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November 2012

NJ TRANSIT
RAIL OPERATION

GENERAL REQUIREMENTS FOR WORKING WITHIN THE RIGHT-OF-WAY

Michael Gaspartich
Deputy General Manager
For Infrastructure Engineering

November 2012

GENERAL REQUIREMENTS FOR WORKING WITHIN THE RIGHT OF WAY

A. GENERAL INFORMATION

Contractors shall cooperate at all times with officials of NJ TRANSIT and use all reasonable care and diligence in their work to avoid accidents, damage or unnecessary delay to, or interference with, passenger trains and other property of NJ TRANSIT. Contractors are advised that a pre-construction meeting will be required prior to any work commencing within the Right-of-Way of NJ TRANSIT property. Prior to entering NJ TRANSIT's property, all Contractors' employees must attend a Contractor Safety Training session offered by NJ TRANSIT's Safety Department. Contact NJ TRANSIT Safety Department at (973) 522-3719 to arrange for the scheduling of this program.

Contractors are to be advised that all construction operations within and over the limits of NJ TRANSIT's Right-of-Way shall be accomplished by methods which will in no way cause damage to the tracks, facilities, aerial or underground lines, embankments or drainage systems. It shall be the Contractor's responsibility to provide for protection of the tracks and embankments (as shown on approved plans or as field approved) in a safe and satisfactory manner, to install and maintain such shoring, sheeting and bracing as may be required, and to remove and dispose of such protective facilities upon completion of the work. Blasting will not be permitted on or along the Right-of-Way without prior written approval of NJ TRANSIT. All damage to NJ TRANSIT property caused by the Contractor's operations shall be repaired by the Contractor, or at the Contractor's expense by NJ TRANSIT, at the discretion of NJ TRANSIT. Work shall not continue until such damage is repaired and the railroad is back in service.

Whenever, in the judgement of NJ TRANSIT, work within or adjacent to the railroad's Right-of-Way may affect or involve the safe movement of its trains, the time and method of doing such work shall first be submitted in writing and approved by NJ TRANSIT. This approval shall not be considered as releasing the Contractor from responsibility or liability for any damage which NJ TRANSIT may suffer, or for which it may be held liable, by the action or omissions of the Contractor or those of his sub-contractors, or their employees.

Contractors shall provide written notice not less than ten (10) business days in advance of any work to be performed within or above the Right-of-Way, or other work which may affect railroad safety to: Manager, R.O.W. Engineering, NJ TRANSIT Rail Operations, One Penn Plaza East, Newark, NJ 07105.

NJ TRANSIT will require protective personnel to be on duty to protect its operations when the Contractor is working within the Right-of-Way. Flag protection will be required when the contractor is on, above or below NJ TRANSIT's property, or immediately adjacent to NJ TRANSIT property, and having the capability of obstructing an adjacent track. The specific responsibilities of the NJ TRANSIT Flaggers are to provide enforcement of NJ TRANSIT Safety and Operating rules and other items as provided in these General Requirements (as discussed in the "Contractor Safety Program"). They are **not** provided for engineering related matters.

Where such work is in proximity (15 feet or less) **or has the potential** to come in contact with overhead electrical wires or facilities, before any work proceeds, an on-site safety meeting must be conducted to determine the identity of such wires or facilities and appropriate steps to be taken. If owned by NJ TRANSIT, a qualified Class A employee(s) will be assigned who will take the necessary precautions in accordance with the NJ TRANSIT Electrical Operating Instructions. All cranes and hoisting equipment used in this application must be properly grounded in accordance with NJ TRANSIT Specification MW-252.

When Crane Operators' visibility is impaired during any hoisting operation; Spotters or qualified Groundmen shall be utilized to guide the Operator. Universal hand signals shall be utilized and their meaning clearly understood between Operator and Spotter. When visual contact between the Operator and Spotter is impaired, two-way radio contact must be utilized.

The minimum hours per day for employees engaged in flagging or protection purposes will be eight (8) hours, plus appropriate travel time. For all time over eight (8) hours, the overtime rate will be charged. Personnel used in flagging service will be paid deadhead (traveling) time to and from headquarters each day, plus transportation from headquarters to the site of the work if required (in accordance with the current collective bargaining agreement). It will be the responsibility of the Contractor to provide transportation for the Flagmen from and to the nearest NJ TRANSIT train station, as necessary.

NJ TRANSIT will assign Inspectors and/or Engineers during the time the Contractor is engaged in construction work on railroad property to provide general coordination of construction operations, to insure adherence to plans and specifications, and to insure the use of approved construction methods. It is to be understood that the providing of Inspectors, Engineers, Operators, Conductors, Flagmen or other forces, and the taking of any other precautions deemed necessary by NJ TRANSIT shall not relieve the Contractor or sub-Contractor from liability for payment of damages caused by their respective operations.

All of NJ TRANSIT's costs shall be at the prevailing rates of pay in accordance with railroad accounts, and shall include overtime burden, (if overtime pay is warranted), and Workmen's Compensation Insurance, Public Liability Insurance, Property Damage Insurance, Railroad Unemployment Insurance, Railroad Retirement, Excise Tax, Vacation allowance, and other standard and legal costs, including overhead for supervision and accounting. In general, a recommendation is made that final payment to the Contractor not be made, until NJ TRANSIT has been reimbursed in full for all of the costs.

Typically, use of NJ TRANSIT property will be restricted as follows, unless specifically authorized by the on-site NJ TRANSIT qualified employee (Flagman):

(a) All workers must maintain a distance of no less than eighteen (18) feet from the track.

(b) Any tools and equipment being utilized must not extend closer than eighteen (18) feet from the track.

(c) When a train is approaching, all workers must cease work, stand clear of the track, and face the approaching train.

(d) No worker is permitted to cross the railroad tracks at any area other than designated grade crossings.

(e) No tools or working materials are permitted to be left along the NJ TRANSIT Right-of-Way.

(f) In no event shall equipment or material be transported across a track or tracks without special permission and appropriate flagging protection.

(g) All personnel, equipment and materials to be used during the construction shall be kept at all times at least fifteen (15) feet from all electrical, signal and communication systems unless protected by an Electrical, Signal or Communication's Department representative. The Contractor is responsible for damage to NJ TRANSIT property and any utilities located thereon, whether above or below ground.

(h) All personnel, equipment and materials to be used during the construction in electrified territory shall also be kept at all times at least fifteen (15) feet from overhead trolley, messenger, static and transmission lines unless clearance and protection is provided by a qualified Electric Traction Department Class A High Tension Lineman. All work performed on or around electrical lines or equipment where arc flash hazard exists shall be governed by the latest National Fire Protection Association 70 E Requirements.

(i) All lifting operations shall be reviewed in meeting a standard requirement for a positive block to be installed on the hoisting equipment. This positive block is required to avoid contact with facilities or interfere with safe train operations.

(j) When construction activity involves any type of hoisting procedure adjacent to aerial lines, the Contractor shall furnish NJ TRANSIT with sufficient florescent orange rubber goods, as determined by NJ TRANSIT, to be installed as an aid for equipment Operators and Groundmen in visually locating the aerial lines, and as additional protection against damage.

B. ERECTION, DEMOLITION OR OTHER HOISTING OPERATIONS OVER TRACKS OF NJ TRANSIT

1. All erection, Demolition and other Hoisting Operations within NJ TRANSIT's property must be designed and carried out in accordance to NJ TRANSIT's "ENGINEERING DATA REQUIRED FOR APPROVAL OF ERECTION, DEMOLITION, OR OTHER HOISTING OPERATIONS OVER NJ TRANSIT RAIL OPERATIONS".

C. INDEMNIFICATION

The Contractor shall indemnify, defend, keep and save harmless NJ TRANSIT, NJ TRANSIT Rail Operations, NJ TRANSIT's contract operators, and other railroad(s) operating on the affected property, their successors, assigns, contractors, agents, employees, servants or officials, and each and every one of them or any other designee of NJ TRANSIT, (the "Indemnified Parties") against all claims, just or unjust, made against the Indemnified Parties on account of injuries, deaths, losses of any kind whatsoever, damages, suits, liabilities, judgments, claims for infringement of patent, trademark or copyright, cost and expenses which may in anywise accrue against the Indemnified Parties in consequence of the granting of a Permit or which may in anywise result therefrom, and whether or not it shall be alleged or determined that the cause thereof was the negligent acts or omissions of the Indemnified Parties and the Contractor shall appear, defend and pay, as its own expense, all costs, including counsel fees, arising therefrom or incurred in connection therewith, and, if any judgment shall be rendered against the Indemnified Parties in any such action, the Contractor shall, at its own expense, satisfy and discharge the same.

The railroad operations at or near the Facilities involve some risk, and the Contractor, as part of the consideration for a Permit, and with full knowledge and appreciation of such risk, shall release and waive any right to ask for or demand any special, direct, incidental, indirect, punitive, reliance or consequential damages, whether foreseeable or not, for or on account of any loss or injury to any property of the Contractor and its employees, including property in the care, custody, and control of the Contractor, and to the Facilities and contents thereof that are over, under, upon, or in the property of NJ TRANSIT, including loss of, or interference with, service or use thereof, or loss of profits or revenue, cost of capital, cost of replacement services, claims of customers or third parties, whether or not it shall be alleged or determined that the cause thereof was breach of contract, breach of warranty, negligent acts or omissions of the Indemnified Parties or the Contractor, their successors, assigns, contractors, agents, employees, servants and officials or of other persons.

C. INSURANCE REQUIREMENTS

In addition to other insurance carried by the Contractor, the Contractor shall carry, or cause to have carried during any Project construction, through completion and acceptance of the Project by NJ TRANSIT and for the entire period of occupancy permitted herein, insurance coverage of the following kinds and minimum amounts:

(a) Contractor's Comprehensive General Liability Insurance
The Contractor shall purchase and maintain a comprehensive general liability policy of insurance. This policy shall protect the Contractor, NJ TRANSIT and the Indemnified Parties, against liability which arises in consequence of granting this Permit, including access thereto over NJ TRANSIT's adjacent property and/or which arises from any of the claims indicated in Indemnification Paragraph 16 (a) and (b) against which the Contractor is required to indemnify NJ TRANSIT. The policy is to be written by a good and solvent insurance company authorized to do business in New Jersey with an A.M. BEST Insurance Rating of "A-" or better or by companies acceptable to NJ TRANSIT. This policy shall name NJ TRANSIT as an additional insured. The liability policy (ies) and insurance shall include a cross-liability coverage providing severability of interests so that coverage will respond as if separate policies were in force for each insured. The coverage limits of the policy shall be not less than $5,000,000 combined single limit per occurrence for bodily injury and property damage. NJ TRANSIT reserves the right to require reasonable increases in the coverage limits from time to time.

(b) Automobile Liability Insurance
Minimum of two million dollars ($2,000,000) combined single limit per accident for bodily injury and property damage liability. This policy shall name NJ TRANSIT and the Indemnified Parties as an additional insured.

(c)Contractors' and/or Subcontractors' Comprehensive General Liability Insurance
The Contractor shall furnish evidence by virtue of a standard certificate of insurance that, with respect to any work or activities performed by its contractors and/or subcontractors hereunder, they carry in their own behalf Comprehensive General Liability Insurance in the amount of $5,000,000 per occurrence for damages arising out of bodily injuries or death and/or Property Damage. Coverage provided under this liability policy shall be on an occurrence basis and shall include, but not be limited to, premises operations liability, personal injury liability, property damage liability, contractual liability, independent contractors liability and products liability. There shall be no coverage exceptions for property containing or adjacent to railroad facilities. This policy shall name NJ TRANSIT and the Indemnified Parties as an additional insured. The liability policy (ies) and insurance shall include a cross-liability coverage providing severability of interests so that coverage will respond as if separate policies were in force for each insured. Should the Contractor be self-insured, it is required to supply annually a letter certifying that it is self-insured and is complying with all laws and regulations required for self-insurance.

(d) Contractor's Pollution Liability Insurance
The Contractor shall furnish evidence of contractor's pollution liability insurance covering the liability of its contractor arising out of any sudden and/or non-sudden pollution or impairment of the environment, including clean-up costs and defense that arise from the operation of contractor or its subcontractor. Coverage under this policy shall have limits of liability with a minimum of $2,000,000 per occurrence. This policy shall name NJ TRANSIT and the Indemnified Parties as additional insured.

(e) Railroad Protective Public Liability Insurance
In addition to the above, The Contractor shall furnish evidence in the form of one signed copy and one certified copy of the Railroad Protective Public Liability Insurance Policy that, with respect to the operations it, its contractors, or any of its subcontractors perform, it has provided Railroad Protective Public Liability Insurance (AAR- AASHO form) in the name of NJ TRANSIT, NJ TRANSIT Rail Operations, NJ TRANSIT's contract operator, and other Operating Railroad providing for a limit of not less than $2,000,000 single limit bodily injury and/or property damage combined, for damages arising out of bodily injuries to or death of all persons in any one occurrence and for damage to or destruction of property, including the loss of use thereof, in any one occurrence. Such insurance shall be furnished with an aggregate of not less than $6,000,000 for all damages as a result of more than one occurrence. (Reference: "Standard Provisions for General Liability Policies" as contained in U.S. Department of Transportation, Federal Highway Administration, Federal Aid Highway Program Manual, Volume 6, Chapter 6, Section 2,Subsection 2, Attachment I, as amended).

(i) The address of NJ TRANSIT CORPORATION shall appear as Director of Risk Management and Insurance, One Penn Plaza East, Newark, NJ 07105-2246. The insurance hereinbefore specified shall be carried until all work required to be performed under the terms of the contract is satisfactorily completed and formally accepted.

(f) Workers' Compensation and Employer's Liability Insurance
The Contractor shall provide to NJ TRANSIT a certificate of insurance showing that the coverage the Contractor, its contractors and/or its subcontractors carry for Workers' Compensation is within the statutory limits of the State of New Jersey. In case any class of employees on the Project under this Permit is not protected under the Worker's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide employer's liability insurance for the protection of each of its employees as are not otherwise protected. Limits of Employer Liability are as follows:

Employer's Liability	$1,000,000 each accident
	$1,000,000 each employee disease
	$1,000,000 policy limit – disease

(g) **(i)** All insurance required by the Permit shall be provided at the sole cost of the Contractor and shall be in full force and effect until all work is completed to the satisfaction of NJ TRANSIT. Proof of insurance must be provided prior to entering upon the property, with a copy of the general accord statement being supplied to NJ TRANSIT's Manager Right-of-Way Engineering or his representative.

(ii) All insurance policies or certificates shall contain the following cancellation notice: "This policy is not subject to cancellation or change until thirty (30) days after NJ TRANSIT has received written notice thereof as evidenced by return receipt of a registered letter addressed to the Director, Risk Management and Insurance, New Jersey Transit Corporation, One Penn Plaza East, Newark, New Jersey, 07105-2246."

(iii) All hazards to be covered shall include the so-called "XCU" coverage for explosion, collapse, and damage where work is to be done over or under NJ TRANSIT owned railroad property.

(h) The foregoing insurance coverage is not intended to, nor does it limit the liability of the Contractor to hold the Indemnified Parties harmless as set forth in Paragraph C above.

(i) All insurance certificates must be mailed to NJ TRANSIT, **Right-of-Way Engineering Department, c/o Manager – R.O.W. Engineering, located at One Penn Plaza East, Newark, New Jersey 07105.**

D. MINIMUM STANDARDS FOR GEOTECHNICAL INVESTIGATIONS

Subsurface investigations made on or adjacent to the Right-of-Way should meet the minimum recommended practices as provided in Chapter 1, Volume 1, of the current AREMA Manual for Railway Engineering. Additionally, the following requirements must be met:

- Borings shall be advanced using casing or mud rotary techniques. Use of hollow stem augers below the water table is prohibited.
- All borings shall be grouted with non-shrink cement grout from the bottom to the top of the bore hole at completion. Subsequent minor surface settlement shall be back-filled with tamped earth, asphalt or finished concrete, as appropriate.
- No observation or monitoring wells shall be installed on railroad property without prior authorization of NJ TRANSIT'S Environmental Services Unit.
- No sampling of any kind shall be done on railroad property without prior authorization of NJ TRANSIT'S Environmental Services Unit.
- No work shall be done that interferes with operation and/or maintenance of the railroad unless specifically approved in a Temporary Access Permit issued by NJ TRANSIT.
- The crossing of tracks or use of tracks by personnel, equipment or material shall only be done under the protection of a qualified NJ TRANSIT representative.
- The presence of buried railroad or foreign utilities may or may not be known and any damage resulting from the investigation will be repaired as required, and all charges resulting from such damage shall be paid promptly by the Applicant in accordance with the terms of the Temporary Access Permit.
- In advance of the authorized investigation, the locations of proposed pits, boring locations, or monitoring well locations shall be marked out in the field to review the site for possible location of buried utilities or conflict with operating systems.

A reproducible location plan of proposed boring layout, test pits' locations, or monitoring well locations will be submitted with the technical specification for the work for review and approval prior to start of work. Detail of the plan shall be sufficient to permit review and comment by the Engineering and Environmental Services Departments. These plans and specifications shall be accompanied by a brief narrative of how the work will be carried out.

The location plan should provide from a licensed Land Surveyor the proposed state plane coordinates and approximate ground surface elevations of the work, and reference centerline alignment and profile of near tracks, support poles and guy anchors, existing foundations and overhead or undergrade wire, conduit, pipelines or structures. NJ TRANSIT uses State coordinate systems for horizontal control as appropriate and vertical datum based on Mean Sea Level equal to 0.0 feet in plan and nearest 0.1 feet in elevation.

