections, obtaining soils information, or any other purpose associated with the design and construction of the proposed occupancy, will not be permitted without a proper entry permit issued by NICTD. The applicant must pay the associated fees and execute the entry permit.

In addition, the issuance of an entry permit does not grant any authority to the Utility Owner to go ahead and proceed with construction. Construction cannot begin until a formal agreement (or amendment) is executed between NICTD and the Utility Owner.

D. Safety

All operations by utility contractors working on NICTD right-of-way shall be conducted so as not to interfere with, interrupt, or endanger the operations of trains or damage, destroy, or endanger the integrity of railroad facilities. All work on or near NICTD

property shall be conducted in accordance with NICTD's safety rules and regulations at all times, and operations are subject to NICTD inspection without any formal advanced notice.

All Utility Owner employees and agents shall conduct job briefings each morning and throughout the day when conditions or job scope changes. Also, utility employees and agents, while on NICTD property, shall be required to wear an orange hard hat, safety glasses with side shields, orange safety vest, 6" lace up boots with a distinct heel, ear protection, shirts with sleeves, and long pants. Additional personal protective equipment (PPE) may be required for certain operations including abrasive cutting, the use of torches, the use of chainsaws, etc.

Those contractors that are covered by Roadway Worker (C.F.R. 214) are required to have Roadway Worker Training. Also, all "FRA Bridge Worker Safety" rules will apply to workers performing bridge attachments, including proper fall protection rules.

All cranes, lifts, or other equipment that will be operated within the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded as directed by NICTD.

Whenever equipment or personnel are working closer than 25 feet from the centerline of an adjacent track, that track shall be considered as being obstructed. So whenever possible, all operations shall be conducted no less than this distance.

All test holes or pits less than 15 feet from the centerline of main tracks, shall be filled or covered prior to the passing of trains. No open pits or holes shall be left over night and all pits and trenches shall be shored according to OSHA requirements. In addition, no dirt or debris is allowed to foul the ballast section of the tracks and all excavation or plow trenches shall be back-filled and compacted immediately.

All operations shall be conducted only with the permission of, and as directed by, a duly qualified NICTD employee in charge (EIC)/flagman. The crossing of tracks at grade by equipment and personnel is also prohibited, except by prior arrangement with and as directed by NICTD.

All work must be stopped while trains are passing within the work zone and all workers are to remain off of the tracks. If it becomes necessary to perform work on the tracks, then protection will be provided as stated above.

Any violation of NICTD safety rules or policy may result in the removal of contractor personnel from the right-of-way.

E. Flagging Protection

In general, a railroad flagman is required any time work is performed within NICTD's right-of-way. In addition, this protection cannot be provided by any person other than an authorized NICTD employee, or NICTD approved contractor (EICOTS).

NICTD will determine if the project requires flagging and/or construction monitoring. All costs associated with flagging or construction monitoring will be the responsibility of the Utility Owner. NICTD, at its sole discretion, may elect to have the Utility Owner remit payment for the estimated flagging/construction monitoring cost in advance of any work, or elect to invoice the Utility Owner the actual cost as it's incurred.

The minimum charge for a railroad flagman is 8 hours per day. An overtime rate shall be charged for any time in excess of 8 hours. Flagmen are paid from the time that they leave their headquarters to the time that they return from the job site.

F. Hours of Operation

Work on NICTD's right-of-way is only allowed during non-rush hour times. These allowable times are generally between 9:00 AM and 3:00 PM, Monday through Friday at the discretion of NICTD. Night hours and weekend work will be determined by NICTD on a case-by-case basis.

G. Replacement or Modification to Existing Facilities

Any replacement or modification to an existing underground or overhead utility shall be considered a new installation subject to the requirements of these guidelines.

H. Abandoned Facilities

The Owner of any utility proposed for abandonment shall notify the railroad in writing, of their intention to vacate. Abandoned pipelines shall be removed or completely filled with grout, compacted sand, or other NICTD approved methods. In addition, abandoned manholes and other structures shall be removed to a minimum depth of 2 feet below finished grade and be completely filled with grout, compacted sand, or other methods as approved by NICTD.

