August 5, 2016

Judith Whitney, Clerk of the Board
Vermont Public Service Board
112 State Street
Montpelier, Vermont 05620-2701

re 8814

RE: Gas Safety, Notice of Probable Violation

Dear Ms. Whitney:

Enclosed please find a copy of a Notice of Probable Violation under Public Service Board Rule 6.000. Pursuant to Rule 6.104(A), when the Department issues a Notice of Probable Violation to a person alleged to have violated Board Rules pertaining to gas safety, a copy must be filed with the Board and is to be treated by the Board as a petition to impose penalties under 30 V.S.A. § 2816.

Pursuant to Rule 6.104(D), the alleged violator has 30 days from the date of receipt of the Notice to respond in writing to the Board and the Department. The response may either accept any proposed remedial action and commit to the payment of any proposed civil penalty, or object to the same. In the event the response is an acceptance of the proposed remedial action and penalty, the alleged violator will be deemed to have waived any right to a hearing as long as the Board's final Order is consistent with the agreement between the Department and the alleged violator. *See* PSBR 6.104(E)(1)-(2) & (G). In the event the alleged violator objects to any proposed remedial action and penalty and requests a hearing, the Board shall provide notice and an opportunity for hearing before entering any final Order. *See* PSBR 6.104(E)(3) & (H).

Thank you for your assistance in this matter. Please don't hesitate to call if you have any questions.

Cordially,

GC Morris, Gas Engineer

cc: John St.Hilaire, Vermont Gas Systems, Inc.

VERMONT

State of Vermont
Department of Public Service
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Montpelier, VT 05620-2601
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7970

August 5, 2016

John St. Hilaire, Vice President Operations
Vermont Gas Systems, Inc.
P.O. Box 467, Burlington, VT 05402-0467
85 Swift Street, South Burlington, VT 05403

Notice of Probable Violations
Re: Construction of the Addison Natural Gas Project

Dear Mr. St.Hilaire:

Pursuant to 30 V.S.A. § 29, and Public Service Board (PSB) Rule 6.100, the Vermont Department of Public Service (Department) conducted several pipeline safety inspections related to construction of the Addison Natural Gas Project (Project) by Vermont Gas Systems, Inc. (VGS) in June 2016. These inspections were made to verify compliance with 49 CFR 192, PSB Rule 6.100, and other requirements related to the certificate of public good authorizing construction of the Project pursuant to 30 V.S.A. § 248 (PSB Docket No. 7970). This letter serves to document specific concerns and is not intended to be a comprehensive list.

During the inspections and subsequent interviews with VGS representatives, the Department became aware of several probable violations of 49 CFR 192, as provided in greater detail below. These items were shared with VGS representatives at the time of discovery and again during numerous subsequent meetings with you and other construction personnel up until the date of this letter. We acknowledge VGS has addressed some of these items subsequent to notification of the findings in the field. In some cases, however, VGS has not adequately demonstrated that specific conditions have been remediated.

49 CFR 192.303 states, in its entirety: "Each transmission line or main must be constructed in accordance with comprehensive written specifications or standards that are consistent with this part." This code requirement can be broken into two components: 1) each operator must *develop*, prior to construction, "comprehensive written specifications or standards consistent with [49 CFR 192]" for each construction task or requirement to be performed, and 2) each operator must then *follow* its written specifications or standards during construction.

The inspection findings below all relate to VGS project specification: CHA Project No. 28757, Section 130000 – Minimum requirements for Pipeline Construction Paralleling Overhead Electrical Lines (copy attached). The Department requested a current copy of this specification[1] in March 2016 and during several subsequent meetings with you, including on April 8, 2016. VGS provided a copy of this specification to the Department on May 24, 2016. VGS commenced construction tasks that fall under this specification on June 7, 2016.

FINDINGS

1) Section 1.1 A. states: "VELCO requirements shall be maintained at all times. In the event of a conflict between this specification and VELCO requirements, VELCO shall govern, [sic]" The "VELCO requirements" are not otherwise identified, specified, or included as an appendix to the VGS specification. Subsequent to asking VGS contract construction personnel and contract inspectors for the VELCO requirements, the Department requested the VELCO requirements from VGS corporate personnel on June 17, 2016. VGS was unable to produce these requirements. The Department was only able to obtain the VELCO requirements directly from VELCO, after making a request to VELCO. There is no "comprehensive written specification or standard" in place if it is not clear to construction personnel what the VELCO requirements are or where to locate them (especially since the VELCO requirements "govern" in the event of a conflict with the VGS specification). The Department requests that VGS immediately conduct a meeting with VELCO to gain a complete understanding of the specific VELCO requirements, and then to attach those VELCO requirements as an appendix to the VGS specification.