Property information should be coordinated with the applicable Right-of-Way and Track Maps or Valuation Sheets. Copies of these maps can be obtained from the NJ TRANSIT Real Estate Department. These maps should be used to locate the work with respect to railroad stationing, structure number and mile post.

A draft summary Engineering Report shall be prepared signed and sealed by the licensed professional Engineer in charge of the work. Upon review and comment by NJ TRANSIT, three copies of the final report shall be submitted for record.

E. ADDITIONAL REQUIREMENTS FOR PIPELINE OCCUPANCIES

The Contractor shall be responsible for compliance with all provisions of NJ TRANSIT Specification EP-2 and shall comply with all reasonable requests from NJ TRANSIT.

The Contractor shall be responsible to furnish all labor, materials and equipment necessary to install the casing and carrier pipes as referred to in the executed Occupancy Permit and as shown on the approved contract documents. The Contractor shall be responsible for notification to NJ TRANSIT and the appropriate utility companies for surface markout, and NJ TRANSIT shall be responsible for markout of its own facilities potentially affected by the installation.

If the jacking pit/boring equipment is constructed such that verbal communications are limited, universal hand signals shall be utilized and their meaning clearly understood between all employees. When visual contact between key operators and support groundmen cannot be adequately maintained, two-way radio contact must be utilized.

The Contractor must provide material certifications for all material to be installed and must prepare and submit for review (allowing 30 days) detailed drawings and supporting calculations (all signed and sealed by a professional Engineer licensed in the State where the work is being performed) showing the proposed methods of crossing; including jacking pit details, shoring, bracing, dewatering methods, pushing backstops, receiving pits, grade and alignment controls, catalog cuts on jacking equipment, and narrative methods for installing casing and carrier pipe. The Contractors must be prepared to work continuously and complete the jacking operation below the tracks once the live load influence line has been entered by the auger/casing.

The use of water or other liquids to facilitate conventional casing emplacement and soil removal is prohibited. If during installation, an obstruction is encountered which prevents installation of the pipe in accordance with the approved plans, the pipe shall be abandoned in place and immediately filled with grout. A revised installation plan must be submitted for approval.

When water is known or expected to be encountered, a designed dewatering system with pumps of sufficient capacity shall be utilized to handle the flow in such a fashion which does not allow groundwater to affect the installation or NJ TRANSIT's property. When dewatering, close observation shall be maintained to detect any settlement or displacement of the embankments, tracks and other facilities.

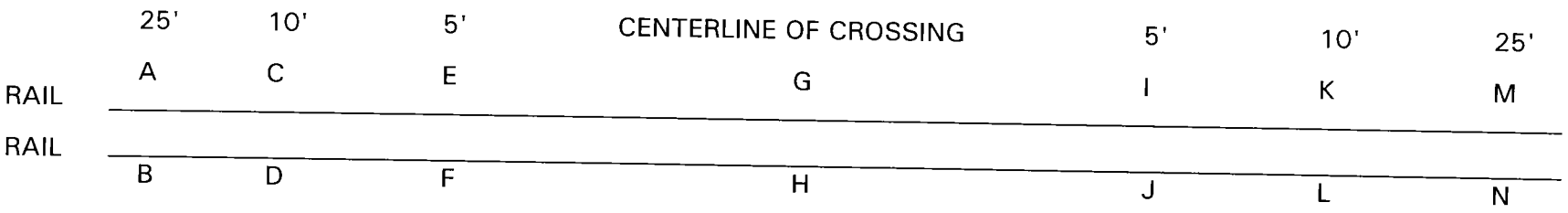
As part of the jacking operation, the Contractor shall be responsible for the completion of Survey Control Monitoring to verify track movement prior to, during, and at a point after completion. The survey monitoring procedure and location layout can be site-specific modified, but, must generally follow those as shown on the attached. The survey monitoring procedure must be completed and signed by a Licensed Land Surveyor.

F. SURVEY MONITORING PROCEDURES FOR SUBSURFACE PIPELINE INSTALLATION

ACTIVITY FREQUENCY	LOCATION OF SETTLEMENT POINTS	FREQUENCY
Prior to installation and disturbance of the property.	The top of each rail at the centerline of crossing, 5', 10', and 25' on each side of the crossing, or as directed by the Manager, Right-of-Way Engineering, or his designee. When temporary track supports have been installed only the running rails shall be monitored.	Take 3 sets of readings with at least 1 train passing the area between readings for a base level measurement. All readings to be measured to the nearest 0.001 ft.
Installation of the casing, grouting operation and during dewatering operation.	All points noted above and as required by NJ TRANSIT on the Contractor's approved dewatering plans.	Immediately prior to start and continuously during jacking, and all grouting operations. Daily during all dewatering activities for the first 7 days and then twice weekly.
At completion of jacking as necessary.	All points noted above.	After 1 train, after 5 trains, after 1 day, after 1 week, after 1 month or as directed by the Manager, Right-of-Way Engineering, or his designee.

Should the total changes in rail elevations for any pair of adjacent points exceed the established base elevations by 0.02 ft., the Surveyor shall immediately notify the Manager, Right-of-Way Engineering, or his designee. All readings shall be transmitted directly to the NJ TRANSIT Resident Engineer within 24 hours of taking the measurement. Elevations shall be referenced to a U.S.G.S. benchmark and survey runs shall be reported with the proper closure errors. Readings and elevations shall be certified by a licensed Land Surveyor. Copies of the field data shall be maintained on-site by the Applicant's Engineer. Review of the survey data by NJ TRANSIT will be made at the end of the first month following the jacking operation to determine the need for additional elevation measurements.

TRACK SURVEY MONITORING POINTS (TYPICAL FOR ALL TRACKS)



NOTE: All field markouts shall be accomplished using a paint or keel marker. Chisel cuts are prohibited on the rail.

SPECIFICATIONS

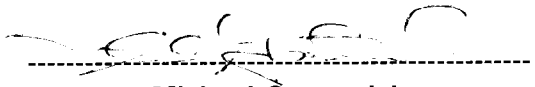
FOR

PIPELINE OCCUPANCY

ON

NEW JERSEY TRANSIT PROPERTY

EP - 2



Michael Gaspartich
Deputy General Manager
For Infrastructure Engineering

November 2012

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A. GENERAL REQUIREMENTS

1. SCOPE

a. These specifications apply to the design, construction and maintenance of pipelines and casings carrying flammable and non-flammable substances, containing wires and cables, under, over, across and longitudinally along NJ TRANSIT property, right-of-way and facilities. References made to "State", unless otherwise noted, is typically meant to be the State of New Jersey. When the occupancy is in the State of New York, State of New York requirements shall be substituted for New Jersey in the applicable specifications.

b. NJ TRANSIT owns its right-of-way for the primary purpose of operating a railroad. All occupancies shall therefore be designed and constructed so that operations and facilities are not interfered with, interrupted or endangered. In addition, the proposed facility shall be located to minimize encumbrance to the right-of-way so that the railroad will have unrestricted use of its property for current and future operations.

2. APPLICATION FOR OCCUPANCY PERMIT

a. Individuals, Owners, Corporations and Municipalities (hereinafter known as the Applicant) desiring occupancy on NJ TRANSIT property must agree, upon approval of the construction plans by NJ TRANSIT, to execute an appropriate Occupancy Permit and pay any required fees and/or rentals outlined therein.

b. Application for an Occupancy Permit shall be made by letter addressed to Manager, Property Management Permits, NJ TRANSIT Real Estate Department, One Penn Plaza East, Newark, New Jersey 07105-2246. The application must provide the following information:

1. Name of Applicant desiring the occupancy.

2. Complete mailing address of Applicant.

3. Name and title of person who will sign the Occupancy Permit.

4. The State in which the Applicant is incorporated.

5. Complete description of the project, including installation, location and specific details of the occupancy.

c. No entry upon NJ TRANSIT property for the purpose of conducting surveys, field inspections, obtaining soil information, or for any other purpose required for the design and engineering of the proposed occupancy, will be allowed without a Temporary Access Permit executed by NJ TRANSIT. The Applicant must apply for the Temporary Access Permit and pay any associated fees. Such applications should be initiated by contacting the Property Manager per paragraph 2b above.

d. It is to be clearly understood that the issuance of a Temporary Access Permit does not constitute authority to proceed with the actual construction. Actual construction cannot begin until a formal Occupancy Permit has been fully executed by NJ TRANSIT and authorization to proceed has been granted.

3. SUBMISSION OF PLANS AND DOCUMENTATION

a. All Occupancy Permit applications shall be accompanied by ten complete sets of all project construction plans, specifications and computations covering the proposed occupancy. The construction plans, specifications and computations shall be signed and sealed by a Licensed Professional Engineer registered in the State of New Jersey. If the plans, specifications and computations (including those submitted by contractors or suppliers) are not signed and sealed, they will be given no further consideration.

b. Two full size sets and eight half size sets (11" x 17") of plans for proposed pipeline occupancy shall be submitted to NJ TRANSIT. The half size plans are to be folded to an 8-1/2" x 11" size, 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 at the upper left hand corner and still be unfolded to full size without being removed from the file. After folding, the title block or any other identification of the plans shall be visible at the lower right hand corner without the necessity of unfolding. Each plan shall bear an individual identifying number and an original issue date, together with subsequent revision dates. Revisions shall be clearly identified on the plans so that it is readily apparent as to what revisions were made and when. All plan sheets are to be folded individually and, where more than one plan is involved, the plan sheets shall be assembled into complete sets before submission to NJ TRANSIT. Upon completion of the project, as-built plans shall also be provided in a viewable CD ROM format.

c. Failure of the Applicant to comply with these requirements may be sufficient cause for rejection of the application.

d. Plans shall be drawn to scale, and a bar scale shall be provided. As a minimum, the following information shall be included:

    1. Plan view of proposed pipeline in relation to all NJ TRANSIT facilities and facilities immediately adjacent to NJ TRANSIT including, but not limited to, tracks, buildings, signals, pole lines, other utilities and all other facilities that may affect or influence the pipeline design and construction. The right-of-way property line shall be clearly delineated (see Section D "DESIGN STANDARDS").

    2. Location of centerline of pipe (in feet) from the nearest railroad milepost, centerline of a railroad bridge (giving bridge milepost number), or centerline of an existing or former passenger station. In all cases, the names of the municipality and the county in which the proposed facilities are located must be shown.

3. Profile of ground at centerline of pipe (from field survey) showing the relationship of the pipe and casing to ground level, tracks and other facilities (see Section D). For longitudinal occupations, the profile of adjacent track or tracks must be shown (see Section D). The location and description of benchmarks used in the field survey shall be given, and elevations shall be referenced to the current National Geodetic Vertical Datum (NGVD 1929; Sandy Hook, NJ).

4. If the pipeline is in a public highway, the limits of the right-of-way for the highway shall be clearly indicated with dimensions from the centerline.

5. The angle of crossings in relation to the centerline of tracks.

6. Location and description of valves or control stations of the pipeline, or junction boxes and splice points for cable conduits, shall be clearly shown on the plans.

7. The Pipeline Crossing Data Sheet must be completed and shown on the plans submitted for approval (see Section D).

8. Location and description of all appurtenances, manholes and other accesses shall be shown on the plans.

e. The plans must be specific as to:

1. Method of construction and installation.

2. Size and material of casing pipe, including any insulation or coatings proposed.

3. Size and material of carrier pipe, including any insulation or coatings proposed.

f. Location and dimensions of jacking, boring, or tunneling pits, and of longitudinal pipeline trenches shall be shown, along with details of their sheeting and shoring. If the bottom of the excavated pit nearest the adjacent track intersects a line from a point 5 feet horizontally from center line of adjacent track at the plane of the base of rail drawn on a slope of 1-1/2 horizontal to 1 vertical, a temporary earth support system designed by a Registered Professional Engineer licensed in the State of New Jersey shall be submitted for approval. In any event, the face of the pit shall be no less that 25 feet from adjacent track, unless otherwise approved by the NJ TRANSIT. During construction, jacking, boring or tunneling pits shall be fenced, lighted, and otherwise protected as directed by the NJ TRANSIT designated field representative.

g. If required, a dewatering plan shall be included in the submission. The dewatering plan shall include the location and dimensions of system components, structural capacity of pits, etc., and all pertinent collection and discharge data.

h. When computer calculations are included with design calculations, the following minimum documentation shall be furnished:

1. A synopsis of the computer program(s), stating briefly: required input, method of solution, approximations used, specifications or codes used, cases considered, output generated, extent of previous usage or certification of program(s) and the name of the author of the program(s).

2. Identification by number, indexing and cross referencing of all calculation sheets, including supplemental "long-hand" calculation sheets.

3. Fully identified, dimensioned and annotated diagram of each member of the structure being considered.

4. Clear identification and printing of all input and output values, including intermediate values, if such values are necessary for orderly review.

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.

i. Once an application is approved by NJ TRANSIT and the Occupancy Permit issued, no variance from the plans, specifications, methods of construction, etc. will be considered or permitted without resubmission of plans to, and receipt of approval from, NJ TRANSIT.

4. PERMIT APPROVAL - NOTIFICATION TO PROCEED

a. Notification to Proceed with Construction: After approval of the engineering plans, computations and specifications, and the execution of the Occupancy Permit, the Applicant's project can be undertaken. The Applicant will notify NJ TRANSIT a minimum of ten (10) working days prior to the desired start of construction (see attached GENERAL REQUIREMENTS FOR WORKING WITHIN RIGHT OF WAY). The Applicant is responsible for notifying and coordinating the work with all utility owners as required under the New Jersey One Call System.

b. An Occupancy Permit that has been approved by NJ TRANSIT will remain in effect for a period of two (2) years. Applicants must reapply for an Occupancy Permit if any work is to be done on NJ TRANSIT's right of way beyond the two-year limitation. Additionally, the Applicant is responsible for any Occupancy Permit revisions necessary to accommodate interim changes to existing conditions on NJ TRANSIT property.

5. MODIFICATION OF EXISTING FACILITIES

a. 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.

6. ABANDONED FACILITIES

a. The owner of all pipelines and other occupancies shall notify in writing, the Manager, Property Management, Permits of the intention to abandon. Failure to do so will lead to the owner being continually billed for the pipeline occupancy.

b. Abandoned pipelines, manholes and other structures shall be removed to a minimum distance of 5 feet below finished grade. Structures below 5 feet will be completely filled with cement grout, compacted sand or other materials approved by NJ TRANSIT, using methods approved by NJ TRANSIT.

7. CONFLICT OF SPECIFICATIONS

a. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the higher degree so prescribed shall be deemed a part of these specifications. Any such requirements shall be clearly referenced in the application.

8. GLOSSARY

AASHTO - American Association of State Highway and Transportation Officials

ANSI - American National Standards Institute

API - American Petroleum Institute

AREMA - American Railway Engineering and Maintenance-of-Way Association

ASTM - American Society for Testing and Materials

Boring - Pushing a pipe through fill material, with a boring auger rotating within the pipe to remove the soil.

Carrier Pipe - Pipe containing primary fluid or cable through occupancy area.

Casing Pipe - Protective encasement for a carrier pipe whose function is both structural and for containment of carrier fluids within the occupancy area, and/or dispersion of carrier fluids beyond the occupancy area.

Cooper E-80 - Live load for each track based on four 80 kips axle load with 5 feet axle spacing.

Horizontal Directional Drilling (Directional Boring) - method of drilling under existing conditions using a pilot hole bore.

Jack Boring - method of jacking a pilot rod under existing conditions between a launching pit and a receiving pit.

Longitudinal Occupancy - The installation and maintenance of pipelines along and adjacent to tracks and within NJ TRANSIT property, right-of-way and facilities that do not cross tracks.

LSCM - Low strength cementitious material

MSDS - Material Safety Data Sheet

NEC - National Electric Code

NESC - National Electric and Safety Code

NGVD - National Geodetic Vertical Datum (1929, Sandy Hook, NJ)

NJTRO - NJ TRANSIT Rail Operations

Occupancy Permit - Agreement between NJ Transit and applicant to allow applicant to construct and maintain pipelines under, over, across or longitudinally along NJ TRANSIT property, right-of-way and facilities.

One-Call System - Statewide system to protect underground utilities and services that must be coordinated prior to the start of excavation work; 1-800-272-1000

Open-Cut Trenching - Surface excavation methods to allow the installation of pipelines.

OSHA - Occupational Safety and Health Administration

Pits (Launch/Receiving) - Excavations at each end of a work area to allow jacking, boring or tunneling operations under existing site conditions.

Temporary Access Permit - Permit allowing applicant to enter NJ TRANSIT property solely for the purpose of obtaining information required for the design and engineering of a proposed Occupancy Permit

Transverse Occupancy - The installation and maintenance of pipelines on NJ TRANSIT property, right-of-way and facilities, where such pipelines cross tracks.

Tremie Grouting - A method in which concrete placed underwater through a pipeline (tremie pipe) to form a seal between the subsurface and water levels.

Tunneling - Method of boring with or without the use of placing liner plates behind a tunneling shield or tunneling machine, thus forming a casing for the installation of a carrier pipe under existing conditions.

