BLUEBOOK

SPECIFICATIONS AND REQUIREMENTS FOR GAS INSTALLATIONS

RHODE ISLAND

June 22, 2010

nationalgrid

IMPORTANT NOTICE

REGARDING

NATIONAL GRID SPECIFICATIONS AND REQUIREMENTS FOR GAS INSTALLATIONS

These Specifications and Requirements have been designed with great care so that, when followed consistently, they will ensure that a new installation will comply with Rhode Island law, IFGC (International Fuel Gas Code), various codes and other safety requirements. Failure to comply may result in a code or safety *violation* and/or a job not being approved. Therefore, delays could result while the contractor corrects the changes at his/her expense.

The specifications, construction standards and other requirements contained in this book represent National Grid commitment to the contracting community for quality and consistency of service. Any variation from the type of hardware used, connection point of service, service entrance or other details on a construction standard must be approved in advance by National Grid in writing.

We at National Grid are always available to discuss your design concerns and to provide assistance to you. We encourage any questions regarding your problems on specific projects, please be sure to contact us for our input during the *planning* stages to avoid possible additional costs later in the job.

Edward Angelone – Gas Sales & Marketing
Paul Gugliotta – Materials & Standards/Gas Engineering
Carl Krause – Gas Sales Fulfillment / Technical Lead
Anthony Natalie - Gas Sales & Marketing
William Pike – Field Operations
Robert Polinsky – Customer Meter Services, Bellmore
Perry Sheth P.E, - Materials & Standards/Gas Engineering
Kyle Wasnieski, Customer Meter Services, Greenpoint
Robert Zabielski - Gas Sales & Marketing

TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 PURPOSE ... 1
- 1.2 SCOPE/REFERENCES ... 1
- 1.3 EXCLUSIONS; RETROACTIVITY ... 2
- 1.4 ALTERNATE MATERIALS, EQUIPMENT AND PROCEDURES ... 2
- 1.5 RESPONSIBILITY ... 2

2.0 DEFINITION OF TERMS ... 2

3.0 GENERAL ... 7

- 3.1 AREA/GEOGRAPHICAL CONSIDERATIONS 7
- 3.2 COMMUNICATION/COOPERATION ... 8
- 3.3 MEANING OF **"SHALL"** IN THIS BOOK ... 8
- 3.4 STATE AND LOCAL CODES ... 8
- 3.5 RESPONSIBILITY FOR CODE APPLICABILITY ... 8
- 3.6 INSPECTIONS, CERTIFICATES, PERMITS ... 8
- 3.7 ACCESS TO CUSTOMERS' PREMISES ... 9
- 3.8 IDENTIFICATION OF EMPLOYEES ... 9
- 3.9 UNAUTHORIZED CONNECTIONS ... 9
- 3.10 SEALS AND TAMPERING DEVICES ... 9
- 3.11 DISCONNECTION OF SERVICE ... 9
- 3.12 REACTIVATING GAS SERVICE FOLLOWING A WARNING TAG VIOLATION ... 9
- 3.13 NATIONAL GRID EQUIPMENT ON PRIVATE PROPERTY ... 10
- 3.14 DEMOLITION ... 10
- 3.15 INTERCONNECTIONS ... 10
- 3.16 BACK-PRESSURE AND SUCTION PROTECTION ... 10
- 3.17 PROTECTION WHEN COMPRESSED AIR OR OXYGEN CAN ENTER GAS PIPING ... 10
- 3.18 ADEQUACY AND SAFETY ... 10
- 3.19 CODE COMPLIANCE ... 10
- 3.20 REVISIONS OF THIS BOOK ... 11

4.0 NEW GAS SERVICE INSTALLATION PROCESS ... 11
- 4.1 GENERAL ... 13
- 4.2 REQUIREMENTS FOR HAVING A NEW RESIDENTIAL AND SMALL COMMERCIAL GAS SERVICE INSTALLED ... 13

5.0 GAS SERVICE LINE(S) ... 14
- 5.1 GAS SERVICE LINE(S) TO A BUILDING OR OTHER GAS USAGE ... 14
- 5.2 LOCATION OF GAS SERVICE LINE(S)/LATERAL(S) ... 15

5.3 SERVICE ENTRANCE……..... 15

5.4 CONNECTION POINT OF SERVICE, BROOKLYN UNION/CUSTOMER CONNECTION POINT OF GAS SERVICE 15
5.5 RESTORATION ON PRIVATE PROPERTY 15
5.6 ADDITIONAL METERS OR SERVICES..... 15