Part III – Underground Pipeline Crossing/Encroachment

A. Location

1. Longitudinal pipelines shall be located as far from any tracks or other railroad structures as possible.

2. Pipelines shall be designed to cross tracks at approximately right angles, whenever feasible.

3. Pipelines must be located a minimum of 50 feet from the end of any railroad bridge, culvert, or switch area. Utilities shall not be placed within culverts or under railroad bridges, buildings, station platforms, or other structures.

4. Pipelines shall not be located within the limits of a turnout (switch) when crossing tracks. Turnout limits extend from 20 feet ahead of the PoS (point of switch) to 20 feet beyond the last long tie.

5. Pipelines shall not be designed as an open cut installation, within the limits of a grade crossing. If it is shown that no other method of installation is possible, then the Utility Owner will be responsible for reimbursing NICTD all costs associated with the removal and reconstruction of the grade crossing.

6. Pipelines carrying liquefied petroleum flammable materials shall cross the railroad wherever tracks are carried on an embankment, if at all possible.

B. Installation Depth

1. Casing pipes shall not be less than 5’-6” below the base of rail. Deeper installations may be required to avoid conflicts with buried railroad facilities. Where the pipe is not directly beneath a track, the depth of ground cover shall not be less than 4 feet. At ditches, 6 inches of reinforced concrete shall be placed over the casing pipe, if at least 3 feet of ground cover cannot be provided.

    a. It should be noted that NIPSCO (Northern Indiana Public Service Company) has a primary real estate interest in portions of NICTD’s right-of-way. So any utilities installed lower than 4’ below base of rail will require NIPSCO’s approval as well, and will be subject to any applicable ownership fees that they require.

2. Longitudinal pipelines less than 50 feet from the centerline of a track shall have a minimum ground cover of 4 feet. Where the pipeline is laid more than 50 feet from the centerline of a track, the minimum cover shall be at least 3 feet.

3. For uncased pipelines carrying flammable materials, pipes shall not be less than 10’-0” below the base of rail. Also, uncased pipelines shall not be less than 6 feet

from the ground surface to the top of the pipe at all other locations. Where it is not possible to obtain these depths, use of a casing pipe will be required.

C. Design Requirements

1. To allow for the placement of additional track(s) or the shifting of existing track(s), all proposed pipelines or structures shall be designed as if a railroad loading is directly above the facility. All pipes, manholes, and other facilities shall be designed for the external and internal loads to which they will be subjected.

2. The dead load of the earth shall be considered as 120 pounds per cubic foot unless soil conditions warrant the use of a higher value.

3. The railroad live load used shall be a Cooper E-80 loading where freight traffic exists. Where only NICTD traffic occurs on the line, Cooper E-50 loading is sufficient. Refer to the current AREMA Manual for more information on railroad live loading.

4. An impact factor of 1.75 (multiply the live load by the impact factor) shall be used for a depth of cover up to 5 feet. Between 5 and 30 feet, the impact factor is reduced by 0.03 per foot of depth. Below a depth of 30 feet, the impact factor is one.

5. The values shown in Table 1 shall be used for the vertical pressure on a buried structure (for Cooper E-80 loading) for the various heights of cover.

Height of Cover	**Load**	
Feet	**[psf]**	**[kPa]**
2	3,800	162.8
3	3,150	150.8
4	2,850	136.5
5	2,550	122.1
6	2,250	107.7
7	1,950	93.4
8	1,700	81.4
9	1,500	71.8
10	1,300	62.2
12	1,000	47.9
14	800	38.3
16	625	29.9
18	500	23.9
20	400	19.2
25	250	12.0
30	150	7.2

Table 1: Live Loads (including impact for various heights of cover for a Cooper E-80 loading)

6. To determine the horizontal pressure caused by the railroad loading on a sheet pile wall or other structure adjacent to the track, the Boussinesq Equation shall be used. See AREMA Chapter 8, Section 20.3.2.2.

7. The vertical and horizontal pressures described above shall be used unless an alternate design method is approved by NICTD. Proposals to use an alternate design method must include acceptable references, as well as a statement explaining the justification for choosing the alternate method.