B. TECHNICAL REQUIREMENTS

1. LOCATION OF PIPELINE ON THE RIGHT-OF WAY

a. Pipelines laid longitudinally on NJ TRANSIT Right-of-Way shall be located as far as practicable from any tracks or other important structures and as close to the NJ TRANSIT property line as possible. Longitudinal pipelines must not be located within drainage ditches located on the right-of-way.

b. Pipelines shall be located, where practicable, to cross tracks at approximate right angles thereto, but generally no less than 45 degrees.

c. Pipelines shall not be located within the limits of a turnout (switch) when crossing the track. The limits of the turnout extend from the second tie before the point of the switch to the first tie beyond the last long timber.

d. Pipelines shall not be located within the limits of a grade crossing. If it is shown that no other location is possible, the Applicant will be responsible for reimbursing NJ TRANSIT for all costs associated with the removal and reconstruction of the grade crossing.

e. Pipelines and casings shall be suitably insulated from underground conduits or direct burial cables carrying electric wires on NJ TRANSIT property, in accordance with ANSI and NESC standards.

2. CARRIER PIPE

a. All pipes, ditches and other structures carrying surface drainage on NJ TRANSIT property and/or crossing under NJ TRANSIT tracks 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 in the State of New Jersey, shall be submitted to NJ TRANSIT for approval. If the drainage is to discharge into an existing drainage channel on NJ TRANSIT Right-of-Way and/or under NJ TRANSIT 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.

b. Carrier pipes within a casing shall be designed for NJ TRANSIT live loads as if they are not encased.

c. 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 where railroad loading will be experienced, the following shall be the minimum requirements for carrier pipes:

1. Reinforced concrete pipe - ASTM C76, Class V. Wall C

2. Ductile Iron Pipe - ANSI A21.51, Class 6

3. Corrugated Metal Pipe - AREMA Manual, Chapter 1, Part 4

4. Others - as approved by NJ TRANSIT

d. 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 *"Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols"*; ANSI B 31.8 "Gas Transmission and Distribution Piping Systems"; 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 NJ TRANSIT tracks, across NJ TRANSIT right-of-way, and longitudinally on NJ TRANSIT right-of way (the following percentages apply to hoop stress):

   a). Seventy-two percent for installation of oil pipelines.

   b). Fifty percent for pipelines carrying liquefied petroleum gas and other flammable liquids with low flash point.

   c). Sixty percent for installation of gas pipelines.

3. CASING PIPE

a. Pressurized pipelines under or along NJ TRANSIT tracks and across operating right-or-way shall be encased in a larger pipe or conduit called the casing pipe, as shown in Section D.

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 NJ TRANSIT, might cause damage if escaping on or near NJ TRANSIT property.

c. For non-pressure sewer or drainage piping, where the installation is approved by NJ TRANSIT, the casing pipe may be omitted when the pipe strength is capable of withstanding railroad loading hereinafter specified.

d. The casing pipe shall normally be laid across the entire width of the right-of-way. Casing pipe shall be installed so as to provide an even bearing pressure throughout its length. Casing pipe laid transverse to the railroad shall slope to one end.

e. Protection at ends of casings:

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

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

3. 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.

f. Vents

1. All casings when sealed shall be adequately vented. Special attention shall be given to sealed casings for flammable substances in accordance with ANSI Standards. 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 and 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.

2. 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 relief 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 NJ TRANSIT.

3. Vent pipes shall be at least four (4) feet vertically from aerial electric wires or greater if required by NESC and ANSI Standards.

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

4. DESIGN LOADING FOR PIPES

a. Pipes may be rigid or flexible, as permitted by their specific use. The design loading criteria is described below, and shall be in accordance with the current AREMA Manual for Railway Engineering, Volumes 1 and 2.

1. Where casing pipe is required or desired, casing pipe and joint shall be of metal and of leak proof construction, designed for the earth and/or other pressures present plus a Cooper E-80 railroad live loading with 50% added for impact.

2. The values shown in Table 1 shall be used for the vertical pressure on a buried structure for the various heights of cover.

Table 1
(AREMA, Volume 1, Part 4, Table 4-39)
Cooper E-80 live loads, including impact, for various heights of cover

Height of Cover (feet)	Load (lb/sq.ft.)
2	3800
5	2400
8	1600
10	1100
12	800
15	600
20	300
30	100
Note: If height of cover, from bottom of cross tie to top of structure, is over 30 feet, use dead load only. For live load other than Cooper E 80, the above values should be adjusted accordingly.	

3. Steel casing pipe shall have a minimum wall thickness as shown in Table 2, unless computations indicate that a thicker wall is required.

Table 2
(AREMA Volume 1, Part 5, Table 5-1)

Pipe Diameter	Coated or Cathodically Protected	Uncoated and Unprotected
Nominal Pipe Size (inches)	Nominal Wall Thickness (inches)	Nominal Wall Thickness (inches)
10 and under	0.188	0.188
12 and 14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.532
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 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 and 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 and 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

4. Steel pipe shall have minimum yield strength of 35,000 psi. The ASTM or API specification and grade for the pipe are to be shown on the Pipe Data Sheet.

5. Corrugated metal pipe or structural plate pipe may be used for casing, provided the pressure in the carrier pipe is less than 100 psi, and only when placed by the open cut method. Jacking or boring through railroad embankment for corrugated pipe is not permitted. Pipe shall be bituminous coated and shall conform to the current AREMA Manual for Railway Engineering, Volume 1, Part 4.

6. Tunnel liner plates shall be galvanized and bituminous coated and shall conform to the current AREMA Manual for Railway Engineering, Volume 1, Part 4. In no event shall the liner plate thickness be less than 0.105 inch.

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

8. Reinforced concrete pipe may be used for a casing. For a cover depth of 14 feet or less, reinforced concrete pipe shall conform to the current ASTM C76, Class V, Wall C. It may be used in open cut methods of installation, or when suitably designed for jacking methods. For depth of cover greater than 14 feet, the designer shall prepare an engineering analysis in accordance with the current AREMA Manual for Railway Engineering, Volume 2, Chapter 8, Part 10. For elliptical or arch pipe, where the supporting strength of the pipe D = 3,000 pounds per linear foot and reinforced concrete pipe is not available, a separate engineering analysis shall be submitted.

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

10. 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 flexible casing pipe shall be at least two (2) inches greater than the outside diameter, including insulation, of the carrier pipe for pipe less than eight (8) inches in diameter; 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.

11. When steel casing pipe is used, the joints shall be fully closed by welding or mechanical means to ensure tightness. The closure shall develop the full strength of the casing pipe. Closure details shall be shown on the plans.

12. Casing pipe under NJ TRANSIT tracks and across NJ TRANSIT Right-of-Way shall extend the greater of the following distances measured at right angles to centerline of tracks:

    a). Across the entire width of NJ TRANSIT Right-of-Way.

    b). Two (2) feet beyond toe of slope.

    c). A minimum distance of 25 feet each side from centerline of outside track when casing is sealed at both ends.

    d). A minimum distance of 45 feet from centerline of outside track when casing is open at both ends.

13. Where installation of the casing pipe is proposed by means of open cut, the designer should determine the effects upon the casing due to change in weight of the new compacted fills and potential for lateral spreading of the embankment and account for these effects in the design. Where segmental casing pipe segments are used, temporary or permanent tension rods may be required by the Engineer.

5. SIGNS

a. All pipelines (except those in streets where it would not be practical to do so) shall be prominently marked at Right-of-Way lines (on both sides of track for under crossings) by durable, weatherproof signs located on the edge of Right-of-Way. Signs shall show the following:

    1. Name and address of Owner

    2. Contents of Pipe

    3. Pressure in Pipe

    4. Depth of pipe below grade at point of sign

    5. Emergency telephone in event of pipe rupture

b. The material, size of lettering and the installation method of the sign shall be as approved by NJ TRANSIT. For pipelines running longitudinally on NJ TRANSIT property, signs shall be placed over the pipe (or offset and appropriately marked) at all changes in direction of the pipeline. Such signs should also be located so that when standing at one sign the next adjacent maker in either direction is visible. The owner shall maintain all signs on NJ TRANSIT Right-of-Way as long as the Occupancy Permit is in effect.

6. EMERGENCY SHUT-OFF VALVES

Accessible emergency shut-off valves shall be installed on each side of the railroad at locations selected by NJ TRANSIT where hazard to life and property should be guarded against. Where pipelines are provided with automatic control stations and within distances approved by NJ TRANSIT, no additional valves will be required.

7. DEPTH OF PIPELINE INSTALLATION

Pipe under NJ TRANSIT tracks and across NJ TRANSIT Right-of-Way shall be not less than 5-1/2 feet from bottom of tie to top of casing at its closest point. On other portions of Right-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 four (4) feet, unless otherwise specified herein.

8. CATHODIC PROTECTION

a. Cathodic protection shall be applied to all pipelines and casings carrying flammable substances in accordance with ANSI Standards.

b. Where casing and/or carrier pipe is cathodically protected by other than anodes, NJ TRANSIT shall be notified and a suitable test shall be made and witnessed by NJ TRANSIT to insure that all 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.

9. SOIL INVESTIGATIONS

a. For all pipe crossings, soil borings or other soil investigations approved by NJ TRANSIT shall be made to determine the nature of the underlying material (see Section A, Paragraph 2.c. for procedures). Boring location plans need to be approved by NJ TRANSIT in advance of the taking of the borings.

b. Borings shall be made on each side of the tracks, on the centerline of the pipe crossings, and as close to the tracks as practicable.

c. Soil borings shall be made in accordance with the current AREMA Manual for Railway Engineering, Chapter 8, Part 22. Soils shall be investigated by the split-spoon and/or thin walled tube method, and rock shall be investigated by the coring method, as appropriate. The location of the carrying pipe and/or casing shall be superimposed on the Boring Location Plan before submission to NJ TRANSIT.

d. Soil boring logs shall clearly indicate all of the following :

1. Boring number as shown on Boring Location Plan.

2. Elevation of ground at boring, using the same NGVD as the pipeline construction plans. The location of the carrier pipe and/or casing pipe shall be superimposed on the boring logs before submission to NJ TRANSIT.

3. Description or soil classification of each soil sample encountered shall be made in accordance with the Unified Soils Classification System. Classification and description of rock shall include type, local designation, joint or fracture frequency, foliation and, joint dip, surface degree of weathering and any other pertinent observations concerning the drilling and recovery.

4. Elevations or depth from surface for each change in strata.

5. Identification of depth where samples were taken or attempted and percentage of recovery.

6. Location of ground water at time of sampling and, if available, subsequent readings shall be reported. Observed conditions, such as depth of hole or casing, drill fluid, recent precipitation, surface elevation of nearby bodies of water and time permitted for the stabilized level to occur shall be noted.

7. Natural dry density in pounds per cubic foot for all strata.

8. Unconfined compressive strength in tons per square foot for all cohesive strata.

9. Natural water content (percent), liquid limit (percent) and plastic limit (percent) for all cohesive soils.

10. Standard Penetration Test N Value in blows per foot (or inches/blow), for each sample obtained or unsuccessful attempt.

11. Samples shall be retained for review by NJ TRANSIT.

12. Failed boring attempts shall be logged and reported.

13. All borings and attempts shall be tremie grouted with non-shrink grout or other approved material. The quantity of grout material used shall be measured and reported.

e. Soil boring logs shall be accompanied with a plan drawn to scale showing the location of 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. Datum shall be NGVD 1929; Sandy Hook, NJ on the logs; elevations shown to the nearest 0.1 foot).

C. CONSTRUCTION

1. CONSTRUCTION INSPECTION REQUIREMENTS

a. The Applicant shall provide full time on-site inspection by a Resident Engineer during the installation of temporary and permanent facilities approved by NJ TRANSIT. This inspection shall be under the supervision of a Professional Engineer licensed in the State of New Jersey. The Professional Engineer shall certify that the facilities were installed in accordance with these specifications and the approved plans. The on-site Resident Engineer shall coordinate the activities of the contractor for the purpose of scheduling flag protection, NJ TRANSIT force account work, and any other requirements that may arise during the project. All work shall be performed in accordance with the attached document *"NJ TRANSIT GENERAL REQUIREMENTS FOR WORKING WITHIN THE RIGHT OF WAY"*.

2. INSTALLATION METHODS

a. Open Cut or Braced Trench (Considered only when other conventional pipe installation methods are determined by NJ TRANSIT as not feasible)

1. Installation by open cut or braced trench methods will not be permitted under mainline tracks or within the limits of at-grade crossings. If considered and approved by NJ TRANSIT, open cut methods shall comply with the current AREMA Manual for Railway Engineering, Chapter 1. At least two to three months may be required for NJ TRANSIT review and approval of open cut or braced trench methods.

2. Where NJ TRANSIT has approved the open cut method, pipe shall be installed on a Class B bed of compacted graded aggregate. Sand backfill shall be used to fill around the sides and on top of the pipe. A colored warning tape shall be placed a minimum of 12 inches above the top of the pipe. Additional backfill shall be well-graded, clean granular soil having less than 20 percent by dry weight passing No. 200 U.S. STD sieve. Maximum aggregate size shall be 1/2 inch. Backfill shall be placed in loose 8 inch layers and compacted to at least 95 percent of its maximum density at or within two (2) percent of the optimum moisture content as determined in accordance with current ASTM D1557 (AASHTO T180).

3. All associated NJ TRANSIT costs for labor, material and equipment shall be paid by the Applicant including, but is not limited to, engineering supervision and inspection, maintenance of way forces, work trains, track testing and resurfacing after completion.

4. Prior to the start of an open cut installation, the contractor shall have all materials on site, including emergency stand-by handling equipment.

b. Jacking

1. Jacking of casing pipe shall be in accordance with the current AREMA Manual for Railway Engineering, Chapter 1. This operation shall be continuous once started, and shall be conducted without hand-mining ahead of the pipe and without the use of any type of boring, augering, or drilling equipment. Ordinarily 36-inch diameter pipe is the minimum size that should be used. Bracing and backstops shall be designed and jacks of sufficient rating shall be used so that the jacking can be progressed without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit or is at least 25 feet from the centerline of the last track.

2. When jacking reinforced concrete pipe, grout holes, tapped for no smaller than 1-1/4 inch pipe, shall be cast into pipe at manufacture. Three grout holes equally spaced around the circumference and 4 feet longitudinally shall be provided for RCP 54 inches in diameter and smaller. Immediately upon completion of jacking operations, the installation shall be pressure grouted.

c. Horizontal Directional Drilling/Directional Boring

1. Installations by this method are generally not acceptable. However, consideration will be given where the depth of cover is substantial, or if the bore is in rock. Factors considered will be track usage, pipe size, contents of pipeline, soil condition, etc. Two methods of directional boring will be considered. The first method is for steel pipelines and consists of boring a small diameter pilot hole on the desired vertical and horizontal alignment using a mechanical cutting head with high pressure fluid (Bentonite Slurry) to remove the cuttings. The drill string is advanced while slurry is being pumped through the cutting head. When the cutting head reaches the far side of the crossing, it is removed and a reamer with a diameter not to exceed 25% of the diameter of the pipe is attached to the lead end of the drill string. The pipeline is attached to the reamer and the pilot hole is then back reamed while the pipeline is pulled into place. The second method is used to place small diameter conduit. This method consists of using hydraulic jacking equipment to push a solid rod under the railroad from a launching pit to a receiving pit. A cone shaped expander is attached to the end of the rod and the conduit is attached to the expander. The rod, expander and the conduit are then pulled back from the launching pit until the full length of the conduit is in place.

2. The following preliminary information must be submitted with the request for consideration of this type of installation:

   a). A site plan of the area.
   b). A plan view and profile of the crossing.
   c). A Pipe Data Sheet.
   d). Several soil borings along the proposed pipeline route.
   e). A construction procedure, including a general description of equipment to be used.

3. If NJ TRANSIT determines this method of installation is acceptable, final design plans and specifications are to be prepared and submitted for approval. The project specification must require the contractor to submit to NJ TRANSIT for approval a complete construction procedure of the proposed boring operation. Included with the submission shall be the manufacturer's catalog information describing the type of equipment to be used. Where boring machines are approved, it is with the understanding that the machine is capable of stabilizing the bore in the event of blockage.

d. Tunneling With Liner Plate

1. Tunneling operations shall be conducted as approved by NJ TRANSIT. Care shall be exercised in trimming the surface of the excavated section in order that the steel liner plates fit snugly against undisturbed material.

2. Excavation shall not be advanced ahead of the previously installed liner 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.

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

4. Unless otherwise approved by NJ TRANSIT the tunneling shall be conducted continuously on a 24-hour basis, until the tunnel liners extend at least equal to 25 feet beyond the centerline of the last track.

5. A uniform mixture of 1:6 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 1/2 inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liner shall be provided in every third ring. Grouting shall start at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the tunnel. A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.

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

e. Tunneling Shields

1. All pipes 60 inches and larger in outside diameter shall be placed with the use of a tunneling shield unless otherwise approved by NJ TRANSIT. Pipes of smaller diameter may also require a shield when, at the sole discretion of NJ TRANSIT, soil or other conditions indicate its need.

2. The shield shall be of steel construction designed to support railroad track loading as specified 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 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. It shall conform to and not exceed the outside dimensions of the pipe being placed by more than one inch at any point on the periphery unless otherwise approved by NJ TRANSIT.

3. The shield shall be adequately braced and provided with necessary appurtenances for completely bulkheading 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.

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

5. The detail shield plans and design calculations prepared by a Registered Professional Engineer licensed in the State of New Jersey shall be submitted to NJ TRANSIT for approval. No work shall proceed until such approval is obtained.

f. Boring

1. This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the soil. When augers or similar devices, are used for pipe emplacement, 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 excavation 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 the 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. The use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited. Plans and descriptions of the arrangement to be used shall be submitted to NJ TRANSIT for approval and no work shall proceed until such approval is obtained.