6.0 GAS PRESSURE..... 15
6.1 NOMINAL METER OUTLET PRESSURE WHEN SERVED FROM NATIONAL GRID HIGH PRESSURE DISTRIBUTION SYSTEM..... 15
6.2 METER OUTLET PRESSURE WHEN SERVED FROM NATIONAL GRID'S LOW PRESSURE DISTRIBUTION SYSTEM 16
6.3 PRESSURE AND CONTRACTOR'S PIPING ..... .16
6.4 ELEVATED METER OUTLET PRESSURE ON HIGH PRESSURE DISTRIBUTION SYSTEM 16
6.5 ELEVATED METER OUTLET PRESSURE ON LOW PRESSURE DISTRIBUTION SYSTEM 17
6.6 LOCAL CODES RELATING TO ELEVATED GAS PRESSURES 18

7.0 METERS AND REGULATORS..... 18
7.1 PREREQUISITES AND NOTIFICATIONS FOR NEW GAS METERS..... 18
7.2. METER SET LOCATION REQUIREMENTS..... 19
7.3 INSTALLATION AND INTERCONNECTION REQUIREMENTS 20
7.4 INDOOR METER SET REQUIREMENTS..... 20
7.5 INDOOR METER SET REQUIREMENTS FOR LARGE INSTALLATIONS..... 21
7.6 MULTIPLE METER HEADER REQUIREMENTS 21
7.7 METER SET PROTECTION REQUIREMENTS 21
7.8 METER HEADER PAD REQUIREMENTS FOR LARGE GAS INSTALLATIONS 21
7.9 WALLS TO SUPPORT METER HEADER REQUIREMENTS 21
7.10 RELOCATION OF GAS METER SETS 22
7.11 GAS SERVICE REGULATOR AND VENTING REQUIREMENTS..... 22
7.12 METER BYPASS REQUIREMENTS……..23
7.13 TELEMETERING INSTALLATION REQUIREMENTS 23
7.14 METER INSTALLATION, PURGING AND RELIGHTING..... 23

8.0 CUSTOMER-OWNED GAS PIPING SYSTEMS 24
8.1 GENERAL..... 24
8.2 PIPE SIZING 24
8.3 PIPING DRAWING 25
8.4 GAS PIPING MATERIALS..... 25
8.4.1 GENERAL..... 26
8.4.2 GAS PIPING MATERIALS, INDOORS 26
8.4.3 GAS PIPING MATERIALS, OUTDOORS, ABOVE GROUND 26
8.4.4 GAS PIPING MATERIALS, BELOW GROUND, GENERAL 26
8.4.5 GAS PIPING BELOW GROUND, STEEL PIPE OPTION..... 27
8.4.6 GAS PIPING BELOW GROUND, PLASTIC PIPE OPTION 27
8.4.7 GAS "PIPING" BELOW GROUND, COPPER TUBING OPTION 28
8.5 VALVES……..... 28
8.6 STEEL GAS PIPING, WELDING REQUIREMENTS 28

8.6.1 GENERAL……..…..28
8.6.2 RESIDENTIAL, COMMERCIAL, INDUSTRIAL, MULTI-FAMILY INSTALLATIONS IN NASSAU AND SUFFOLK COUNTIES 28
8.6.3 ALL PUBLIC AND PRIVATE SCHOOL BUILDINGS, INCLUDING COLLEGES 29
8.6.4 TESTING REQUIREMENTS OF PIPING AFTER THE METER…….29
8.6.5 STANDARDS FIR NON MERCURY GAUGE……..……29
8.6.6 WELDER QUALIFICATIONS……30
8.7 GAS PIPING (INDOORS AND OUTDOORS) ABOVE GROUND, INSTALLATION REQUIREMENTS, GENERAL 30
8.8 GAS PIPING OUTDOORS, BELOW GROUND, INSTALLATION REQUIREMENTS..... 31
8.9 STEEL GAS PIPING , CORROSION PROTECTION REQUIREMENTS, COATING AND WRAPPING 33
8.10 STEEL GAS PIPING, CORROSION PROTECTION REQUIREMENTS, INSULATING JOINTS 33
8.11 STEEL GAS PIPING, CORROSION PROTECTION REQUIREMENTS, MAGNESIUM ANODES 34
8.12 PLASTIC PIPING, INSTALLATION REQUIREMENTS..... .34
8.13 GAS PIPING THROUGH BUILDING WALLS, ABOVE OR BELOW GROUND, INSTALLATION REQUIREMENTS 35
8.14 PRESSURE TESTING OF GAS PIPING 36