8. All pipeline designs are to specify the type and class of material, maximum working pressures, and the test and design pressure, as applicable. Pipelines shall be constructed, operated, and maintained under the regulations established by the US DOT Hazardous Materials Regulations Board. Any pipelines that do not meet this standard, must obtain NICTD Engineering approval.

9. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas, and other flammable products shall conform to the following requirements:

    a. Current AREMA or ANSI/ASME B 31.4 Code for pressure piping - Liquid Petroleum Transportation Piping Systems
    b. ANSI B 31.8 Code for pressure piping - Gas Transmission and Distribution Piping Systems
    c. 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 the design of the steel pipe shall not exceed the percentages of the specified minimum yield strength multiplied by the longitudinal joint factor of the pipe, as defined in the ANSI codes).

10. Pipelines under railroad tracks and across railroad property shall be in a casing, as described below in Section D.

11. Pipelines (and casing pipes) shall be suitably insulated from any underground conduits carrying electric wires on railroad property.

D. Casing

1. A casing is required for all pipelines carrying non-flammable materials and it is strongly encouraged that pipelines carrying flammable materials are also cased. Casing pipes must extend the full width of the right-of-way. If proposing an uncased installation, then the requirements in Section E below shall be followed.

2. Casing pipe and joints shall be made of metal and be of leak-proof construction. All underground utility crossings shall be designed to withstand Cooper E-80 railroad live loading where freight traffic exists. Where only NICTD traffic occurs on the line, Cooper E-50 loading is sufficient.

3. All steel pipe shall be coated and cathodically protected. Steel pipe shall have a minimum yield strength of 35,000 pounds per square inch.

4. Steel casing pipe with a minimum cover of 5'-6", shall have a minimum wall thickness as shown in Table 2, unless computations indicate that a thicker wall is required.

Pipe Diameter Nominal Pipe Size (in.)	Coated or Cathodically Protected Nominal Wall Thickness (in.)	Uncoated and Unprotected Nominal Wall Thickness (in.)
10 and under	0.188	0.188
12 & 14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 & 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 & 36	0.469	0.532
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 & 46	0.594	0.657
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 & 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 & 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

Table 2: Steel Casing Pipe Wall Thickness

5. Coated steel pipe that is bored or jacked into place shall conform to the wall thickness requirements for uncoated steel pipe since the coating may be damaged during installation.

6. For the required wall thicknesses on uncased steel carrier pipes conveying natural gas, refer to the "Uncased Pipelines Carrying Gas" section later in this part.

7. Smooth wall steel pipes with a nominal diameter over 72 inches will not be permitted.

8. Cast iron may be used for casing. If it's used, it shall conform to ANSI A21.

9. The inside diameter of the casing pipe shall be such that the carrier pipe can be removed without disturbing the casing.

10. Reinforced concrete pipe will need to be encased for a distance as wide as the embankment at the utility crossing.

11. 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 the track:

    a. Two (2) feet beyond the toe of slope.
    b. Three (3) feet beyond the ditch line.
    c. Twenty-five (25) feet from the centerline of the outside track, when the casing is sealed at both ends.
    d. Forty-five (45) feet from the centerline of the outside track, when the casing is open at both ends.

12. In order to meet future needs, NICTD may request a casing to extend farther than described in these criteria. Utility Owners shall comply with any such requests.

E. Uncased Pipelines Carrying Flammable Materials

1. Pipelines carrying flammable and nonflammable gas products shall be steel and shall conform to the requirements of the current ASME B 31.8 Gas Transmission and Distribution Piping Systems, and other applicable ANSI codes.

2. The minimum wall thickness for uncased carrier pipe shall be in accordance with the values provided in AREMA Chapter 1, Part 5.2.

3. A durable coating, which will resist abrasion (fusion bonded epoxy or other suitable material), shall be used to protect the uncased pipeline when the boring method of installation is used.