2. Any method which employs simultaneous boring and jacking or drilling and jacking for pipes over 8 inches in diameter which does not have the above approved arrangement will not be permitted. For pipes 4 inches and less in diameter, augering or boring without this arrangement may be considered for use only as approved by NJ TRANSIT.

3. CONSTRUCTION OPERATIONS

a. 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.

b. 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 NJ TRANSIT shall be employed to fill such voids.

c. Pressure grouting of the soils or freezing of the soils before jacking, boring, or tunneling may be required at the discretion of NJ TRANSIT to stabilize the soils, control ground 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.

d. The material to be used and the method of injection shall be prepared by a Registered Professional Engineer licensed in the State of New Jersey, or by an experienced and qualified company specializing in this work and submitted for approval to NJ TRANSIT before the start of work. Proof of experience and competency shall accompany the submission. Material Safety Data documentation shall be provided for all materials.

e. When the presence of surface, ground and/or artesian water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site by the contractor, and upon approval of NJ TRANSIT, the contractor shall operate them. Pumps in operation shall be constantly attended on a 24-hour basis, until, in the sole judgment of NJ TRANSIT, the operation can be safely halted. When dewatering, close observation by optical survey, or other instrumentation as required, to verify the adequacy of work, shall be maintained to detect any settlement or displacement of railroad embankment, tracks and facilities. A detailed plan of water control for work including instrumentation shall be submitted by the Applicant for approval by NJ TRANSIT.

f. All construction 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 NJ TRANSIT property shall be conducted in accordance with NJ TRANSIT safety rules and regulations. The contractor shall secure and comply with the NJ TRANSIT safety rules and shall give written acknowledgment to the NJ TRANSIT that they have been received, read, and understood by the contractor and his employees. Construction operations will be subject to NJ TRANSIT inspection at any and all times.

g. All cranes, lifts, or other equipment that will be operated in the vicinity of the Railroad's electrification and power transmission facilities shall be operated and electrically grounded as directed by NJ TRANSIT and shall comply with OSHA Safety and Health Standards, Page 175, Subpart N1926.950. OSHA 2207, Revised 1983, or as provided by the High Voltage Proximity Act (see attached GENERAL REQUIREMENTS FOR WORKING WITHIN THE RIGHT OF WAY).

h. 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, drilling, or similar machines are being used, the machine operator also shall have no less than 12 months experience in the operation of the equipment being used.

i. Blasting will not be permitted under or on NJ TRANSIT's Right-of-Way.

j. Whenever equipment or personnel are working, or could fall into an area closer than 18 feet to the centerline of an adjacent track, that shall be considered as obstructing that track. Insofar as possible, all operations shall be conducted no less than this distance. Operations closer than 18 feet to the centerline of a track shall be conducted only with the permission of and as directed by, a duly qualified NJ TRANSIT flagman employee present at the worksite. Special arrangements must be made at least two (2) weeks in advance of the work, where fouling of track or structures is required for access. These operations require the prior approval of NJ TRANSIT.

k. Crossing of tracks at grade by equipment and personnel is prohibited, except by prior arrangement with, and as directed by NJ TRANSIT.

l. Support of Excavation Adjacent to Track

1. Launching and Receiving Pits

a). The location and dimensions of all pits or excavations shall be shown on the plans. The distance from centerline of adjacent track to face of pit or excavation shall be clearly labeled. The elevation of the bottom of the pit or excavation must be shown on the profile.

b). The face of all pits shall be located an minimum of 25 feet from centerline of adjacent track, measured at right angles to track, unless otherwise approved by NJ TRANSIT.

c). If the bottom of the pit excavation intersects the theoretical railroad embankment line (see Section D), interlocking steel sheet piling, driven prior to excavation, must be used to protect the track stability. The use of trench boxes or similar devices is not acceptable in this area.

d). Design plans and computations for the pits, sealed by a Professional Engineer licensed in New Jersey, must be submitted by the Applicant at the time of application or by the contractor prior to the start of construction. If the pit design is to be submitted by the contractor, the project specification must require the contractor to obtain NJ TRANSIT's approval prior to beginning any work on or which may affect NJ TRANSIT's property.

e). The sheeting shall be designed to support all lateral forces caused by the earth, railroad and other surcharge loads.

f). After construction and backfilling, all sheet piling that is not removed within 10 feet of centerline of adjacent track must be cut off a minimum of 60 inches below final grade and left in place.

g). All excavated areas are to be illuminated (flashing warning lights not permitted), fenced and otherwise protected as directed by NJ TRANSIT.

4. SUPPORT OF TRACKS

a. When the jacking, drilling, tunneling or boring method of installation is used, and depending upon the size and location of the crossings, temporary track supporting structures shall be installed. These temporary structures may be deleted or removed only with the approval of NJ TRANSIT.

b. The type of temporary track supporting structures to be installed shall be approved by NJ TRANSIT. Costs of labor, materials and equipment for installation of the supports and their removal shall be paid by the Applicant.

c. Unless otherwise agreed, all work involving rail, ties and other track material will be performed by NJ TRANSIT. The Applicant shall reimburse NJ TRANSIT for all costs associated with the installation and removal of track supports.

d. When excavation for a pipeline or other structure will be within the theoretical railroad embankment line (see Section D) of an adjacent track, interlocking steel sheet piling will be required to protect the track.

5. PIPELINES ON BRIDGES

a. Only in special cases may pipelines be installed on bridges for which NJ TRANSIT has responsibility. In general, this applies to most bridges over NJ TRANSIT tracks or bridges carrying NJ TRANSIT tracks.

b. In such special cases, when it can be demonstrated to NJ TRANSIT's satisfaction that such an installation is necessary and that no practicable alternative is available, NJ TRANSIT may permit the installation and only by special design approved by NJ TRANSIT.

c. Pipelines on bridges shall be so located to minimize the possibility of damage from vehicles, railroad equipment, vandalism and other external causes. They shall be encased in a casing pipe as directed by NJ TRANSIT.

d. An Occupancy Permit is required in accordance with the General Requirements of Section A.

6. 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 kv that provide an air gap between carrier pipe and casing to meet or exceed ANSI, NESC or other governing Standards.

b. Carrier pipe supporting hangers, mountings or cradles shall provide an insulation value of not less than 25 kv that provide an air gap between carrier pipe and casing that will meet or exceed ANSI, NESC or other governing Standards.

c. Casing shall be bonded to NJ TRANSIT's return conductor at each end through bridge steel or direct when bridge members are of non-conductive material conforming to NJ TRANSIT Standards.

d. The casing and installation equipment shall be bonded and grounded to an earth ground of not more than 25 ohms resistance to ground for construction. Adequacy of the ground shall be monitored by the applicant.

7. DRAINAGE

a. Occupancies shall be designed and their construction shall be accomplished so that adequate and uninterrupted drainage of NJ TRANSIT 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 NJ TRANSIT. Upon completion of the work, the temporary facilities shall be removed and the permanent facilities restored.

b. Where disturbance of the ground may result in contamination of the ballast or this contamination occurs as result of a wash out, the Applicant shall be responsible for costs to restore the track and structure. Temporary soil erosion measures for protecting the track shall be submitted as part of the construction plan and approved by NJ TRANSIT. Under no circumstances should additional flow be routed onto NJ Transit Right of Way, either during construction or upon project completion.

8. INSPECTION AND TESTING REQUIREMENTS FOR HAZARDOUS MATERIALS

a. For pipelines carrying flammable or hazardous materials, ANSI Codes B31.8 and B31.4, current at time of constructing the pipeline shall govern the inspection and testing of the facility on NJ TRANSIT property except that proof-testing of strength of carrier pipe shall be in accordance with the requirements of ANSI Codes B 31.8 for location Classes 2, 3, or 4 ANSI Code B 31.4 as applicable for all pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas and other flammable substances.

D. PUBLICATION STANDARDS

AWS — American Welding Society, Inc.
550 NW 42nd Avenue
Miami, FL 33126-0567

ANSI — American National Standards Institute, Inc.
11 West 42nd Street
New York, NY 10036

ASTM — American Society for Testing and Material
100 Bar Harbor Drive
West Conshohocken, PA 19428-2959

AREMA — American Railway Engineering and Maintenance-of-Way Association
8201 Corporate Drive, Suite 1125
Landover, MD 20785

AWWA — American Water Works Association, Inc.
1401 New York Avenue N.W., Suite 640
Washington, DC 20005

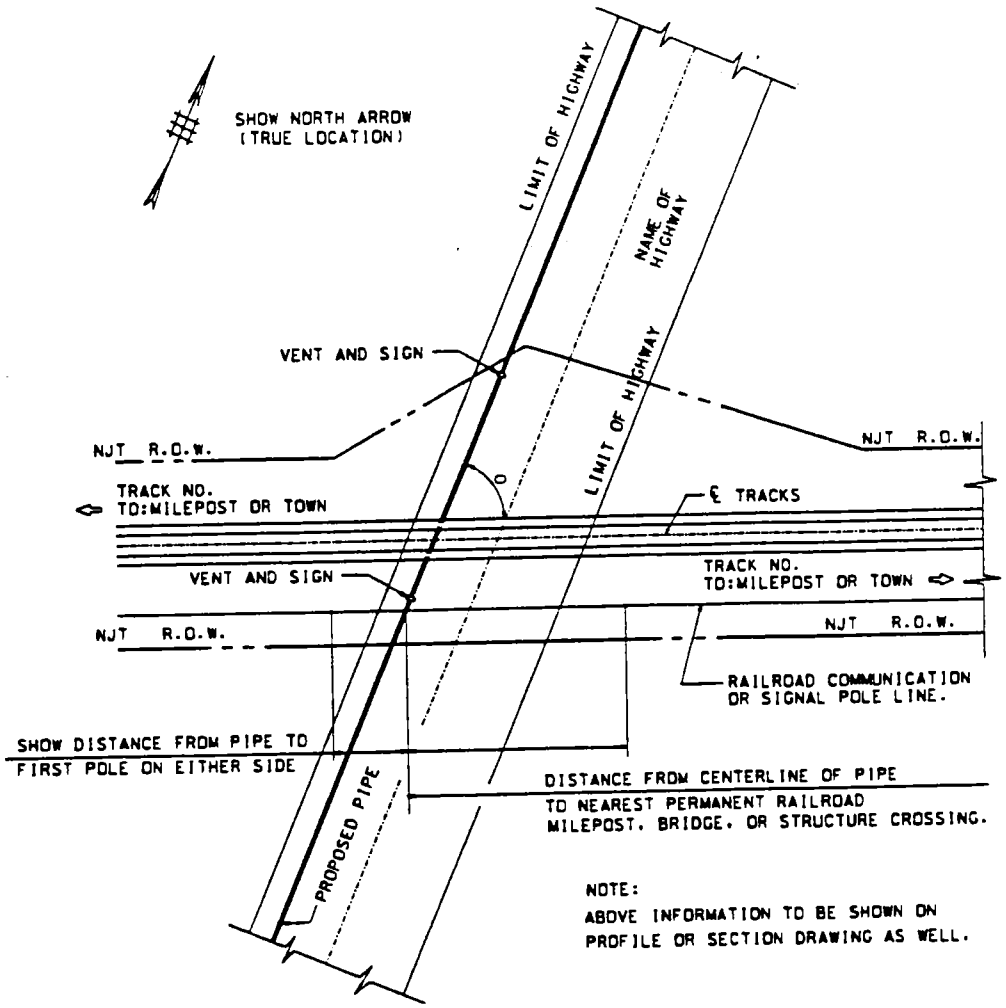
OSHA — Occupational, Safety and Health Administration
Superintendent of Documents
U.S. Printing Office
Washington, DC 20402

NACE — Nation Association of Corrosion Engineers
P.O. Box 201009
Houston, TX 77216-1009

Note: If other than American Railway Engineering and Maintenance-of-Way Association (AREMA), American Society for Testing and Materials (ASTM), and American National Standards (ANSI) specifications are referred to for design materials or workmanship on the plans and specifications for the work, then copies of the applicable sections of such other specifications shall accompany the plans and specifications for the work.

E. DRAWING STANDARDS

SHEET 1	TYPICAL PLAN VIEW INFORMATION
SHEET 2	TYPICAL INFORMATION TO BE SHOWN ON PROFILE SECTIONS
SHEET 3	TYPICAL INFORMATION TO BE SHOWN ON SECITION AND PROFILE DRAWINGS
SHEET 4	PIPELINE IN ROADWAY UNDER RAILROAD BRIDGE
SHEET 5	DETAILS FOR OVER RAILROAD BRIDGE
SHEET 6	PIPE CROSSING DATA SHEET

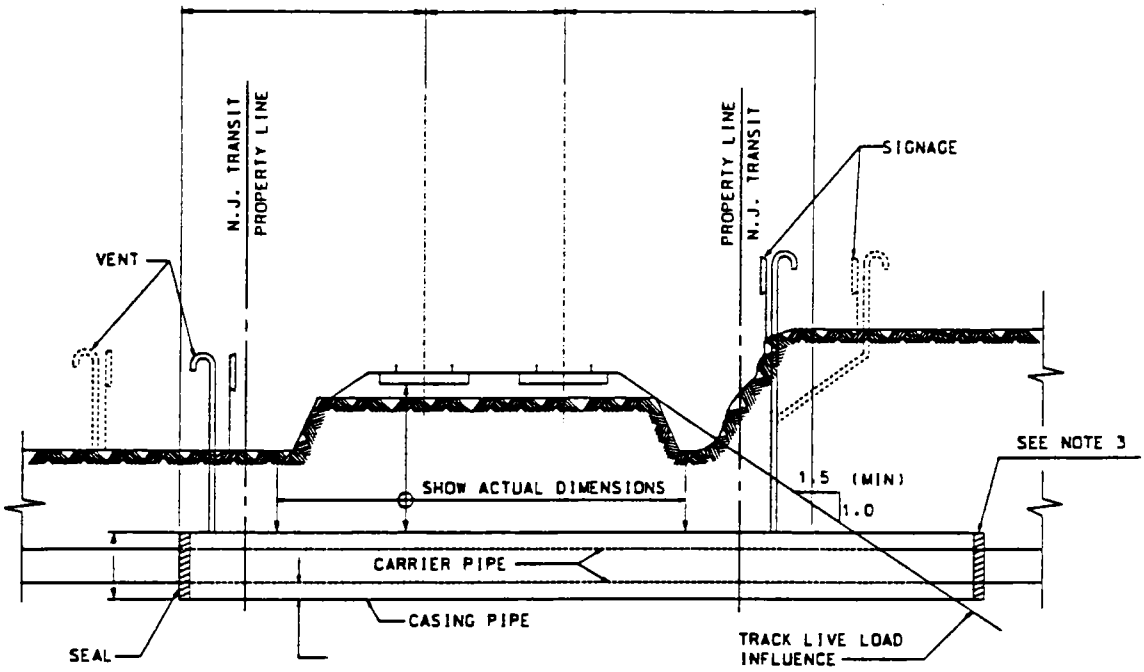


PLAN

SCALE:

NOTES:

1. IF MANHOLES ARE PLACED ON NJ TRANSIT PROPERTY, DETAILS OF SAME, WITH CLEARANCES TO NEAR RAILS ARE TO BE SHOWN ON THE DRAWINGS.
2. IF THE PROPOSED PIPE IS TO SERVE A NEW DEVELOPMENT, A MAP SHOWING THE AREA IN RELATION TO ESTABLISHED AREAS AND ROADS IS TO BE SUBMITTED WITH THE REQUEST.
3. IF THE PROPOSED PIPE IS NOT WHOLLY WITHIN HIGHWAY LIMITS, A REASONABLE CONTINUATION OF THE PIPE SHOULD BE SHOWN.
4. SCALE OF DRAWING TO BE SHOWN.
5. BURIED COMMUNICATION AND SIGNAL LINES MAY BE PRESENT. OTHER UTILITIES MAY ALSO BE ENCOUNTERED. PERMITTEE MUST VERIFY PRESENCE AND LOCATION OF ANY SUB SURFACE LINE PRIOR TO STARTING CONSTRUCTION.
6. PROVIDE DIMENSIONS WHERE INDICATED, INCLUDING ANGLE OF CROSSING.

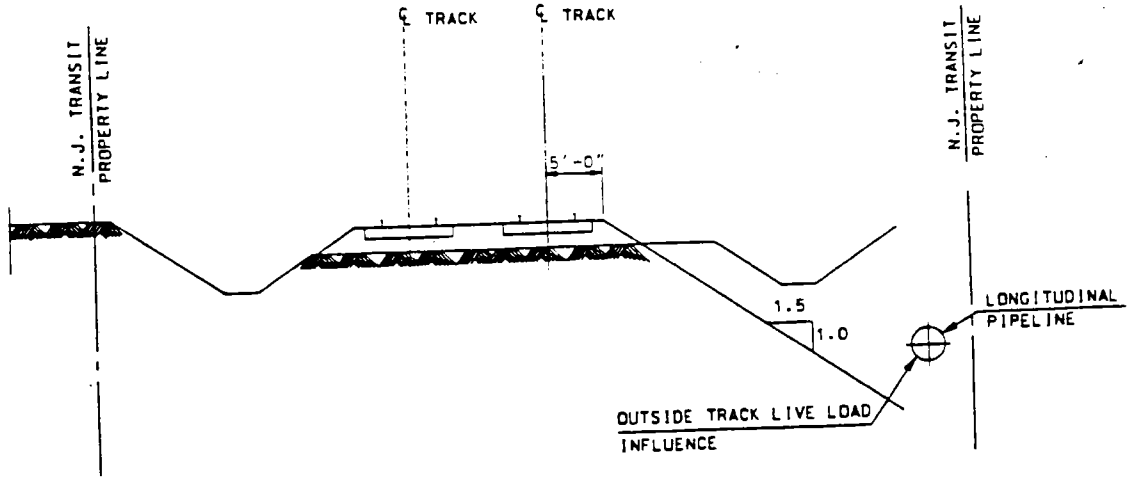


SECTION

SCALE:

NOTES:

1. ABOVE INFORMATION AND DIMENSIONS TO BE SHOWN ON PROFILE SECTION DRAWING.
2. VENTS IF REQUIRED.
3. END OF CASING PIPE MAY OR MAY NOT BE OUTSIDE THE N.J. TRANSIT PROPERTY LINE. BUT MUST BE OUTSIDE THE TRACK LIVE LOAD INFLUENCE.