2) Section 3.2 A. states: "The contractor will furnish a responsible person that can understand and follow the Technical Specifications and Electrical Safety required

[1] This specification, Section 130000, is included with a group of specifications collectively titled Technical Specifications for Vermont Gas Systems, Inc. 85 Swift Street, South Burlington, VT 05403, Addison Natural Gas Project (ANGP), Phase 1 and dated April 29, 2015. This collective group of specifications was utilized during the 2015 construction season. VGS informed the Department that the 2016 construction season was expected to begin approximately April 18, 2016 and that portions of the collective specifications would be modified prior to the 2016 construction season. Section 130000 was not one of the portions modified and remains dated 04.29.15. This specification could be applicable to project Right of Way activities, such as clearing, blasting, crushing, and grading which occurred prior to pipeline installation.

for the specific project. The responsible person for electrical safety must be approved by the Owner." Responsibilities and duties of this "responsible person" are specified throughout the specification. On June 17, 2016, the Department inquired about the "responsible person" and representatives of the primary contractor and of VGS stated a responsible person was not designated nor had a responsible person been approved. On June 24, 2016, VGS's Engineering Compliance Manager informed the Department in writing that their contractor had an electrical expert on the Project and suggested the Department contact the Project Manager/VGS representative for the purpose of contacting that person. On June 24, 2016, the Department asked the Project Manager/VGS representative about the "responsible person"; the Project Manager/VGS representative was not aware of the responsible person's identity. On June 24, 2016, the Department issued a written information request to VGS regarding the identity and approval criteria of the responsible person, and requested that VGS respond with this information at the earliest opportunity because this is a critical and immediate safety topic. On June 27, 2016, VGS verbally informed the Department that a "responsible person" arrived onsite that same day. The Department Pipeline Inspector was introduced to the identified person on June 27, however the person stated he "was not assigned as an on-site representative". The Department has not, to date, received written documentation from VGS to substantiate the criteria it utilized to approve the "responsible person", when that person was approved and what actions that person has the authority to perform.

Additionally, the Department made the following observations at several locations where pipeline construction activity was occurring:

On June 7, 2016, the Department's Pipeline Inspector observed pipeline stringing[2] along Hurricane Lane in Williston. At that time, he asked the VGS representative to present a record of an electrical safety assessment for the location. The VGS representative was not aware of the responsible person to measure and record induced voltage at that location.

On June 8 and June 10, 2016, the Department's Pipeline Inspector observed pipeline stringing at Project station 1500+00 in Monkton and observed pipeline welding at Project station 1032+00 in Hinesburg. At those times, he asked VGS representatives to present a record of an electrical safety assessment for the respective location. The VGS representatives were not aware of the responsible person to measure and record induced voltage at those locations.

These observations indicate the absence of a "responsible person", contraventions of the Project specifications, and probable violations of state and federal gas pipeline safety regulations.

3) Further deviations from the Project specifications were observed on June 24, 2016 and are indicated in the chart below.

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[2] Interstate Natural Gas Association of America (INGAA) defines "stringing" in the Association's Frequency Asked Questions (FAQs) regarding pipeline construction: "Natural gas pipelines are assembled in segments typically 40 to 80 feet long. The crew monitors the pipeline design plan to make sure that the segments of pipe are lined up along the pipeline right-of-way. This process is called stringing." This process occurs prior to welding the segments together.