4. If NICTD determines there is the potential for damage to the uncased pipeline (foreign material in the sub grade, third party damage, etc.), special protection of the pipeline will be required. Special protection may include the use of concrete jacketed carrier pipe, a protection slab over the pipeline, increased depth of bury, or other means.

F. 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 that may cause corrosion.

3. Reinforced concrete pipe is only allowed as a carrier when it is properly encased and the pipeline is operated under gravity flow. See Section D of this part regarding casing.

4. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas, and other flammable products shall conform to the requirements stated above in Section C (Design Requirements).

5. Plastic carrier pipe materials include, but are not limited to: thermoplastic and thermoset plastic pipes such as PVC, ABS, HDPE, PE, and FRP.

    a. Plastic pipe shall not be used to convey any flammable liquids. Plastic pipe may be used to convey flammable gases, provided that the pipe material is compatible with the type of gas being conveyed and the maximum allowable operating pressure is less than 100 psi.

G. Pipelines on Bridges

1. Pipelines shall not be located on any bridge carrying NICTD tracks.

2. Overhead pipelines on bridges will only be considered on NICTD right-of-way when underground installation is not feasible. When no other alternative exists, overhead pipelines may be permitted provided that the following criteria are met:

    a. Pipeline bridges over NICTD tracks shall be located so as to minimize the possibility of damage from railroad equipment, vehicles, vandalism, and other causes. They shall be encased as directed by NICTD.

    b. The vertical clearance from the top of rail to the lowest point of the overhead structure shall not be less than 33 feet. It should be noted that NIPSCO (Northern Indiana Public Service Company) has a primary real estate interest in portions of NICTD's right-of-way. So any utilities installed above 30' from the top of rail will require NIPSCO's approval as well, and will be subject to any applicable ownership fees that they require.

    c. Supports for the overhead structure shall be located outside of the right-of-way limits, or 20 feet from the centerline of the nearest track, whichever distance is greater.

d. Supports within 25 feet of the centerline of any track shall have pier protection, as described in AREMA (Chapter 8, Section 2.1.5).

e. A fence topped with barbed wire or other measures to prevent access by unauthorized personnel shall be provided.

f. Complete structural plans and design calculations shall be signed and sealed by a Professional Engineer and submitted with the application.

H. Construction Requirements

1. 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 a track.

2. All pipelines shall be prominently marked at the right-of-way lines (where the utility crosses railroad property) by durable weatherproof signs, located over the centerline of the pipe. Utility marker signs are to be maintained for all underground crossings. Signs shall display the following:

   a. Name and address of the Utility Owner
   b. Contents of the pipe
   c. Pipe pressure
   d. Emergency contact number

3. Casing and pipeline installations shall be accomplished by bore and jack, jacking, tunneling, or other NICTD approved method. Tunneling construction under tracks will only be permitted under the direct supervision of NICTD. Tunneling procedures and equipment, as well as the structural design, must have NICTD Engineering approval prior to the start of any work. Generally, tunneling will not be considered where less than 6 feet of cover exists, or where excessively sandy, loose, or rocky soils are anticipated.

4. If it becomes necessary to abandon a bored or tunneled hole, prompt remedial action shall be taken by the Utility Owner at no cost to NICTD.

5. 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.

6. Pits for boring, tunneling, or jacking will not be permitted within 30 feet of the centerline of a track. In fill sections, pits shall not be closer to the track than the toe of fill slopes. And in ditch sections, pits shall not be closer to the toe of shoulder slopes when pipes are allowed onto railroad property.

7. All casing pipes shall be properly vented when necessary. Vent pipes shall be of sufficient diameter, but in no case less than 2 inches in diameter and shall be attached near each end of the casing, projecting through the ground surface at property lines. Vents shall be located at the high end of short casings and at both ends of casings longer than 150 feet.

8. Vent pipes shall extend not less than 4 feet above the ground surface, be at least 16 feet (vertically) from aerial electric wires when flammable materials are being carried, and all vent piping shall be adequately marked.

9. The Utility Owner shall install accessible emergency shut-off valves on each side of the railroad (not in the right-of-way). Where pipelines are provided with automatic control stations, no additional valves will be required.