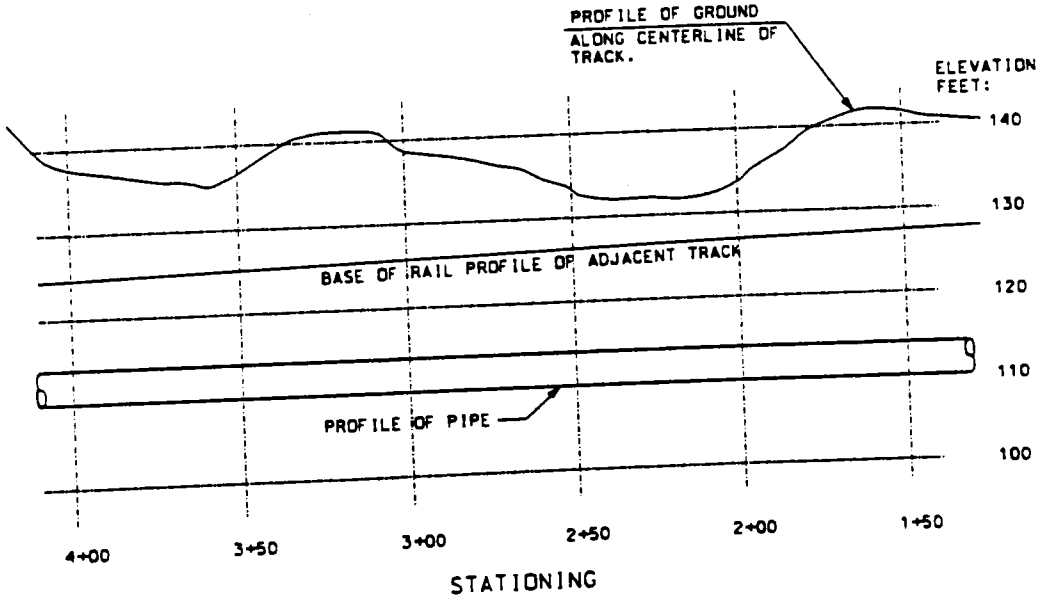


SECTION

SCALE:

NOTE:

ALL INFORMATION TO BE SHOWN TYPICALLY ON ALL CROSS SECTION AND PROFILE DRAWINGS.



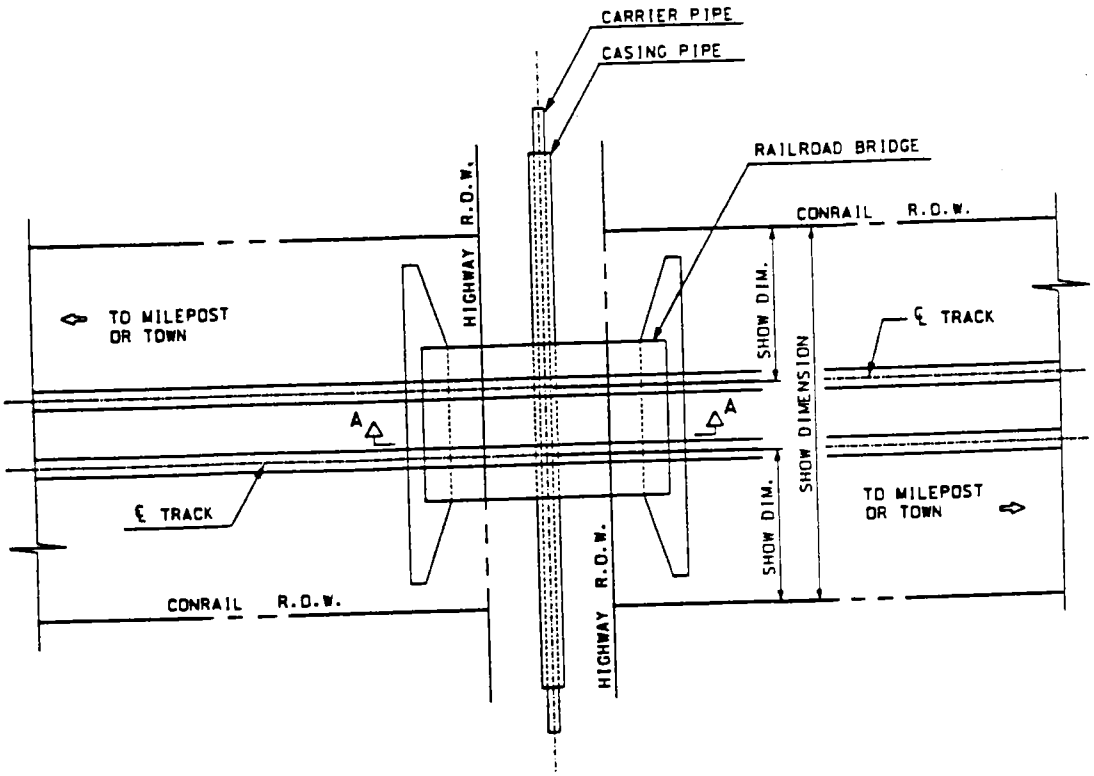
PROFILE

SCALE: VERT.
HORIZ.

NOTE:

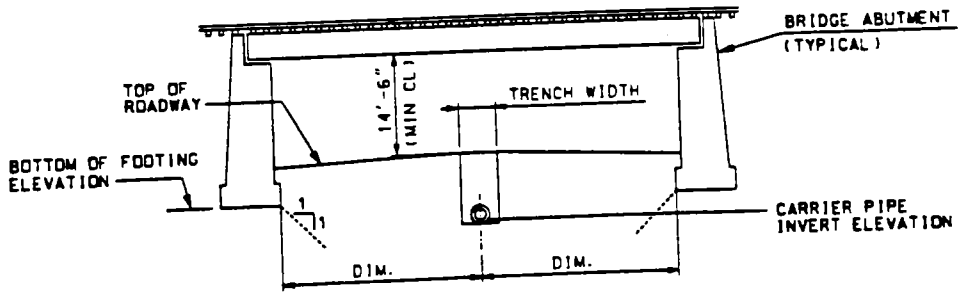
ELEVATIONS ARE BASED ON NGVD 1929. ie: ELEVATION 0.0 FT. EQUALS MEAN SEA LEVEL AT SANDY HOOK N.J.

NJ TRANSIT RAIL OPERATIONS ONE PENN PLAZA EAST NEWARK, NJ 07105-2246	INFRASTRUCTURE ENGINEERING OFFICE OF CHIEF ENGINEER STRUCTURES	SPECIFICATIONS FOR PIPELINE OCCUPANCY OF N.J.TRANSIT PROPERTY	EP2 SPECIFICATIONS TYPICAL INFORMATION TO BE SHOWN ON SECTION AND PROFILE DRAWINGS	SHEET 3 of 6



PLAN

SCALE:

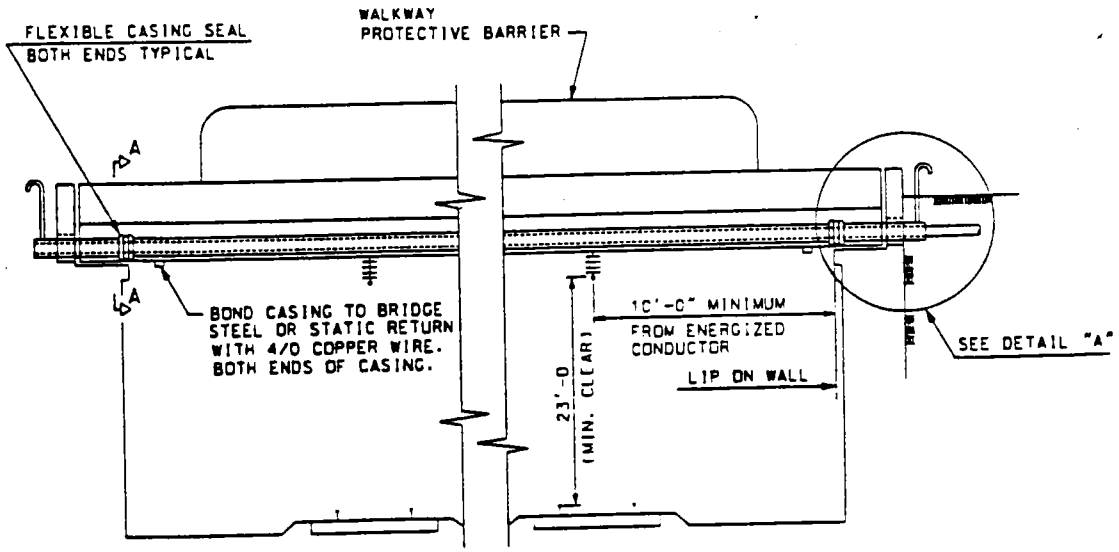


NOTE:

PIPE OR EXCAVATION MUST NOT BE WITHIN THE 1 TO 1 SLOPE LINE THAT EXTENDS FROM BOTTOM OF FOOTING.

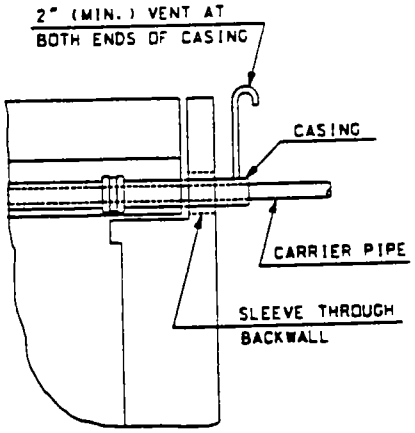
SECTION A-A

SCALE:



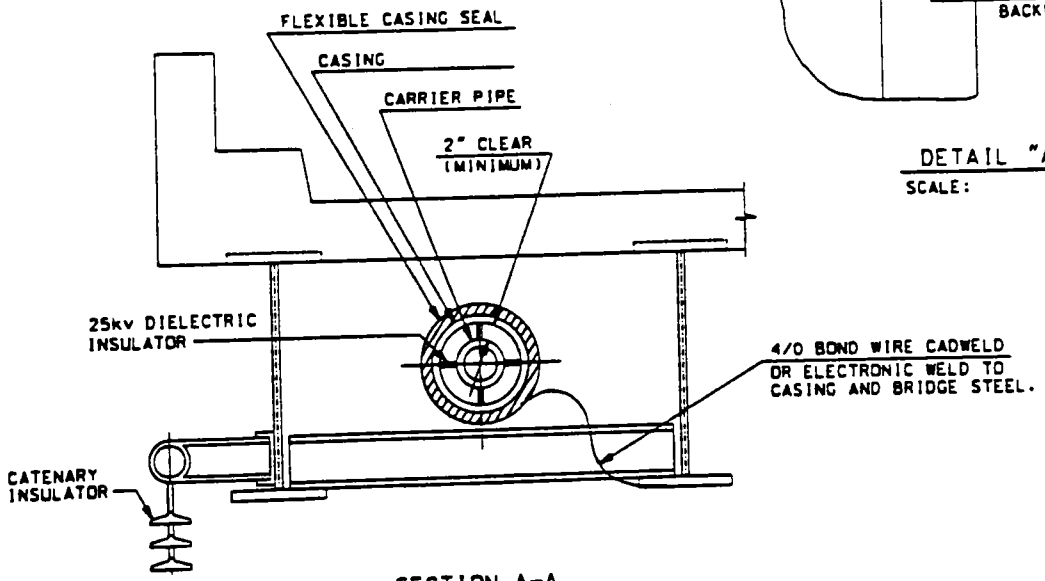
ELEVATION

SCALE:



DETAIL "A"

SCALE:



SECTION A-A

SCALE:

PIPE CROSSING DATA SHEET

In addition to plan and profile of crossing, drawings submitted for NJ TRANSIT approval shall contain the following information:

	Carrier Pipe	Casing Pipe
Contents to be handled		
Normal operating pressure		
Nominal size of pipe		
Outside Diameter		
Inside Diameter		
Wall Thickness		
Weight per Foot		
Material		
Process of Manufacture		
Specification		
Grade or Class		
Test Pressure		
Type of Joint		
Type of Coating		
Details of Cathodic Protection		
Details of Seal or Protection at Ends of Casing		
Method of Installation		

Character of Subsurface _____

Material at the Crossing Location _____ (Unified Soil Class)

Approximate Elevation of Ground Water Level _____ Feet (Datum=NGVD 1929)

Source of Information on Subsurface Conditions (Boring, Test Pits or Other)

_____

NOTE: Any soil investigation made on railroad property or adjacent to tracks shall be carried on under the supervision of NJ TRANSIT.

ENGINEERING DATA REQUIRED
FOR ERECTION, DEMOLITION OR OTHER
HOISTING OPERATIONS
OVER NJ TRANSIT RAIL OPERATIONS

Michael Gaspartich

Deputy General Manager

For Infrastructure Engineering

November 2012

ENGINEERING DATA REQUIRED FOR ERECTION, DEMOLITION OR OTHER HOISTING OPERATIONS OVER NJ TRANSIT RAIL OPERATIONS

1. A detailed plan must be submitted and approved by NJ TRANSIT, showing locations of cranes or hoisting devices (both horizontally and vertically), operating radii, and delivery or disposal locations. The location of all tracks and other railroad facilities should also be clearly shown on the submission (with distance and dimension information).

2. Crane rating sheets are to be provided showing cranes to be adequate for 150% of the lift. Crane and boom nomenclature is to be indicated.

3. Plans and computations are to be included with the submission showing weight of pick including safety factors, what work is being performed over NJ TRANSIT facilities. Also, general plans of the existing and proposed facilities, showing complete and sufficient details with supporting data for the demolition or erection of the structure.

4. A location plan showing all physical limitations, restrictions or obstructions such as wires, poles, adjacent structures, etc., showing that the proposed swings are possible.

5. A data sheet shall be prepared listing the type, size and arrangements of slings, shackles, or other connection equipment. Include copies of a catalog or information sheets of specialized equipment being used. All spreaders must be designed and certified to load carrying capacity.

6. A complete lifting procedure is to be included, indicating the order of lifts and any repositioning of the crane or cranes.

7. Temporary support of any components or intermediate stages is to be shown. All temporary supports are to be designed to current AREMA Specifications.

8. A time schedule of various stages must be provided as well as a schedule for the entire lifting procedure.

9. All bridge erection or demolition procedures submitted will be signed and sealed by a registered professional engineer licensed in the State of New Jersey.

10. At least six (6) copies of the plan should be sent to the appropriate project coordinator at NJ TRANSIT Rail Operations, One Penn Plaza East, Newark, New Jersey 07105-2246.

11. The contractor is to be advised that they can expect a minimum thirty (30) day review period for this and any other shop drawing submissions.

12. The contractor must be fully aware of safety around hoisting equipment. To reduce the risk of injury and dangers when working around hoisting equipment, contractors must:

A. Conduct a safety brief all workers of any craft who will be working in the location of the hoisting equipment. Only one employee who is qualified shall be designated to give proper hand signals.

B. Notify all persons in the work area of an impending lift and ensure they stay clear of hoisting equipment and load. Employees may resume work after the lift is completed.

C. Maintain situational awareness. The work environment changes constantly.

D. Ensure that Employee providing signals maintains eye contact with the operator. Proper "non-verbal communication" is important, especially in a noisy environment. Signal the operator only when the nature of the lift is understood and the area around the hoisting equipment and the load is clear.

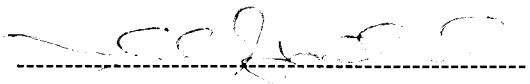
E. Operate hoisting equipment only when it is **absolutely sure** that no person is in a position where he/she is likely to be caught by any part of the load or equipment.

F. Not extend boom or carry the load over any person.

G. Ensure that all persons stay clear of the boom, the swing of the cab, load, bucket or magnet being handled by the hoisting equipment.

GUIDELINES FOR TEMPORARY SHORING

NJ TRANSIT RAIL OPERATIONS



Michael Gaspartich
Deputy General Manager
For Infrastructure Engineering

November 2012

INDEX

GUIDELINES FOR TEMPORARY SHORING

1. SCOPE

The scope of these guidelines is to inform public agencies, design engineers, contractors and inspectors of current Railroad standards and requirements concerning design and construction of temporary shoring.

1. The term **Railroad** refers to New Jersey TRANSIT Rail Operations (NJTRO). The term **Contractor** is defined as any party gaining access to work on Railroad right-of-way or other Railroad operating locations.

2. These guidelines are provided as a reference and may not be taken as authority to construct without prior review and written approval of the Railroad. These guidelines supersede all previous guidelines for temporary shoring and are subject to revision without notice.