ANGP Specification Section 130000 Parts	**Department Observations on 6/24/16**
3.3 C. states *"Pipe shall be unloaded from stringing trucks by a side boom equipped with grounding cable..."*	Hydraulic excavator with a vacuum pipe handler (other than specified) utilized for pipe unloading at Project Station 941+00
3.3 B. states *"Before any section of pipe is picked up or moved in any way, the ground shall be completed between the section of pipe and the equipment moving that pipe."*	Pipe moved with no ground connection at Project Station 941+00
3.4 A. states *"Each continuous segment of pipeline being worked on should be grounded to at least two separate points."*	Pipeline segment was grounded at only one point at Project Station 941+00
3.4 G. states *"Each section of pipe in the stack shall be grounded with a 5/8" min. diameter ground rod...."*	½" Ground rod utilized at Project Station 941+00
3.4 I. states *"All grounding attachments and removals shall be made by or under the direct supervision of the person responsible for electrical safety."*	Grounding attachments made without direct supervision of person responsible for electrical safety at Project Station 941+00
3.4 B. states *"Suitable connectors should be utilized to connect the #2 A.W.G. cable to the individual ground rods and to the pipeline."*	Connectors were utilized with no apparent electrical rating at Project Station 941+00
3.4 F. states *" The person in charge of electrical safety shall check the integrity of each connection by measuring the resistance from a near point on the copper cable to the ground rod or pipeline steel using a suitable Ohm Meter."*	Electrical measurements taken by method inconsistent with specification at Project Station 941+00
3.4 A. states *"Each continuous segment of* pipeline *being worked on should be grounded to at least two separate points."*	Pipe-string with no grounding or bonding at Project Station 720+00
3.4 M. 1. states *"Each person coming into contact with the pipeline during construction should do so only when: (a) Using rubber insulating gloves."*	Employees handled pipe without rubber-insulating gloves at Project Station 673+00
3.8 A states *"The contractor should post adequate signs warning of possible electrical hazards at each access to the right-of-way and any other measures required to prevent public access to temporary grounding installations."*	No signs indicating the presence of an electrical hazard were at location with pipe segment, Project Station 673+00
3.4 G states *"Each section of pipe in the stack shall be grounded with a 5/8" min. diameter ground rod driven into the ground at least four (4) feet."*	Grounding rod depth: 6" at Project Station 650+00

As we've discussed on numerous occasions, remediation of these probable violations is especially urgent as these are worker safety issues. On July 8, 2016, the Department's Pipeline Inspector measured voltage as prescribed in Section 3.5 A. of the specification and obtained a reading as high as 118 V_{AC} between an ungrounded pipe and a clean steel pin driven into the ground.

CONCLUSIONS

Based on the above findings, the Department concludes that two Probable Violations are related to this topic:

1) A Probable Violation of 49 CFR 192.303 to the extent that VGS did not fully develop and follow project specification: CHA Project No. 28757, Section 130000 – Minimum requirements for Pipeline Construction Paralleling Overhead Electrical Lines as described above in Findings 1 through 3. This Probable Violation has existed from June 7, 2016, through the date of this letter to the extent that VGS is not in full compliance of its written specification, although the Department notes that VGS has made some progress towards compliance during this time period. If we only consider the number of construction days from June 7 through June 24, 2016 (including Saturdays, but not Sundays), this would result in a minimum of 16 days in (probable) violation.

2) A Probable Violation of PSB Rule 6.102 (B), which states: "The Department may at any time request information reasonably related to enforcement of gas safety rules or regulations. Such information shall be provided within fifteen (15) days. Where the Department determines that an emergency need for such information exists, the Department may require information to be provided immediately." As documented in Finding 2, above, on June 24, 2016, the Department issued a written information request to VGS regarding the identity and approval criteria of the responsible person, and requested that VGS respond with this information at the earliest opportunity because this is a critical and immediate safety topic. The Department has not received this information as of the date of this letter, which is a minimum of 14 business days in (probable) violation (from July 18, which is 15 business days from June 24), considering the Department requested this information at VGS's earliest opportunity due to the immediate safety topic.