10. Manholes shall be located outside of railroad property and be identifiable and suitably marked.

11. When the jacking, boring, or tunneling method of installation is used, and depending upon the size and location of the crossing, temporary track supports shall be installed at the direction of NICTD.

I. Methods of Installation

1. Bore and Jack (Steel Pipe)

    a. This method consists of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the soil, dirt and rubble.

    b. The boring operation shall be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.

    c. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe.

    d. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.

    e. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than ½ inch. 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, then other methods approved by NICTD shall be employed to fill such voids.

f. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.

g. Plans and description of the arrangement to be used shall be submitted to NICTD for approval and no work shall proceed until such approval is obtained.

h. Any method that employs simultaneous boring and jacking for pipes over 8 inches in diameter that does not have the above approved arrangement will not be permitted. For pipe 8 inches and less in diameter, auguring or boring without this arrangement may be considered for use only as approved by NICTD.

2. Jacking (RCP and Steel Pipe)

a. This method consists of pushing sections of the pipe into position with jacks placed against a backstop and excavation performed by hand from within the jacking shield at the head of the pipe. Ordinarily 36-inch pipe is the least size that should be used, since it is not practical to work within smaller diameter pipes.

b. Jacking shall be in accordance with the current AREMA Manual, Chapter 1, Section 4.13, “Earth Boring and 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.

c. Bracing and backstops shall be so designed and jacks of sufficient rating used so that jacking can be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.

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

e. When jacking reinforced concrete pipe tapped for no smaller than 1 ½ inch pipe, grout holes shall be cast into the pipe at manufacture. Three (3) grout holes equally spaced around the circumference and 4 feet longitudinally shall be provided for greater than 54 inches and smaller. Four (4) grout holes equally spaced around the circumference and 4 feet longitudinally shall be provided for RCP 60 inches and larger.

f. Immediately upon completion of jacking operations, the installation shall be pressure grouted.

3. Tunneling (Tunnel Liner Plate)

   a. This method consists of placing rings of liner plate within the tail section of a tunneling shield or tunneling machine. A tunneling shield shall be used for all liner plate installations unless otherwise approved by NICTD.

   b. The shield shall be of steel construction, designed to support a railroad track loading as specified earlier in these guidelines, in addition to the other loadings imposed. 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 degrees 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. The shield shall conform to and not exceed the outside dimensions of the liner plate tunnel being placed by more than 1 inch at any point on the periphery, unless otherwise approved by NICTD.

   c. The shield shall be adequately braced and provided with necessary appurtenances for completely bulkheading the face with horizontal breastboards, 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.

   d. Manufacturer's shop detail plans and computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to NICTD for approval.

   e. Unless otherwise approved by NICTD, the tunneling shall be conducted continuously on a 24-hour basis, until the tunnel liner extends at least beyond the theoretical railroad embankment line.

   f. At any interruption of the tunneling operation, the heading shall be completely bulkheaded.

   g. The liner plates shall have tapped grout holes for no smaller than 1-½ inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liner and 4 feet longitudinally.

4. Horizontal Directional Drilling (HDD)

    a. Installations by this method are considered a variance to NICTD guidelines, but special consideration will be given where the depth of cover is substantial (15 feet or greater) or the bore is in rock. Factors considered will be track usage, pipe size, contents of the pipeline, soil conditions, boring equipment and procedures, etc.

    b. If NICTD determines this method of installation acceptable, final design calculations, plans, and specifications are to be prepared and submitted for railroad approval.

    c. The Utility Owner's contract documents and project specifications must require the contractor to submit a complete construction procedure of the proposed HDD operation to NICTD for approval. Included with the submission shall be manufacturer catalog information describing the type of equipment used.

5. Open Cut (Not a readily acceptable practice)

    a. Similar to HDD, this method is considered a variance and the Utility Owner must request open cut approval when submitting an application.

    b. Installations beneath the track by open trench methods will be only be permitted with the approval of NICTD's Chief Engineer.

    c. Typically, installations by open cut are not be permitted under mainline tracks, tracks carrying heavy tonnage, or tracks carrying passenger trains. Also, open cut shall not be used within the limits of a highway/railroad grade crossing or its approaches, 25 feet either side of traveled way, where possible.

    d. Unless otherwise agreed upon, all work involving rail, ties, and other track material (OTM) will be performed by railroad employees at the sole expense of the Utility Owner.

    e. It is highly recommended by NICTD that this method not be considered.