3 These guidelines supplement the current, American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual of Recommended Practice. The 2002 AREMA Manual was utilized in developing this guideline. The AREMA Manual is available from:

   American Railway Engineering and Maintenance-of-Way Association
   8201 Corporate Drive, Suite 1125
   Landover, MD 20785-2230
   Phone: (301) 459-3200
   FAX: (301) 459-8077
   www.arema.org

4. The specific requirements for temporary shoring addressed in this document shall be followed for all locations where the Railroad operates, regardless of track ownership.

5. Any items not covered specifically herein shall be in accordance with the AREMA Manual and subject to the review and approval of the Railroad. Where conflicts exist, the most stringent specification will govern.

6. All excavations shall also be governed by Railroad requirements, Federal, State and Local laws, rules, and regulations concerning construction safety.

7. Safe rail operations shall be required for the duration of the project. All personnel, railroad tracks and property shall be protected at all times.

8. To expedite the review process of the temporary shoring plans, drawings submitted by the Contractors are required to adhere to the project specifications, AREMA and other Railroad requirements.

2. GENERAL CRITERIA

The Contractor must not begin construction of any component of the shoring system affecting the Railroad right-of-way until written Railroad approval has been received.

1. All excavations shall be in compliance with applicable OSHA regulations and shall be shored where there is any danger to tracks, structures or personnel regardless of depth.

2. The Contractor is responsible for planning and executing all procedures necessary to construct, maintain and remove the temporary shoring system in a safe and controlled manner.

3. Emergency Railroad phone numbers are to be obtained from the Railroad representative in charge of the project prior to the start of any work and shall be posted at the job site.

4. The Contractor must obtain a valid right of entry permit from the Railroad and comply with all Railroad requirements when working on Railroad property.

5. The Contractor is required to meet minimum safety standards as defined by the Railroad.

6. All temporary shoring systems that support or impact the Railroad's tracks or operations shall be designed and constructed to provide safe and adequate rigidity.

7. The Railroad requirements, construction submittal review times and review criteria should be discussed at the pre-construction meeting with the Contractor.

8. A flagman is required when any work is performed within the railroad right-of-way. If the Railroad provides flagging or other services, the Contractor shall not be relieved of any responsibilities or liabilities as set forth in any document authorizing the work. No work is allowed within 25 feet of track centerline when a train passes the work site and all personnel must clear the area within 18 feet of track centerline and secure all equipment when trains are present.

9. All Contractor personnel within the railroad right-of-way shall attend the Railroad's safety orientation class which will be provided by NJ TRANSIT. The Contractor's personnel may be required to travel to offices in Newark at 703 Ferry Street, or some other location convenient to the Railroad and remote from the site, for administration of this class. Each trained employee shall be issued a training qualification identification card. The employee must display the qualification card when working within the Railroad's right-of-way. Contractor shall comply with the Railroad's safety requirements throughout the entire construction period..

10. In addition to contacting NJ-one-call, the Contractor must contact the railroad to obtain a markout to show the approximate locations of their buried Signal, Electrical, Communication, Water and other buried lines. Once this markout is obtained the Contractor might be required to hand dig exploratory trenches, three

(3) feet deep and fifteen (15) inches wide in the form of an "H" with the outside dimensioned matching the sheeting dimensions, prior to placing and driving the sheeting, in areas where railroad underground utilities are known to exist. These trenches are for exploratory purposes only and are to be backfilled and compacted immediately. This work must be done in the presence of a railroad inspector or as directed by the NJ TRANSIT project manager.

11. Relocation of utilities or communication lines not owned by the Railroad shall be coordinated with the utility owners. The utility relocation plans must then be submitted to the Railroad for approval. The shoring plans must include the correct contact for the Railroad, State or Local utility locating service provider. The Railroad will not be responsible for cost associated with any utility, signal, or communication line relocation or adjustments.

3. CONTRACTOR RESPONSIBILITIES

The Contractor shall be solely responsible for the design, construction and performance of the temporary structure. **(AREMA 8.28.1.3)**

1. The Contractor's work shall in no way impede the train operations of the Railroad.

2. Absolute use of the track might be required while driving sheeting adjacent to a track. The track outages will be required if deemed necessary by NJ TRANSIT.

3. The Contractor shall comply with all State and Federal Laws, county or municipal ordinances and regulations which in any manner affect the work.

4. All removed soils will become the responsibility of the Contractor and shall be disposed of outside the Railroad right-of-way according to the applicable Federal, State and Local regulations.

5. The Contractor is responsible to protect the Railroad ballast and subballast from contamination.

6. The Contractor must monitor and record top of rail elevations and track alignment for the duration of the project. These measurements are to be taken in accordance with **Figure No. 1** entitled **Survey Monitoring Procedures**. The movement shall be within the limits defined in **Table 1, Deflection Criteria** in Section 7 entitled "COMPUTATION OF APPLIED FORCES". Displacements exceeding the limits defined in **Table 1** must be immediately reported to the Railroad. All work on the project must stop and the Railroad may take any action necessary to ensure safe passage of trains. The Contractor must immediately submit a corrective action plan to the Railroad for review and approval. The Railroad must review and approve the proposed repair procedure. The repair must be inspected by the Railroad before the track can be placed back in service.

7. Any damage to Railroad property such as track, signal equipment or structure could result in a train derailment. All damage must be reported immediately to the Railroad representative in charge of the project.

4. INFORMATION REQUIRED

Plans and calculations shall be submitted, signed and stamped by a Registered Professional Engineer familiar with Railroad loadings and who is licensed in the state where the shoring system is intended for use. Shoring design plans and calculations shall be in English units. Information shall be assembled concerning right-of-way boundary, clearances, proposed grades of tracks and roads, and all other factors that may influence the controlling dimensions of the proposed shoring system.

1. Field Survey.

Sufficient information shall be shown on the plans in the form of profiles, cross sections and topographical maps to determine general design and structural requirements. Field survey information of critical or key dimensions shall be referenced to the centerline of track(s) and top of rail elevations. Existing and proposed grades and alignment of tracks and roads shall be indicated together with a record of controlling elevation of water surfaces or ground water. Show the location of existing/proposed utilities and construction history of the area which might hamper proper installation of the piling, soldier beams, or ground anchors.

2. Geotechnical Report shall provide:

a. Elevation and location of soil boring in reference to the track(s) centerline and top of rail elevations.
b. Classification of all soils encountered.
c. Internal angle of soil friction.
d. Dry and wet unit weights of soil.
e. Active and passive soil coefficients, pressure diagram for multiple soil strata.
f. Bearing capacity and unconfined compression strength of soil.
g. Backfill and compaction recommendations.
h. Optimum moisture content of fill material.
i. Maximum density of fill material.
j. Minimum recommended factor of safety.
k. Water table elevation on both sides of the shoring system.
l. Dewatering wells and proposed flownets or zones of influence.
m. In seismic areas, evaluation of liquefaction potential of various soil strata.

3. Loads.
All design criteria, temporary and permanent loading must be clearly stated in the design calculations and on the contract and record plans. Temporary loads include, but are not limited to: construction equipment, construction materials and lower water levels adjoining the bulkhead causing unbalanced hydrostatic pressure. Permanent loads include, but are not limited to: future grading and paving, Railroads or highways, structures, material storage piles, snow and earthquake. The allowable live load after construction should be clearly shown in the plans and painted on the pavements behind the bulkheads or shown on signs at the site and also recorded on the record plans. Some of the loads are:

a. Live load pressure due to E80 loading for track parallel to shoring system.
b. Live load pressure due to E80 loading for track at right angle to shoring system.

c. Other live loads.
d. Active earth pressure due to soil.
e. Passive earth pressure due to soil.
f. Active earth pressure due to surcharge loads.
g. Active pressure due to sloped embankment.
h. Dead load.
i. Buoyancy.
j. Longitudinal force from live load.
k. Centrifugal forces.
l. Shrinkage.
m. Temperature.
n. Earthquake.
o. Stream flow pressure.
p. Ice pressure.

4. Drainage. **(AREMA 8.20.2.4)**

a. The drainage pattern of the site before and after construction should be analyzed and adequate drainage provisions should be incorporated into the plans and specifications. Consideration should be given to groundwater as well as surface drainage.
b. Drainage provisions for backfill should be compatible with the assumed water conditions in design.

5. Structural design calculations.

a. List all assumptions used to design the temporary shoring system.
b. Determine E80 live load lateral pressure using the Boussinesq strip load equation. See **Figure 2** which illustrates **"LIVE LOAD PRESSURE DUE TO COOPER E80**".
c. Computerized calculations and programs must clearly indicate the input and output data. List all equations used in determining the output.
d. Example calculations with values must be provided to support computerized output and match the calculated computer result.
e. Provide a simple free body diagram showing all controlling dimensions and applied loads on the temporary shoring system.
f. Calculated lateral deflections of the shoring and effects to the rail system must be included. See section 8, Part 6. Include the elastic deflection of the wall as well as the deflection due to the passive deflection of the resisting soil mass.
g. Documents and manufacturer's recommendations which support the design assumptions must be included with the calculations.

5. TYPES OF TEMPORARY SHORING

1. A shoring box is a prefabricated shoring system which is installed as the excavation progresses. This shoring system is not accepted by the Railroad. This system is allowed in special applications only, typically where Railroad live load surcharge is not present. The shoring box is moved down into the excavation by gravity or by applying vertical loading from excavation equipment.
2. Anchored systems with tiebacks are discouraged. The tiebacks will be an obstruction to future utility installations and may also damage existing utilities. Tiebacks must be removed per Railroad direction. Removal of tieback assemblies is problematic.
3. An anchored sheet pile wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded and the tensile resistance of the anchors.

    a. For purposes of these guidelines, ground anchors shall be cement-grouted tiebacks designed, furnished, installed, tested and stressed in accordance with the project specifications and AREMA requirements.

4. An anchored soldier beam with lagging wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the soldier beam is embedded and from the tensile resistance of the ground anchors.

    a. Anchored soldier beam with lagging walls are generally designed as flexible structures which have sufficient lateral movement to mobilize active earth pressures and a portion of the passive pressure.
    b. For purposes of these specifications, soldier beams include steel H-piles, wide flange sections or other fabricated sections that are driven or set in drilled holes. Lagging refers to the members spanning between soldier beams. The use of wood lagging or contact sheeting is prohibited. The use of soldier piles and lagging will be subject to approval of the Chief Engineer – Structures on a case by case basis.

5. A cantilever sheet pile wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the sheet pile is embedded. If cantilever sheet pile is used for shoring adjacent to an operating track, the shoring system shall be at least 12'-0" away from the centerline of track. Cantilever sheet pile walls shall be used only in granular soils or stiff clays.
6. A cantilever soldier beam with lagging wall is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the soldier beam is embedded.
7. A braced excavation is a structure designed to provide lateral support for a soil mass and derives stability from passive resistance of the soil in which the vertical members are embedded and from the structural capacity of the bracing members.

    a. For purposes of these guidelines, the vertical members of the braced excavation system include steel sheet piling or soldier beams comprised of steel H-piles, wide flange sections, or other fabricated sections that are driven or installed in drilled holes. Wales are horizontal structural members

designed to transfer lateral loads from the vertical members to the struts. Struts are structural compression members that support the lateral loads from the wales.

8. A cofferdam is an enclosed temporary structure used to keep water and soil out of an excavation for a permanent structure such as a bridge pier or abutment or similar structure. Cofferdams may be constructed of timber, steel, concrete or a combination of these. These guidelines consider cofferdams primarily constructed with steel sheet piles.

6. GENERAL SHORING REQUIREMENTS

For general shoring requirements and specific applications of the following items refer to **Figure 3** on the next page which **"GENERAL SHORING REQUIREMENTS**".

1. No excavation shall be permitted closer than 8-6"" measured at a right angle from the centerline of track to the trackside of shoring system. If existing conditions preclude the installation of shoring at the required minimum distance, the shifting of tracks or temporary removal of tracks shall be investigated prior to any approval. All costs associated with track shifting or traffic interruption shall be at Contractor's expense.

2. Evaluate slope and stability conditions to ensure the Railroad embankment will not be adversely affected. Local and global stability conditions must also be evaluated.

3. All shoring within the limits of Zone A or Zone B must be placed prior to the start of excavation

4. Lateral clearances must provide sufficient space for construction of the required ditches parallel to the standard roadbed section. The size of ditches will vary depending upon the flow and terrain and should be designed accordingly.

5. The shoring system must be designed to support the theoretical embankment shown for zones A and B.

6. Any excavation, holes or trenches on the Railroad property shall be covered, guarded and/or protected. Handrails, fence, or other barrier methods must meet OSHA and FRA requirements. Temporary lighting may also be required by the Railroad to identify tripping hazards to train crewmen and other Railroad personnel.

7. The most stringent project specifications of OSHA, FRA, AREMA, NJTRO or other governmental agencies shall be used.

8. Secondhand material is not acceptable unless the Engineer of Record submits a full inspection report which verifies the material properties and condition of the secondhand material. The report must be signed and sealed by the Engineer of Record.

9. Sheet piling shall be cut off at the top of the tie during construction and, after construction and backfilling have been completed piling with ten (10) feet from centerline of track or when the bottom of excavation is below a line extending at 1:1 slope from end of the to a point of intersection with sheeting shall be cut off eighteen (18) inches below existing ground line and left in place. All voids must be filled and drainage facilities restored. See compaction requirements section 9, Part 4

10 Slurry type materials are not acceptable as fill for soldier piles in drilled holes. Concrete and flowable backfill may prevent removal of the shoring system. Use compacted peagravel material.

7. COMPUTATION OF APPLIED FORCES

1. Railroad live load and lateral forces.

   a. For specific applications of the Coopers E80 live load refer to **Figure 2** on the next page which **"LIVE LOAD PRESSURE DUE TO COOPER E80"**.

2. Dead load.

   a. Spoil pile: must be included assuming a minimum height of two feet of soil adjacent to the excavation.
   b. Track: use 200 lbs/linear ft for rails, inside guardrails and fasteners.
   c. Roadbed: ballast, including track ties, use 120 lb per cubic foot.

3. Active earth pressure.

   a. The active earth pressure due to the soil may be computed by the Coulomb Theory or other approved method.
   b. The active earth pressure at depth "z_a" is:

   $P_A = K_A \gamma z_a$, where $K_A = \tan^2(45 - \varphi/2)$

   z_a = depth of soil influencing the active pressure.

4. Active earth pressure due to unbalanced water pressure.

   a. When bulkheads are used for waterfront construction, the bulkhead is subjected to a maximum earth pressure at the low water stage. During a rainstorm or a rapidly receding high water, the water level behind the bulkhead may be several feet higher than in front of the bulkhead.
   b. Drained conditions in backfill apply when clean sand or clean sand and gravel are used and adequate permanent drainage outlets are provided. Where drained conditions exist, the design water level may be assumed at the drainage outlet elevation.

5. Active earth pressure due to surcharge load.

   The active earth pressure due to surcharge load q':

   $P_U = K_A q'$, where $K_A = \tan^2(45 - \varphi/2)$

6. Passive earth pressure.

   The passive earth pressure, P_p, in front of the bulkhead may also be computed by the Coulomb Theory.

   $P_p = K_p \gamma z_p$, where $K_P = \tan^2(45 + \varphi/2)$

   z_p = vertical distance beginning one foot below dredge line but not to exceed embedment depth

7. Pressure due to embankment surcharges.
   Conventional analysis (Rankine, Coulomb, or Log-Spiral) should be used to determine the additional surcharge from embankment slopes.
8. Additional analysis for centrifugal force calculations as described in **AREMA Chapter 15, Part 1,Section 1.3, Article 1.3.6** Centrifugal Loads are required where track curvature exceeds three degrees.
9. Include and compute all other loads that are impacting the shoring system such as a typical Railroad service vehicle (HS-20 truck).

8. STRUCTURAL INTEGRITY

Structures and structural members shall be designed to have design strengths at all sections at least equal to the required strengths calculated for the loads and forces in such combinations as stipulated in **AREMA Chapter 8 Part 2 Article 2.2.4b**, which represents various combinations of loads and forces to which a structure may be subjected. Each part of the structure shall be proportioned for the group loads that are applicable, and the maximum design required shall be used.

1. Embedment depth.

   a. Calculated depth of embedment is the embedment depth required to maintain static equilibrium.
   b. Minimum depth of embedment is the total depth of embedment required to provide static equilibrium plus additional embedment due to the minimum factor of safety.
      1. Embedment depth factor of safety for well-defined loading conditions and thoroughly determined soil parameters is generally 1.3 for most temporary shoring systems. (See **AREMA 8.20.4.1.c**)
      2. All anchored shoring systems require a minimum embedment depth of 1.5 times the calculated depth of embedment. Shallow penetration into strong soil layers is not acceptable. (See **AREMA 8.20.5.1**)

2. The allowable stresses based on AREMA requirements are as follows:

   Structural Steel: 0.55Fy for Compression in extreme fiber. **(AREMA Ch.15 Table 1-11)**

Structural Steel: 0.35Fy for Shear. **(AREMA Ch.15 Table 1-11)**

Sheet Pile Sections: 2/3 of yield strength for steel. **(AREMA 8.20.5.7)**

Concrete: 1/3 of Compressive strength. **(AREMA 8.20.5.7)**

Anchor Rods: 1/2 of yield strength for steel. **(AREMA 8.20.5.7)**

3. AISC allowances for increasing allowable stress due to temporary loading conditions are not acceptable.
4. Gravity type temporary shoring systems must also be analyzed for overturning, sliding and global stability.
5. The contractor is responsible for providing an approved test method to verify the capacity of anchored or tieback systems. The manufacturers recommendations for testing must be satisfied. Systems which support the Railroad embankment will be considered high risk in determining the percentage of elements to be proof tested.
6. Calculated deflections of temporary shoring system and top of rail elevation shall not exceed the criteria outlined in **Table 1 Deflection Criteria**.