RELIEF SOUGHT

Based on the foregoing, the Department recommends that the Board immediately require VGS to:

A. Review all existing specifications, plans, instructions, and procedural documents related to the Project and define all the potential threats to personnel, property and

equipment related to the presence of electric transmission lines and the means by which these threats might be brought to bear;

B. Develop, establish, revise or enhance comprehensive written processes to define specific methods, instruments and other equipment to continually identify, monitor, evaluate and document all electrical hazard(s) considering all construction and installation techniques required to build the Project;

C. Develop, establish, revise or enhance comprehensive written processes to define specific methods, instruments and other equipment to mitigate all electrical hazards, continually monitor mitigated electrical hazards and document the mitigation of all electrical hazards;

D. Develop, establish, revise or enhance a comprehensive written electrical hazards training program), including items B, C, and D above, and promptly convene sessions of the training program, with mandatory attendance required of all appropriate personnel;

E. Implement improved supervisory controls to prevent recurrence of violations; and

F. Perform any other actions that the Board deems appropriate.

Based on Findings 1 through 3, above, the Department further recommends that the Board enter an Order against VGS to impose of a total civil penalty of $150,000 in accordance with PSB Rule 6.104(I) and 30 V.S.A. § 2816.

PROCEDURES GOVERNING THIS NOTICE OF PROBABLE VIOLATION

A copy of this Notice of Probable Violation has been filed with the Public Service Board and is to be treated as a petition to impose penalties under 30 V.S.A. § 2816.

In accordance with PSB Rule 6.104 (D), Vermont Gas Systems Inc. must make a written response to the Department and to the Board within 30 days of this Notice.

This Notice of Probable Violation contains a statement of remedial action sought and proposes the imposition of a civil penalty. Therefore, Vermont Gas Systems, Inc. may:

1) Agree to take the remedial action sought and submit a plan for compliance which shall include a schedule of steps to be taken and a date by which complete compliance shall be obtained;

2) Pay any civil penalty by certified check payable to the Board; and/or

3) Object to imposition of the remedial action and the imposition of the penalty and request a hearing before the Board.

Pursuant to Public Service Board Rule 6.104 (F), a request for hearing must include a statement of the issues intended to be raised at hearing, assert any defenses VGS intends to raise and include an explanation of any mitigating factors accompanied by supporting data or other information. The hearing request may also include any offer made in compromise of the proposed civil penalty or remedial action.

Pursuant to Public Service Board Rule 6.104 (G), if Vermont Gas Systems, Inc. agrees to the remedial actions sought and agrees to pay the proposed civil penalty identified herein, then it will be deemed to have waived notice and an opportunity for hearing, provided the Board's final Order is substantially consistent with the remedial action and penalty agreed to by the Department and Vermont Gas Systems, Inc..

Please contact me with any questions relating to this matter.

Sincerely,

GC Morris
Gas Engineer

cc: Eileen Simollardes, Vermont Gas Systems, Inc.
Bill Jordan, Department of Public Service
Louise C. Porter, Department of Public Service

SECTION 130000 - MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

PART 1 - GENERAL

1.1 MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

A. VELCO requirements shall be maintained at all times. In the event of a conflict between this specification and VELCO requirements, VELCO shall govern,

B. This construction specification applies to pipeline construction that parallels overhead high voltage electric transmission lines and represents minimum requirements only.

C. The purpose of this specification is to cover the procedures and construction techniques which must be used during the construction period to reduce potentials on the pipe and construction equipment to a level less than 15 volts Root Mean Square (RMS) measured between the structure and ground. This is measured using a digital voltmeter.

D. This specification is not all inclusive and is intended to remind the installer of the potential hazards which may be associated with pipeline construction in the vicinity of induced voltage, fault current, and contact to high voltage electric transmission lines.

E. The Contractor should review the project and initiate additional requirements deemed necessary to ensure the safety of persons and property affected thereby. The Contractor shall furnish any special materials required to comply with this section. Consult with the Electrical Transmission & Distribution Utility for specific applications and requirements.

1.2 REFERENCES

A. National Electric Code (NEC)

B. Occupational Safety and Health Administration (OSHA)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STEEL PIPE INSTALLATIONS PARALLELING HIGH VOLTAGE ELECTRIC LINES

A. When exposed metallic piping is run parallel to overhead A.C. electric lines, the pipe is subject to induced voltages and currents that are the result of electromagnetic, electrostatic and resistive coupling.

B. Induced voltages and currents may cause coating damage as well as damage to cathodic protection and electronic monitoring equipment.

C. Induced voltages and current can be hazardous to personnel working on the pipeline during the construction period when long sections of pipe are exposed above ground. Lightning and faults on the transmission line can be especially dangerous.

3.2 ELECTRICAL SAFETY

A. The contractor will furnish a responsible person that can understand and follow the Technical Specifications and Electrical Safety required for the specific project. The responsible person for electrical safety must be approved by the Owner.