Part IV – Wire or Cable Crossing/Encroachment

A. Overhead Electric Power Lines

1. All electric lines, communication lines, fiber optic cables, etc., shall be buried where practicable. When installing, these types of lines shall be directional bored or jacked. Open cut method is not allowed.

2. The poles or towers supporting the line shall be located outside of NICTD's right-of-way.

3. If in NICTD's right-of-way, the poles or towers shall be in a straight line.

4. Crossing poles and towers shall be located as far as possible from any combustible structures. The space around the poles and towers shall be kept free from underbrush, grass, and other combustible material.

5. The side clearance from the pole or tower to the nearest rail may not be less than 12 feet, with a minimum distance of 8'-6" from the nearest rail to any cross arm, guy, or other attachment. Unguyed poles or poles that are guyed away from the track must be located a minimum distance equal to the height of the pole above the ground line plus 10 feet, from the centerline of the nearest track. When necessary for unobstructed views of wayside signals, signs, etc., NICTD may require greater clearances than these specified.

6. Wooden poles supporting at crossing span shall be side-guyed in both directions whenever practicable, and be head-guyed away from the crossing span. Braces may be used instead of guys. All down guys shall have high visibility guarding.

7. The poles/towers shall be plainly marked with the name, initials, or trademark, as well as the pole numbers used, of the Utility Owner. When required by NICTD, the Utility Owner shall place warning signs on crossing structures.

8. In general, lines shall be arranged in the order of their operating voltages. Conductors of the greatest voltage shall occupy the highest position. Where lines of a lower voltage are permitted to cross over circuits of a higher voltage, their mechanical strength shall conform to that required for the higher voltage lines.

9. Where the wires or cables of the crossing span are supported on both crossing supports by pin type insulators, or by suspension type insulators in a suspended position or in a strain position, the vertical clearance between the wires or cables of that crossing span and the top of rail (at 60˚ Fahrenheit and no wind) shall not be less than the following:

a. Where the distance from the nearest crossing support to the point where the line crosses the farthest rail is 75 feet or less, the minimum clearance above the top of rail shall be as shown in the table below:

NOMINAL L-L VOLTAGE	OVERHEAD CLEARANCE	MINIMUM BETWEEN WIRES
0 – 750	27’ – 0”	4’ – 0”
To 15,000	28’ – 0”	6’ – 0”
To 50,000	30’ – 0”	6’ – 0”
69,000	30’ – 8”	6’ – 8”
115,000	32’ – 2”	8 – 2”
138,000	33’ – 0”	9’ – 0”
345,000	39’ – 10”	15’ – 10”
500,000	45’ – 0”	21’ – 0”
745,000	53’ – 2”	29’ – 2”
765,000	53’ – 10”	29’ – 10”

Table 3: Clearances for Overhead Electric Power and Communication Lines

b. Where the distance from the nearest crossing support to the point where the line crosses over the farthest rail is more than 75 feet, the clearance of Item “9a” above, shall be increased by 0.2 feet for every 10 feet in excess of the 75 feet in length.

c. For the protection of railroad crane and pile driver operations, as well as the wire line crossing, it is preferred that any wire or cable crossing be located at least 1,000 feet from any railroad bridge, trestle, or large culvert. When it is necessary to locate the line less than 1,000 feet from such a structure, the vertical clearance shall not be less than 50 feet.

d. As info, the pantographs on NICTD’s rail vehicles operate between 15’-11” in a locked down positon and 24’-8” at their maximum operating height. The pantograph is what collects current from the 1500 V DC overhead catenary system on NICTD’s rail line. For crossings that are to be above NICTD’s overhead catenary wire, the clearances listed above in Table 3 should be followed for supply lines of like voltage, but not less than 29’-0” above top of rail.