Table 1 Deflection Criteria

Horizontal distance from shoring to track C/L measured at a right angle from track	Maximum horizontal movement of shoring system	Maximum acceptable horizontal or vertical movement of rail
8'6"' < S < 12' 6"	3/8"	1/4"
12' 6"' < S < 18" 6"	1/2"	1/4"

9. SOIL CHARACTERISTICS

1. Subsurface Exploration. **(AREMA 8.5.2.2)**

a. Sufficient borings shall be made along the length of the structure to determine, with a reasonable degree of certainty, the subsurface conditions. Irregularities found during the initial soil boring program may dictate that additional borings be taken.
b. The subsurface investigation shall be made in accordance with the provisions of **AREMA Chapter 8 Part 22, Geotechnical Subsurface Investigation**.

2. Type of backfill.

a. Backfill is defined as material behind the wall, whether undisturbed ground or fill, that contributes to the pressure against the wall.
b. The backfill shall be investigated and classified with reference to the soil types described in **AREMA Table 8-5-1**.
c. Types 4 and 5 backfill shall be used only with the permission of the Engineer. In all cases the wall design shall be based on the type of backfill used.

Table 8-5-1 (AREMA) Types of Backfill for Retaining Walls

Backfill Type	Backfill Description
1	Coarse-grained soil without admixture of fine soil particles, very free-draining (clean sand, gravel or broken stone).
2	Coarse-grained soil of low permeability due to admixture of particles of silt size.
3	Fine silty sand; granular materials with conspicuous clay content; or residual soil with stones.
4	Soft or very soft clay, organic silt; or soft silty clay.
5	Medium or stiff clay that may be placed in such a way that a negligible amount of water will enter the spaces between the chunks during floods or heavy rains.

3. Computation of backfill pressure. **(AREMA 8.5.3.2a)**

a. Values of the unit weight, cohesion, and angle of internal friction of the backfill material shall be determined directly by means of soil tests or, if the expense of such tests is not justifiable, by means of **AREMA Table 8-5-2** referring to the soil types defined in **AREMA Table 8-5-1**. Unless the minimum cohesive strength of the backfill material can be evaluated reliably, the cohesion shall be neglected and only the internal friction considered. See Appendix page A-6 for AREMA generic soil properties.

Table 8-5-2 (AREMA) Properties of Backfill Materials

Type of Backfill	Unit Weight Lb. Per Cu. Ft.	Cohesion "c"	Angle of Internal Friction
1	105	0	33°-42°(38°for broken stone)
2	110	0	30°
3	125	0	28°
4	100	0	0°
5	120	240	0°

4. Compaction.

a. The backfill shall preferably be placed in loose layers not to exceed 8 inches in thickness. Each layer shall be compacted before placing the next, but over compaction shall be avoided.
b. It is required that backfill be compacted to no less than 95% of maximum dry density at a moisture content within 2% of optimum and tested using Modified Proctor ASTM D1557.
c. Fill within 100 feet of bridge ends or 20 feet outside culverts shall be placed and compacted to not less than 100% of maximum.
d. No dumping of backfill material shall be permitted in such a way that the successive layers slope downward toward the wall. The layers shall be horizontal or shall slope downward away from the wall.

10. PLANS

The shoring plans must completely identify the site constraints and the shoring system. Use the design templates provided in the appendix as an example to show the required information, specifications and drawings. The specific requirements of

the plan submittals are as follows:

1. General plan view should show:
    a. Railroad right-of-way and North arrow.
    b. Position of all Railroad tracks and identify each track as mainline, siding, spur, etc.
    c. Spacing between all existing tracks.
    d. Location of all access roadways, drainage ditches and direction of flow.
    e. Footprint of proposed structure, proposed shoring system and any existing structures if applicable.
    f. Proposed horizontal construction clearances. The minimum allowable is eight (8) feet six (6) inches measured at a right angle from centerline of track.
    g. Location of existing and proposed utilities.
    h. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
    i. Railroad and other "CALL BEFORE YOU DIG" numbers.
    j. Detailed view of shoring along with controlling elevations and dimensions.

2. Typical section and elevation should show:
    a. Top of rail elevations for all tracks.
    b. Offset from the face of shoring system to the centerline of all tracks at all changes in horizontal alignment.
    c. All structural components, controlling elevations and dimensions of shoring system.
    d. All drainage ditches and controlling dimensions.
    e. All slopes, existing structures and other facilities which may surcharge the shoring system.
    f. Location of all existing and proposed utilities.
    g. Total depth of shoring system.

3. General criteria
    a. Design loads to be based on the AREMA manual and Cooper E80 loading.
    b. Pressure due to embankment surcharges.
    c. ASTM designation and yield strength for each material.
    d. Maximum allowable bending stress for structural steel is 0.55Fy.
    e. Temporary overstress allowances are not acceptable.
    f. All timber members shall be Douglas Fir grade 2 or better.
    g. Insitu soil classification.
    h. Backfill soil classification.
    i. Internal angle of friction and unit weight of the soil.
    j. Active and passive soil coefficients.
    k. Fill within 100 feet of bridge ends or 20 feet outside culverts shall be placed and compacted to a minimum of 100% of maximum dry density tested per Modified Proctor ASTM D1557.
    l. Slopes without shoring shall not be steeper than 2 horizontal to 1 vertical
    m. Dredge line elevation.
    n. Shoring deflection to be calculated and meet Railroad requirements.

4. Miscellaneous:

a. Project name, location, Railroad line, milepost in the title block.
b. Procedure outlining the installation and removal of the temporary shoring system.
c. General notes specifying material requirements, design data, details, dimensions, cross-sections, sequence of construction etc.
d. A description of the tieback installation including drilling, grouting, stressing information and testing procedures, anchor capacity, type of tendon, anchorage hardware, minimum unbonded lengths, minimum anchor lengths, angle of installation, tieback locations and spacing.
e. All details for construction of drainage facilities associated with the shoring system shall be clearly indicated.
f. Details and descriptions of all shoring system members and connection details.
g. Settlement and displacement calculations.
h. Handrail and protective fence details along the excavation.
i. Drawings must be signed and stamped by a Licensed Professional Engineer, registered in the state where the work will be performed.
j. Call before you dig number.
k. Construction clearance diagram.

11. SUBMITTALS

The Contractor will be responsible for any and all cost associated with the review of plans by the Railroad. Review of design submittals by the Railroad will require a minimum of four (4) weeks. To avoid impacting the construction schedule, the Contractor must schedule submittals well in advance. Partial, incomplete or inadequate designs will be rejected, thus delaying the approval. Revised submittals will follow the same procedure as the initial submittal until all issues are resolved. Submit a minimum of three sets of shoring plans and two sets of calculations with manufacturers' specifications. Drawings and calculations must be signed and stamped by a Registered Professional Engineer familiar with Railway loadings and who is licensed in the state where the shoring system is intended for use. Drawings accompanying the shoring plans shall be submitted on 11" x 17" or 8½" x 11" sized paper.

.1. Contractor review.
The Contractor must review the temporary shoring plans to ensure that the proposed method of construction is compatible with the existing site and soil conditions. The Contractor's work plan must be developed to allow train traffic to remain in service. Removal of the shoring system must also be addressed.

.2. Applicant and or Engineer of Record review.
.The applicant and or Engineer of Record must review and approve the submittal for compliance with the project specifications, AREMA Manual, these guidelines and structural capacity before forwarding the submittal to the Railroad.

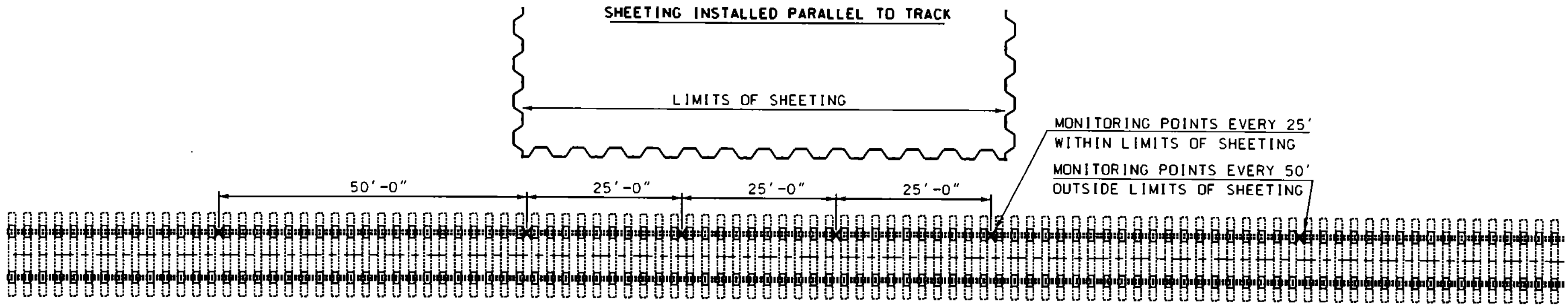
3. Review process.
All design submittals shall be forwarded to the Railroad Representative who will send them to the Structures Design Department. The Structures Design Department shall review. During the review process the Railroad Representative is the point of contact to resolve outstanding issues.

12. BIBLIOGRAPHY

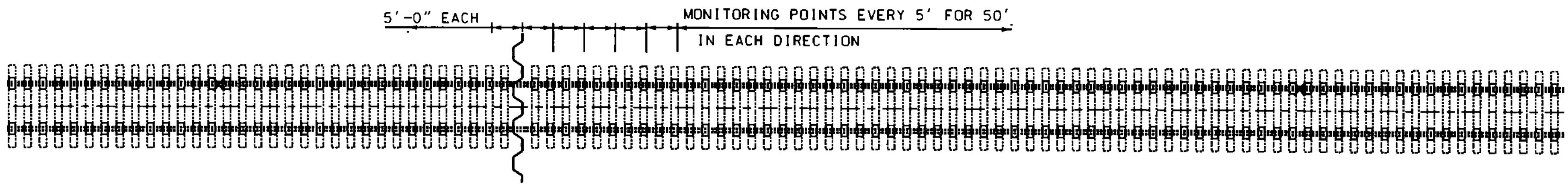
The following list of references used in these guidelines:

1. *Manual for Railway Engineering*, 2002 American Railway Engineering and Maintenance-of-Way Association.

SHEETING INSTALLED PARALLEL TO TRACK



SHEETING INSTALLED PERPENDICULAR TO TRACK



SURVEY MONITORING PROCEEDURES

ACTIVITY FREQUENCY	LOCATION OF SETTLEMENT POINTS	FREQUENCY
INSTALLATION OF THE CASTING, GROUTING OPERATION, AND DURING DEWATERING OPERATION.	ALL POINTS AS NOTED ABOVE AND AS REQUIRED BY NJTRANSIT ON THE CONTRACTOR'S APPROVED DEWATERING PLANS.	IMMEDIATELY PRIOR TO START AND CONTINUOUSLY DURING JACKING, AND ALL GROUTING OPERATIONS. DAILY DURING ALL DEWATERING ACTIVITIES FOR THE FIRST 7 DAYS AND THEN TWICE WEEKLY.
AT COMPLETION OF JACKING AS NECESSARY.	ALL POINTS AS NOTED ABOVE.	AFTER 1 TRAIN, AFTER 5 TRAINS, AFTER 1 DAY, AFTER 1 WEEK, AFTER 1 MONTH OR AS DIRECTED BY THE MANAGER, RIGHT-OF-WAY ENGINEERING, OR HIS DESIGNEE.

SHOULD THE TOTAL CHANGES IN THE RAIL ELEVATIONS FOR ANY PAIR OF ADJACENT POINTS EXCEED THE ESTABLISHED BASE ELEVATIONS BY 0.02 FT, THE SURVEYOR SHALL IMMEDIATELY NOTIFY THE DIRECTOR, RIGHT-OF-WAY ENGINEERING, OR HIS DESIGNEE. ALL READINGS SHALL BE TRASMITTED DIRECTLY TO THE NJTRANSIT RESIDENT ENGINEER WITHIN 24 HOURS OF TAKING THE MEASURMENTS. READINGS AND ELEVATIONS SHALL BE CERTIFIED BY A LICENSED LAND SURVEYOR. COPIES OF THE FIELD DATA SHALL BE MAINTAINED ON-SITE BY THE CONTRACTOR. REVIEW OF THE SURVEY DATA BY NJTRANSIT WILL MADE AT THE END OF THE WEEK FOLLOWING THE SHORING INSTALLATION TO DETERMINE THE NEED FOR ADDITIONAL ELEVATION MEASUREMENTS.

No.	Date	Eng.	Revision Notes	
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.	.	.	.	Chkd.Dwn. .
.	.	.	.	Scale .

Engineer in Charge
JAMES M. GALVIN P.E.
NJ LIC. 24GE03240300

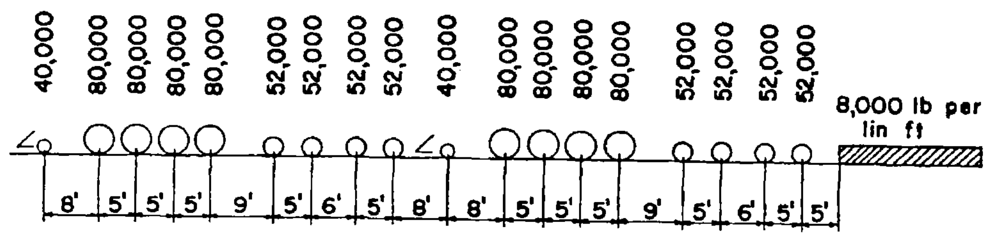
Date: ______

NJ TRANSIT
RAIL OPERATIONS
ONE PENN PLAZA EAST
NEWARK, NJ 07105-2246

INFRASTRUCTURE ENGINEERING
OFFICE OF CHIEF ENGINEER
STRUCTURES

FIGURE 1

Contract No. .
Drawing .
Sheet . of .



COOPER E80 LOAD
SCALE: (NOT TO SCALE)

Vertical pressure q shall be based on a distribution width Ld
Ld is the length of the tie plus Hl
Hl is the height from the bottom of the topof the shoring.
H2 is a depth of the point being evaluated with the Boussinesq Equation.
S is a distance perpendicular from centerline of track to the face of shoring.
D is from top of shoring to one foot below dredge line.
Zp is the minimum embedment depth.
Length of the tie is 9 feet
q is the intensity of strip load due to E80 railroad live load
and shall be calculated as follows:

For Hl=0 Ld= Length of tie, therefore, $q = \frac{80{,}000 \text{ lb}}{(5 \text{ feet})(8.5 \text{ feet})} = 1{,}882 \text{ psf}$

For Hl>0 Ld= Length of tie + Hl, therefore, $q = \frac{80{,}000 \text{ lb}}{(5 \text{ feet})\ (Ld)}$

CASE 1: Lateral live load pressure Ps, due to E80 loading for track parallel to shoring system is calculated using the Boussinesq Load Equation.

$$Ps = \frac{2q}{\pi}\{\beta + \sin\beta\ \sin^2(\alpha) - \cos^2(\alpha)\}$$

The above equation can be simplified into the following equivalent form:

$$Ps = \frac{2q}{\pi}\{\beta - \sin\beta\ \cos(2\alpha)\}$$

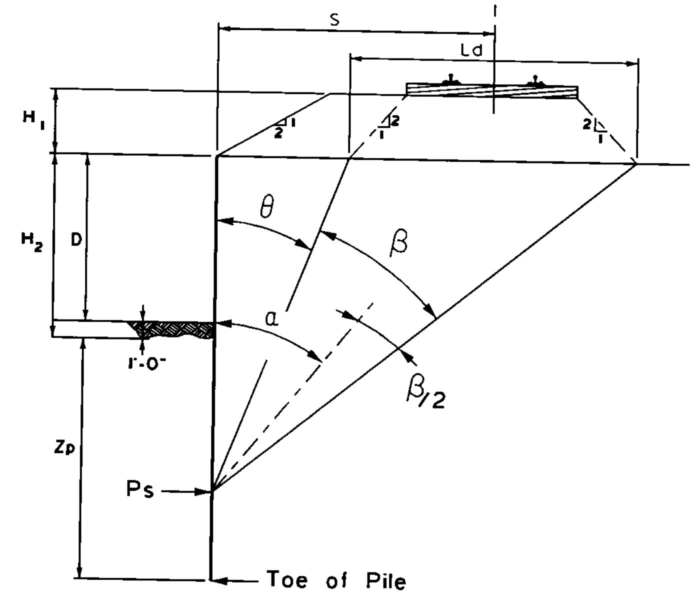
α and β are angles measured in radians, $\alpha = \theta + \frac{\beta}{2}$

CASE 2: Live load presure due to E80 loading for track at a right angle to the shoring system can calculated using the following equation.