1. The person in charge of electrical safety shall:

a. Assure that all electrical safety requirements and devices are fully understood by all members of the construction forces.

b. Be fully aware of proper grounding procedures and with the dangers associated with electromagnetic and electrostatic couplings, resistive coupling, ground fault current discharge, lightning, etc.

c. Know the proper OSHA and NEC safeguards for the construction equipment being used related to the Owner's "limit of approach" regulations to the specific overhead transmission circuits that will be paralleled.

d. Have the necessary instrumentation, equipment and authority to implement and maintain safe working conditions.

e. Assure all safety devices and practices are properly employed during all periods of construction activity in the proximity of electric overhead transmission systems. This includes the choice of the appropriate rubber gloves for the situation.

f. Communicate at least daily with the dispatcher controlling the involved electric lines to ascertain any scheduled changes in loading, outages and switching operations and to notify of work on their Right-of-Way.

B. The Contractor shall adhere to all safety requirements of the electric utilities. This includes, but is not limited to, the following: training, safety certifications, daily reporting, and other applicable documentation as determined necessary by the electric utility.

3.3 EQUIPMENT SAFETY

A. Each piece of equipment utilized to handle pipe in any way such as unloading, picking up, transporting, bending or setting-in shall be grounded and shall be equipped with a cable assembly capable of grounding the sections of pipe to the piece of equipment handling that pipe.

B. Before any section of pipe is picked up or moved in any way, the ground shall be completed between the section of pipe and the equipment moving that pipe. "Setting-In" booms shall be equipped with ground cable and the ground must be maintained at least until the stringer bead is completed. The ground connection on cranes shall be also made to the upper rotating structure supporting the boom.

C. Pipe shall be unloaded from stringing trucks by a side boom equipped with grounding cable as described above. A ground shall be completed between all sections of pipe to be unloaded and the side boom before unloading cables or slings are attached to the pipe.

3.4 GROUNDING

A. Each continuous segment of pipeline being worked on should be grounded to at least two separate points. This grounding should consist of one of the following alternatives:

B. Grounding should be established by driving one or more ground rods to at least a four-foot depth and connecting these ground rods to each other and the pipeline with a #2 A.W.G. stranded copper cable. Suitable connectors should be utilized to connect the #2 A.W.G. cable to the individual ground rods and to the pipeline. No ground connections should be removed without the knowledge and concurrence of the person responsible for electric safety.

C. Should sub-surface conditions prohibit the driving of ground rods, temporary grounding can be established with one or more ground rods, conduits of aluminum foil installed horizontally and covered with a minimum 4 inches of dirt. The segment of the pipeline being worked on should be bonded to the temporary grounding. This bond should consist of an insulated #2 A.W.G. jumper cable. The grounding cable should first be securely attached to the temporary grounding and then attached to the pipeline. Removal should be in reverse order.

D. It is of the utmost importance that the person making or breaking the connection at the ground rod connection not "bridge the gap" between the ground rod and bond clamp.

E. When installing or removing a grounding or bonding facility, personnel shall wear the class of rubber insulating gloves selected by the person responsible for electrical safety. The following procedures for making and breaking grounding connections shall be strictly adhered to:

1. Using Jumper Cable with End Clamps

a. Making grounding connections

1) Establish temporary grounds (ground rods, bare casings, other appropriate ground).

2) Using jumper cable with end clamps, connect one end clamp to the temporary ground.

3) Using rubber gloves, connect the other end clamp to the structure to be grounded.

b. Disconnecting grounding connections

1) Using rubber gloves, disconnect the clamp attached to the structure end.

2) Disconnect the clamp connected to the temporary ground.

2. Using Clamp Around the Pipe and Jumper Cable with End Clamps

a. Making ground connections

1) Establish temporary ground (ground rods, bare casing, other appropriate ground).

2) Using rubber gloves, connect grounding clamp around the pipe.

3) Connect one end of the grounding cable to the temporary ground.

4) Using rubber gloves, connect the other end of the grounding cable to the grounding clamp around the pipe.

b. Disconnecting grounding connections

1) Using rubber gloves, disconnect the grounding cable from the grounding clamp around the pipe.

2) Using rubber gloves, disconnect the grounding clamp around the pipe.