   1) It should be noted that NICTD’s 1500 V system is not earth-grounded. So for safety and track circuit integrity, NICTD does not apply earth grounds, but rather we “bond” (shunt) catenary positive to rail negative. Also, reverse current diode network connections will only be permitted at NICTD substations; no rail connections are allowed.

10. The clearance between any two wires crossing each other and carried on different supports shall not be less than the following:

    a. Where the upper conductor or wire has fixed supports, the sum of the distances from the point of intersection of the two crossing wires to the nearest supporting structure of each span shall not exceed 100 feet.

    b. Where the upper conductor or wire has fixed supports, and the sum of the distances from the point of intersection of the two crossing wires to the nearest supporting structure of each span exceeds 100 feet, the clearance shall be increased by 0.10 feet for every 10 feet in excess of the 100 feet.

    c. Conductors supported by suspension type insulators at crossings over communication wires shall be increased by such an amount that the values specified are maintained in the event of a broken conductor in either adjacent span, provided the said conductor is supported as follows:

        1) At one support by suspension type insulators in a suspended position and at the other support by insulators not free to swing (including semi-strain type insulators).

        2) At one support by a strain insulator and at the other support by a semi-strain type insulator.

11. Splices shall not be made in the crossing span and not in the adjacent spans, which are dependent upon for withstanding the longitudinal tension of the crossing conductors. Taps shall not be made in the crossing span. If a splice or tap is made in any conductor in the span adjacent to the crossing span, it shall be placed at a point nearer to the crossover support than is the nearest conductor crossed over, whenever practicable.

12. Cradles, baskets, and overhead bridges are not acceptable and shall not be used except under unusual conditions where it is economical to build such a structure. This requires the approval of NICTD. Also, drop outs shall not be used.

13. All parts of the supporting structures of the crossing span shall be inspected annually by the Utility Owner and all defective parts shall be promptly restored to a safe condition.

14. The details of construction and maintenance of the crossing, unless otherwise specified, shall be in accordance with the current National Electrical Safety Code (NESC).

15. It should be noted that NIPSCO also has a primary real estate interest in portions of NICTD's right-of-way with respect to any overhead electric or communication lines.

B. Overhead Communication Lines (not more than 400 volts carried)

1. Spans crossing the right-of-way shall have the supporting poles located outside of the right-of-way. The crossing span shall not exceed 175 feet whenever practicable. Also, the adjacent spans shall not exceed the length of the crossing span by more than 50% and the poles supporting the crossing span and the adjacent spans shall be in a straight line.

2. Pole lines parallel to the right-of-way shall have the poles located not less than 12 feet from the nearest rail, with a minimum distance of 8'-6" from the nearest rail to any cross arm, guy, or other attachment. When necessary for unobstructed views of wayside signals, signs, etc., NICTD may require greater clearances than these specified.

3. Wood poles shall be new and structurally sound. If guys are omitted, poles shall be located a minimum distance from the centerline of any track equal to the height of the pole above the ground line plus 10 feet. Gains shall not be cut to a depth of more than ½ inch. Spliced poles shall not be used in the crossing span.

4. Wood crossarms supporting the crossing span shall be fir, treated yellow pine, or other suitable timber. Galvanized, painted steel, or iron crossarms of equal or greater strength than those of the wood crossarms may also be used.

5. All pole line hardware shall be galvanized.

6. Insulator pins shall have sufficient strength able to withstand the loads to which they will be subjected. Iron or steel pins shall have a shank diameter of not less than ½ inch. Wood pins shall be sound and straight grained with a shank diameter of not less than 1-¾ inch.

7. Each insulator shall be of such a pattern, design, and material that when mounted on its pin, it will withstand without any damage.

8. Conductors shall be made of a material, or combination of materials, which will not corrode excessively under the prevailing conditions.

9. Poles supporting the crossing span shall be guyed in both directions and shall be head guyed away from the crossing span when the crossing span places undue stress on the crossing poles, whenever practicable. Guys shall be galvanized steel or stainless steel and shall have high visibility guarding.