$Ps = KA\ q$

where $KA = \tan^2(45 - \frac{\theta}{2})$

θ is the angle of the internal friction in degrees



PLAN
SCALE: (NOT TO SCALE)

HORIZONTAL DISTANCE FROM SHORING TO TRACK ℄ MEASURED AT RIGHT ANGLE FROM TRACK.	MAXIMIUM HORIZONTAL MOVEMENT OF SHORING SYSTEM.	MAXIMIUM ACCEPTABLE HORIZONTAL OR VERTICAL MOVEMENT OF RAIL.
12' < S < 18'	3/8"	1/4"
18' < S < 24'	1/2"	1/4"

No.	Date	Eng.	Revision Notes

Engineer in Charge
JAMES M. GALVIN P.E.
NJ LIC. 24GE03240300
Date: ______

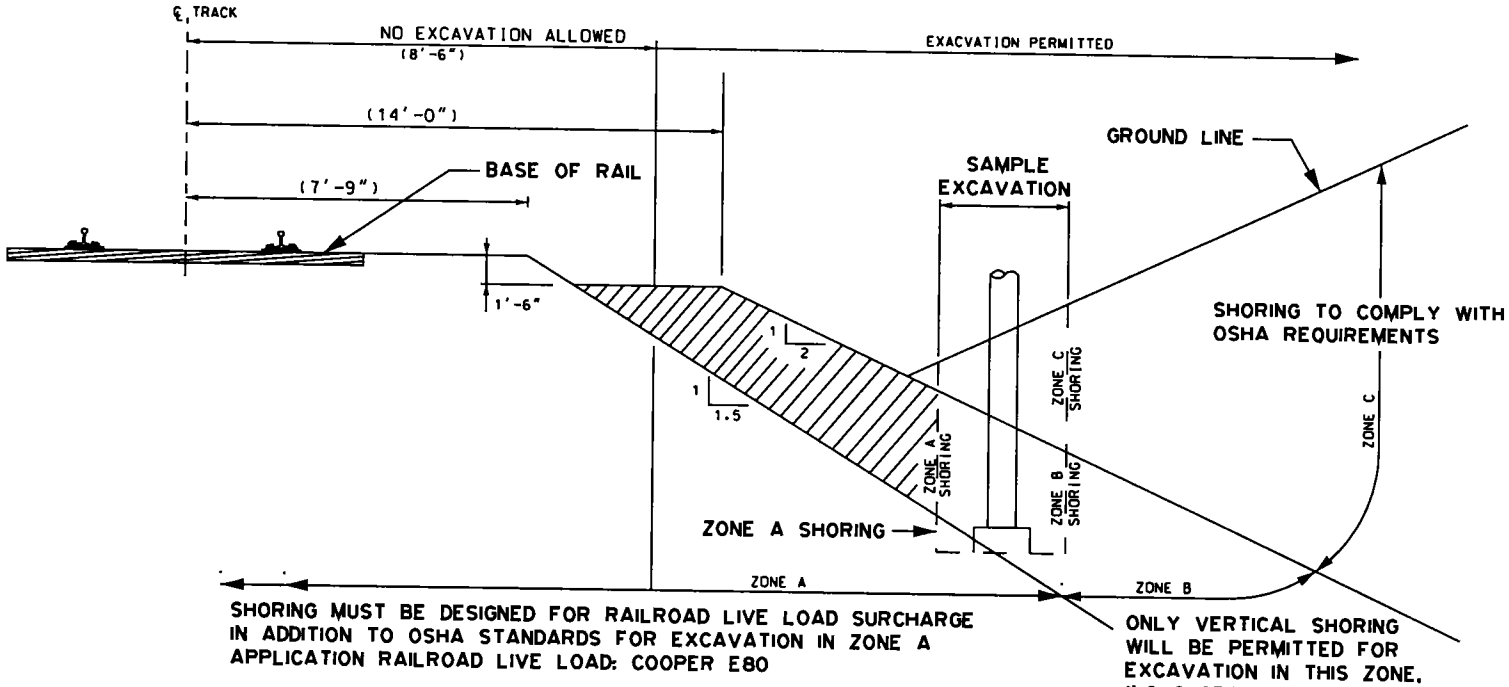
NJ TRANSIT
RAIL OPERATIONS
ONE PENN PLAZA EAST
NEWARK, NJ 07105-2246

INFRASTRUCTURE ENGINEERING
OFFICE OF CHIEF ENGINEER
STRUCTURES

LIVE LOAD PRESSURE DUE TO E80 LOADING

FIGURE 2

Plan No. 8001
Drawing
Sheet of



GENERAL EXCAVATION ZONES

ALL DIMENSIONS ARE MEASURED PERPENDICULAR TO THE CENTERLINE OF TRACK.

PRIOR TO COMMENCING ANY WORK, THE CONTRACTOR SHALL SUBMIT FOR APPROVAL BY THE RAILROAD DETAILED PLANS INDICATING THE NATURE AND EXTENT OF THE TRACK PROTECTION SHORING PROPOSED. THE CONTRACTOR SHALL INSTALL THE TEMPORARY SHORING SYSTEM PER THE APPROVED PLANS. DESIGN OF THE TEMPORARY SHORING SYSTEM TO COMPLY WITH THE GUIDELINES FOR TEMPORARY SHORING.

FOR EXCAVATIONS WHICH ENCROACH INTO ZONE A OR B SHORING PLANS SHALL BE ACCOMPANIED BY DESIGN PLANS. PLANS AND CALCULATIONS TO BE SIGNED AND STAMPED BY A REGISTERED PROFESSIONAL ENGINEER REGISTERED IN THE STATE WHERE THE WORK WILL BE PERFORMED.

No.	Date	Eng.	Revision Notes	Date / Des. / Chkd. / Dwn. / Chkd.Dwn. / Scale	Engineer in Charge: JAMES M. GALVIN P.E. NJ LIC. 24GE03240300 — Date:	NJ TRANSIT — RAIL OPERATIONS, ONE PENN PLAZA EAST, NEWARK, NJ 07105-2246	INFRASTRUCTURE ENGINEERING OFFICE OF CHIEF ENGINEER STRUCTURES		FIGURE 3	Contract No. / Drawing / Sheet of

SPECIFICATIONS

FOR

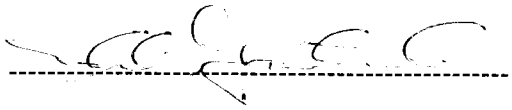
WIRE, CONDUIT, AND CABLE

OCCUPANCY

OF

NJ TRANSIT PROPERTY

ET-2



Michael Gaspartich

Deputy General Manager

For Infrastructure Engineering

November 2012

INDEX

1. SCOPE:

1.1 These specifications apply to the design of electrical infrastructure, wires, and cables (power, fiber optic, communication, etc.) which are to be located over, under, across, or upon NJ TRANSIT right-of-ways, properties, and facilities, as well as any tracks owned by others over which NJ TRANSIT Rail operates its equipment. Excavations associated with such installations are subject to requirements cited in the "EP-2 Specifications For Pipeline Occupancy on NJ TRANSIT Property".

2. APPLICATION FOR OCCUPANCY

2.1 Individuals, Corporations, Municipalities, and other entities (known as the owner, permittee, or applicant) requesting occupancy of NJ TRANSIT rail property by which such wire or cable occupations must agree, upon approval of the construction details by the office of the Chief Electrical Engineer, to execute an appropriate occupancy agreement and pay any and all required fees and/or rentals outlined therein.

2.2 Application for occupancy shall be made by a letter addressed to Property Agreement Coordinator, NJ TRANSIT Corporation, One Penn Plaza East, Newark, NJ 07105-2246, giving the following:

a. Name of Individual, Corporation, Municipality, or other entity requesting the occupancy

b. Complete mailing address of applicant

c. Name and title of person who is authorized to sign the agreement

d. The state in which the applicant is incorporated, if applicable

2.3 All applications shall be accompanied with eight (8) copies of all construction plans and three (3) copies of specifications and

computations concerning the proposed occupancy. The construction plans and the specifications shall be signed and sealed by a licensed Professional Engineer registered in the appropriate state where the work will be located.

2.4 The applicant is advised that they should expect a minimum of 30 days review period.

3. APPROVAL OF PLANS

3.1 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 not be permitted until a Temporary Access Permit is obtained. The issuance of such a permit does not constitute authority to proceed with the actual construction, which cannot begin until a formal agreement (License or Occupancy Permit) is executed by NJ TRANSIT Corporation and permission to proceed is given by the NJ TRANSIT's field manager.

3.2 Plans for proposed wire line or cable occupations shall be submitted to and meet the approval of the Chief Electrical engineer prior to start of construction.

3.3 After folding drawings to be submitted, the title block and other identification of the plans shall be visible without the necessity of unfolding at the lower right-hand corner. Each plan shall be individually identified by 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.

3.4 All plans are to be individually folded and when more than one plan is involved, they shall be assembled into complete sets before submission to NJ TRANSIT.

3.5 Plans shall be drawn to scale and show the following:

3.5.1 Plan view of crossing or occupation in relation to all NJ TRANSIT facilities. All related dimensions must be shown referenced from top of rail for height measurements, and centerline of track for lateral measurements.

3.5.2 Show the location of wire or cable (in feet/inches) from nearest railroad milepost, centerline of a railroad bridge (giving bridge number) or center line of an existing train station. In all cases, the name of the county and state in which the proposed facilities are located must be shown. The location plan shall indicate proposed state plane coordinates and ground surface elevations of the work as well as reference to centerline alignment and profile of near tracks, support poles and guy anchors, existing foundations and overhead or under-grade wire, conduit, pipelines or structures. NJ TRANSIT Rail uses NJ State or NY State coordinate systems for horizontal control as appropriate and vertical datum based on Mean Sea Level equal to 0.0 feet at Sandy Hook, NJ (1929). Location and elevation of referenced bench mark, used for top of rail elevations shall be shown.

3.5.3 Show the profile of ground on centerline of pole or tower line, showing clearances, between top of rail and bottom of sag (governing worst-case clearance condition), as well as clearances from bottom wire or cable to top wire or cable of railroad's transmission, signal, and communication lines, catenary and third rail, when present. If none of these facilities are in existence at the point of crossing, the plans should so indicated. Actual under-clearances shall be shown. Criteria for unusual conditions such as wind or ice loads shall be identified. Sag calculations indicating the worst case clearance for each identified location shall be provided.

3.5.4 Show all known property lines. If wires, cables or conduits are within public highway limits, such limits shall be clearly indicated with dimensions from center line. Indicate existing or discovered subsurface utilities, drains, or structures along with associated buried depths. Property information shall be coordinated with the

applicable Right-of-Way and Track maps or valuation sheets. Copies of these maps can be obtained from the NJ TRANSIT Real Estate Department. These maps should be used to located work with respect to railroad stationing, structure number, and mile post.

3.5.5 The plan must be specific, as to:

a. Base diameter, height, class, and buried depth of poles/structures. Poles shall be set as close to the property lines as possible but no closer than 18'0" from face of pole to center line of nearest track. Each location must be analyzed to consider speed, traffic, proximity of ditches, conflicts with right-of-way access roads, curves, etc.

b. Identify number of, size, geometry, configuration, length, and material of wires, as well as number of pairs in communication cables. The same basic requirements held for fiber optic cables. (Complete description shall be provided of the items). Also, include any additional appurtenances to be attached to structures, to include, but not limited to guys, antennas, alternative energy devices, meters, etc.)

c. Nominal voltage and frequency of line. (State line to line or line to neutral and if and how circuit is grounded).

d. Number of, locations, size, material, of anchors and all guying for structures, poles and arms. Design incorporating guy anchors must avoid drainage ditches and allow for the maintenance of same. Guys shall avoid extending into the live load influence envelope of the track structure (refer to EP-2 Specifications).

Notes: Double cross-arms and/or dead-end construction are required on poles crossing or adjacent to track. Any tower designs must be accompanied by engineering computations and data. Ultimate design criteria are required for review and approval by Chief Electrical Engineer.

4. CONSTRUCTION REQUIREMENTS

4.1 Power and communication lines shall be constructed in accordance with "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines, National Electrical Safety Code, Part 2", (current issue), in addition to as outlined in Item 3.5.5 (a) of this document.

4.2 Vertical Clearances above top of rail are required to meet or exceed current NESC code clearance plus ten feet. Special exceptions may be made with approval by Chief Electrical Engineer.

4.3 Under special conditions, the railroad will give consideration to occupancy on its catenary structures, subject to the approval of the Chief Electrical Engineer.

4.4 The applicant, when working within NJ Transit Electrified Territory, shall be governed, and abide by, the rules outlined in New Jersey Transit's Electrical Operating Instructions, TRO-3, current issue.

4.5 The applicant shall provide the names and phone numbers of at least two (2) persons available on a 24-hour basis, should an emergency situation occur.

4.6 The applicant shall thoroughly describe all plans for and staging of demolition, erection, wire-pulling, temporary support, and other procedures necessary to accomplish his work.

4.7 The applicant is instructed to incorporate schedules, staging, methods, and techniques which minimize the potential hazards and limit impact on NJ TRANSIT Rail Operations. NJ TRANSIT Rail reserves the right to modify construction plans to reduce the possibility of service interruptions and facilitate emergency work or planned maintenance.

4.8 The contractor shall be responsible for adhering to all governing code requirements and Federal, State, County, & local rules, regulations,

and requirements. The contractor shall be responsible for relocation of electrical utility lines, providing disconnect switches, obtaining utility service interruptions, line, equipment or other facility outages/clearances, and acquiring utility approval for work subject to these regulations.

5. LONGITUDINAL OCCUPANCIES

5.1 Wires and cables running longitudinally along rail rights-of-ways shall be constructed as close to railroad property lines as possible. For electrical power wires and cables and communication cables the following information shall be submitted:

a. Voltage of circuit(s), number of pairs

b. geometry, configuration, ect. of electrical circuit(s)

c. Number of electrical circuit(s)

d. Size (AWG or MCM) and material of wires, cables, or fibers

(Messenger included)

e. Length of spans clearly indicated on drawing

Any facilities overhanging railroad property must have approval of the railroad and appropriate rental charges will be applied.

6. UNDERGROUND ELECTRICAL FACILITIES

6.1 All underground electrical facilities (except those in streets where it would not be practical to do so) shall be prominently marked at right-of-way lines (on both sides of track for 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 including voltage
3. Pipe depth below surface at point of a sign
4. 24 hour emergency telephone number

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

6.3 The owner must maintain all signs on NJ TRANSIT right-of-ways as long as the occupational agreement is in effect. The signs must be easily readable, solidly installed, and replaced/repaired when damaged.

6.4 Any mark-out of existing or proposed facilities shall conform with current NJ One Call Mark-Out requirements. In addition to contacting the NJ One Call, the contractor must contact NJ TRANSIT for marking its own facilities prior to any excavation work.

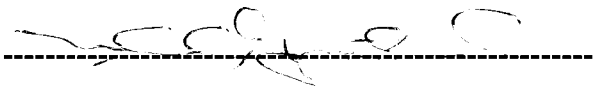
7. INDUCTIVE INTERFERENCE

7.1 On agreements covering longitudinal occupancies, provisions will be included that the applicant shall provide appropriate remedies, at his own expense, to correct any interference with railroad facilities.

7.2 NJ TRANSIT shall not be responsible for undesirable effects or hazardous conditions caused by its electrical, signal, or communication facilities which arise in installations constructed by the applicant. The applicant shall take any and all steps necessary to mitigate such conditions and/or personnel hazards.

7.3 Existing occupancies on NJ TRANSIT property, by others, shall be reviewed by the applicant to determine compatibility of the combined systems. The applicant shall cooperate with third parties to insure that existing occupations are not impaired and at applicants expensive, shall correct all interference that results from this construction.

Third Party Contractor Vehicle use on NJ TRANSIT Property



Michael Gaspartich
Deputy General Manager
For Infrastructure Engineering

November 2012

Third Party Contractor Vehicle use on NJ TRANSIT Property

All hi-rail equipment to be used on NJ TRANSIT right-of-way must be inspected and approved by the NJ TRANSIT's Work Equipment Department prior to entering NJ TRANSIT's property.

Once inspected and approved, Hi-rail equipment will be issued a sticker which will be valid for 3 months. The sticker must be displayed in the vehicle cab during use. If the hi-rail sticker becomes invalid, the vehicle will not be allowed to operate on NJ TRANSIT property. The contractor must ensure that the inspected and approved equipment remains is its approved physical and working condition.

NJ TRANSIT's Work Equipment Shop will require a two week notification prior to the anticipated inspection date of the equipment. If equipment fails inspection, it will not be allowed to operate on the right-of-way.

The contractor must ensure that hi-rail equipment operators are properly trained and fully qualified to operate said equipment.

The attached "Contractor Hi-Rail Equipment Check List" will be used during inspection.

NJ TRANSIT

CONTRACTOR HI-RAIL EQUIPMENT CHECK LIST

Date _____

Contractor _____

Phone# _____

Truck# _____ License plate# _____

Height 15'1 max _____ Widht 10'1"max _____

Expire date _____

		OK	Fail
1)	Visual Inspection		
2)	Tire and wheel Condition		
3)	Rail wheel condition (wear)		
4)	Steering wheel lock for Hi-rail (If required)		
5)	Hi rail safety locking pins		
6)	Hi-rail mounting bolt		
7)	Hi-rail brakes (front)		
8)	Head/tail/Brake lights front/rear		
9)	Mirrors		
10)	Horn		
11)	Strobe light		
12)	back_up alarm		
13)	First aid kit		
14)	Fire Extinguisher		
15)	Hi rails insulated	YES	NO
Guide wheel back flange gauge		**Front**	
		Rear	

Inspected by: _____

Pass Fail

Note. Inspection only good for 3 months
If truck leave N.J.T will need new inspection