3) Disconnect the grounding cable from the temporary ground.

4) Proper work procedures related to electrical safety shall be established for all construction activities associated with this project.

F. The person in charge of electrical safety shall check the integrity of each connection by measuring the resistance from a near point on the copper cable to the ground rod or pipeline steel using a suitable Ohm Meter. A good electrical connection will have a resistance of 0.1 Ohm or less.

G. Pipe shall be hauled to the right-of-way and stored in stacks of ten sections or less. Each section of pipe in the stack shall be grounded with a 5/8" min. diameter ground rod driven into the ground at least four (4) feet. All sections in one stack shall be grounded together. This ground shall be maintained until each individual section of pipe has been removed from the stack.

H. When grounding sections of pipe, the ground rod shall be driven and the grounding cable connected to the ground rod first. The grounding cable shall then be connected to the pipe. Cables used for temporary grounding attachments shall have good mechanical strength as well as high conductivity. The cable shall be single conductor #2 A.W.G. stranded copper, cable or equivalent. Cable attachments to temporary grounding systems shall be made by a method that assures good electrical contact while applying firm pressure to the pipe metal. This method of attachment should have a current carrying capacity of at least 200 amperes. When removing grounding cable, the cable shall be removed from the pipe or equipment first and then from the ground rod.

I. All grounding attachments and removals shall be made by or under the direct supervision of the person responsible for electrical safety.

J. Temporary ground connections should be made by electrically connecting the pipeline to each casing. Prior to the installation of the cathodic protection test leads, a bond should be installed using an insulated #2 A.W.G. jumper cable with suitable clamps. Connection shall be made first to the casing and then to the pipe. Removal of bond shall be made on reverse order.

K. If electrolytic grounding cells are to be installed between the pipe and casing as part of the final installation, the bonds shall not be removed until the grounding cells are installed.

L. Before any casing-pipeline temporary bond is removed, the person in charge of electrical safety shall determine that all permanent test wire connections to the pipeline and casing are intact. This shall be done by measuring the potential of the wire to a close copper-sulfate reference electrode using a suitable high resistance volt-meter. A wire connection with good metallic contact will show a potential of from 0.3 to 0.7 volt. A broken or disconnected wire connection will show a potential of 0.2 volt or less.

M. Insulating joints shall be installed with a bond cable shorting out the insulating material. This bond cable shall remain in place until the insulating joint has been welded into the pipeline and a grounding cell has been connected across the insulating flange. The grounding cell with test station must be in service and the bond cable removed before the insulating joint is buried.

1. Each person coming in contact with the pipeline during construction should do so only when:

a. Using rubber-insulating gloves. The person in charge of electrical safety should be in charge of insuring that all rubber-insulating gloves are kept in good insulating condition by following accepted test procedures. All gloves that are damaged (punctured, ripped, torn, etc.) shall be immediately replaced.

b. Standing on a grounding mat that is electrically connected to the pipeline at two separate locations. The grounding mat could consist of a copper weld wire mesh of #8 A.W.G. wire with a 4" x 4" mesh spacing. The mat should be electrically connected to the pipeline through a minimum #2 A.W.G. insulated jumper cables thermo welded to the mat and connected to the pipe using suitable clamps.

N. Temporary gradient control mats shall extend a minimum of 1 meter in all directions outside the work area. There shall be no contact between persons over the gradient mat and those not over the mat, including the handing over of tools, instruments or other materials.

1. Regardless of the approach selected, it is always advisable to handle the pipe (whenever possible) by the coated area of the pipe.

O. All piping at tie-ins shall be bonded across the gap. All piping at cut-outs shall be bonded across before the cut-out is started. Prior to installing the cable bond at tie-ins and prior to removing the cable bond across cut-outs, each side shall be properly grounded as indicated in Item 6.1.

P. Whenever a section of pipe must be lifted free of the earth on a web sling or equivalent for transport, the pipe steel so lifted should be electrically connected to a metallic portion of the tractor doing the lifting and transporting. This requirement may be waived if the lifting and/or transporting of the pipe can be accomplished with connections called for in Item 6 of these recommendations.