10. Suspension strands shall be galvanized steel or other material that will not corrode excessively under the prevailing conditions.

11. The crossing shall be maintained in a safe condition. The poles, crossarms, guys, wires, and other parts and materials used in the structure of the crossing shall be periodically inspected and all defects shall be promptly repaired by the Utility Owner of the line. The guys and anchors shall be maintained so that the guys are kept taut and serve the purpose for which they are intended. The line wires shall be kept to the proper sag. Underbrush, grass, or other combustible material shall be kept removed from the poles by the Utility Owner, for a sufficient distance to reduce fire hazards to a minimum.

12. See Table 3, for the minimum required vertical clearances for overhead communication lines.

C. Underground Electric Power Lines

1. Lines located within the right-of-way must be located as far as possible from existing tracks and other railroad facilities, due to the fact that NICTD occupies the right-of-way for the purpose of operating a commuter railroad. All installations shall be designed and constructed so that railroad operations and facilities are not interfered with. Additionally, the proposed installation shall be located to minimize encumbrance to the right-of-way in order for NICTD to have unrestricted use of the property for all current and future operations.

2. Lines shall be located to cross tracks at right angles.

3. The tops of ducts and cable system structures for underground cable crossings shall be located at a depth of not less than 5'-6" below the base of rail and not less than 3 feet below the bottoms of ditches, or 4 feet below the natural ground with the lowest depth governing. Deeper installations may be required in order to avoid underground railroad facilities.

4. Underground crossings of power supply cables with a maximum voltage of 750 volts and communication cables of low voltage may be installed by pushing a galvanized steel pipe underneath the tracks to serve as a conduit, provided that such pipe extends the full width of the right-of-way. All ducts and/or encasements beneath the tracks must be capable of withstanding Cooper E-80 loading and conform to AREMA Standards. Any conduits and/or encasements larger than 4 inches will be governed entirely by those requirements which normally cover pipelines (See PART III above). Jacking or boring installation is preferred and no water is to be used in the installation of the encasement. Plastic casing pipe is not permitted.

5. Underground crossings of power supply cables operating above 750 volts shall be installed between the points where the underground crossing enters and leaves NICTD property. The cable is to be enclosed in galvanized steel pipe or approved concrete encasement for the mechanical protection of the cable. No unprotected cable of this magnitude will be permitted.

6. All underground installations (from the centerline of the crossing) must be located a minimum of 50 feet from the end of any railroad bridge or centerline of any culvert or switch area.

7. If the proposed location of the line crosses existing culverts, the top of the buried wire line must be installed at a minimum of 5 feet below the culvert invert. If the location crosses a ditch beyond the end of the culvert (field side), then the top of the buried encroachment must be installed 5 feet below the bottom elevation of the ditch.

8. Manholes must be capable of withstanding H-20 highway loading requirements and must be installed so as not to create a stumbling hazard.

9. All underground installations carrying power or communication wires and cables shall be constructed and properly marked with signs. See Part III, Section H, 2 earlier in this document for signage requirements.

10. In addition to the requirements laid out in these guidelines, the underground crossing is to conform to the requirements of the latest edition of the National Electrical Safety Code (NESC). The crossing is also to conform to the requirements of any local or state laws, or regulations of any local code enforcing authority that may be in effect at the time of the installation.

Part V – Publication Standards

Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in these guidelines, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not assured to be, accurate and up-to-date. Utility Owners should always seek out the latest publication of any standard mentioned in these guidelines.

Organization	Contact Information
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC 20036 Phone: 202-293-8020
AREMA	The American Railway Engineering and Maintenance-of-Way Association 4501 Forbes Blvd., Suite 130 Lanham, MD 20706 Phone: 301-459-3200
ASTM	American Society for Testing and Materials PO Box C700 West Conshohocken, PA 19428 Phone: 877-909-2786
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 Phone: 1-800-926-7337
IEEE	Institute of Electrical and Electronics Engineers Piscataway, NJ US Phone: 1-800-678-4333
NACE	The National Association of Corrosion Engineers Houston, TX USA Phone: 1-800-797-6223

Table 4: Publication Standards Sources