Q. A grounding strap or chain shall be attached to each rubber tired vehicle with a secure electrical connection to provide a ground contact for the vehicle during both mobile and stationary operations. The grounding strap or chain shall be of sufficient length to provide three (3) feet of earth contact immediately after the vehicle comes to a stop within 200 feet from the centerline of high voltage overhead conductors.

R. If steel chain is used for the grounding connection, it shall be of a minimum 1/4" size. If a strap is used for the grounding connection, it must be approved by the Owner before utilization.

S. All bonding connections shall be made to driven ground rods as described above. Bonding connections shall not be made between the pipeline and the electric transmission line ground. Such a connection can result in high pipeline potentials during power line faults with current flow through the pipeline that could damage the steel as well as the coating.

T. The pipeline shall not be bonded or grounded to foreign structures without permission of the Owner of the foreign structure. If permission is not granted, the foreign structure shall be electrically isolated from the pipeline under construction.

U. Workers shall avoid at all times making simultaneous contact to a grounded and ungrounded structure.

V. Other grounding materials and suppliers can be used subject to approval by Owner. Examples of other cable jumpers that could be used are:

1. Cable jumpers using 50 lb. minimum pull magnet for connection to pipe, heavy equipment, fuel trucks and general use.

2. Standard welding or battery jumper clamps with well-insulated handles, and teeth to bite into the metal.

W. All grounding attachments and removals should be made by or under the direct supervision of the person in charge of electrical safety.

3.5 VOLTAGE MEASUREMENT

A. The voltage to ground of any string of pipe exposed to contact by personnel shall be measured periodically by reading the voltage between the pipe and a clean steel pin driven in the ground.

B. If the A-C voltage exceeds 15 volts above ground, supplementary grounds must be used to reduce this voltage to less than 15 volts. In the event that measured A-C voltage above ground exceeds 15 volts, the person in charge of electrical safety shall issue appropriate warnings and all work on the pipe string shall be suspended until potential is reduced to less than 15 volts.

C. These grounds shall be maintained at all times. A record of a periodic measurement of induced voltage shall be obtained and the record of these readings maintained. The bonding entities shall be as widely separated as is possible. As the "still-above ground" portion of the construction advances, bonds should be kept close to the construction end. This may only be done by installation of a third or higher number bond near the "construction end" before removing a bond near the completed end.

3.6 VEHICLES

A. Rubber tired equipment parked for any appreciable time on a power line right-of-way can obtain a significant static charge. Vehicles should be parked no closer than 200 feet from the centerline of high voltage overhead conductors.

B. Refueling of any motor vehicles or construction equipment shall not be permitted within 100 yards of any electric overhead transmission facility unless right-of-way conditions are such that this distance is unobtainable, and the electric utility approves. If the 100 yards minimum cannot be complied with, the maximum distance possible shall be obtained, then each fuel truck shall be grounded and shall be equipped with a cable assembly capable of completing an electrical bond between the truck and any piece of equipment to be fueled. This bond must be made each and every time the refueling takes place within 100 yards of any electric overhead transmission facility prior to any part of refueling operation. This bond shall not be removed until all refueling operations are completed. Care should be taken where the cable attachments are made so that good electrical continuity is established. No fueling operations shall be carried out within 50 feet of the power transmission line.

C. At all times during construction, care must be exercised to assure that booms, cables and other equipment are no closer than 25 feet (or greater if stated in OSHA requirements or by the electrical utility) from overhead power lines. Height of conductors above ground shall never be taken for granted but should be investigated in each case. Where operator of equipment is unable to personally assess that minimum distance is maintained, a second person shall be designated to guide the operator. Consideration must also be given to the possibilities of broken cables whip lashing close to power lines. It is recommended that each piece of equipment be positioned so that, should this occur, the cable would not come closer than 25 feet to a power line.

3.7 WEATHER LIMITATIONS

A. All construction work shall be suspended in the area of overhead high voltage power lines during any potential lightning activity.

3.8 WARNING SIGNS

A. The Contractor should post adequate signs warning of possible electrical hazards at each access to the right-of-way and any other measures required to prevent public access to temporary grounding installations.

B. Warning signs shall be posted on all cranes and other hoisting equipment at locations that will always be in plain view of the operator. Said signs shall state: "Danger, do not operate any part of this equipment within 25 feet of the High-Voltage Lines." Similar warning signs shall be posted on various parts of the equipment.

END OF SECTION