9.0 GAS UTILIZATION EQUIPMENT 36
9.1 GENERAL..... 36
9.1.1 APPLIANCES, ACCESSORIES AND EQUIPMENT APPROVAL 36
9.1.2 INSTALLING CONTRACTOR'S RESPONSIBILITIES..... 36
9.1.3 CO ALARMS 37
9.1.4 ASSEMBLY OF EQUIPMENT 37
9.1.5 GAS UTILIZATION EQUIPMENT INSTALLED IN RESIDENTIAL GARAGES…….37
9.2 NATIONAL GRID "NATURAL GAS PRESSURE, IGNITION & DRAFT TEST" 37
9.3 GENERAL REQUIREMENTS, SPACE AND WATER HEATING EQUIPMENT INSTALLATIONS 37
9.4 COMBUSTION, DILUTION AND VENTILATION AIR (FRESH AIR) REQUIREMENTS..... 37
9.5 VENTING OF **CA**TEGORY I GAS UTILIZATION EQUIPMENT ONLY 37
9.6 VENTING OF GAS UTILIZATION EQUIPMENT - CATEGORIIES II**,** III AND IV..... 38
9.7 CHIMNEYS..... 38
9.8 SPILL SWITCH REQUIREMENTS..... 39
9.9 INSTALLATION OF HEAT PRODUCING EQUIPMENT IN FLAMMABLE OR CORROSIVE ATMOSPHERES …….39

9.10 GAS CONVERSIONS AND CONVERSION BURNER REQUIREMENTS 40
9.11 GAS FIREPLACES (VENTED DECORATIVE GAS APPLIANCES) 41
9.12 ILLIMINATING DEVICES 41
9.13 NATURAL GAS COMBUSTION ENGINES 41
9.14 COMPRESSED NATURAL GAS (CNG) STATIONS 42
9.15 UNVENTED ROOM HEATERS 42
9.16 OTHER EQUIPMEMNT 42
9.17 COMBO WATER HEATERS…….…… 42

APPENDICES

APPENDIX A SERVICE REGULATOR VENT PIPING REQUIREMENTS
APPENDIX B CHOOSING A FURNACE OR BOILER
APPENDIX C C.O. ALARM CODE
APPENDIX D PROPERTIES OF NATURAL GAS
APPENDIX E METER SIZES AND DIMENSIONS
APPENDIX F REFERENCED STANDARDS
APPENDIX G LINKS TO MANUFACTURERS

1.0 INTRODUCTION

1.1 PURPOSE

This book presents specifications and requirements relating to the connection and use of natural gas supplied from facilities. It contains the minimum acceptable standards for gas piping and gas appliance installation necessary to ensure the safe and satisfactory utilization of natural gas by our customers. The information contained herein is intended primarily to assist the installer in the new gas installation process, but it is also intended for use by our customers, by architects and engineers, and finally, by people in various departments at National Grid . It shall be used when a customer's gas installation is new, when a customer is increasing gas usage from a smaller capacity, or when any changes are made from the original installation. It represents a collection of information which will provide for a safe, properly conceived, accurately sized and cost effective installation that will give long lasting, satisfactory service to our customers.

1.2 SCOPE/REFERENCES

The contents of this book apply to installations connecting gas supply system to a customer's premises. We have made it as comprehensive as is practical, within the limits of the intended overview of the subject matter it addresses. The intent of the book is to provide a framework for the subject, not a collection of specific information from various sources. Generally, it refers to several primary documents which form its basis:

a. The International Fuel Gas Code, latest revision, referred to in the book as IFGC.

b. The Rhode Island State Codes SBC-2 “Residential 1and 2 Family Dwellings”
SBC-19 “Fuel Gas Code”

It is important to note here that in Rhode Island, It is the owner's or installer's responsibility to become aware of the requirements of the area in which the installation is to take place. The reference to the latest revision of the IFGC is intended to be followed in Rhode Island.

1.3 EXCLUSIONS; RETROACTIVITY

Unless otherwise stated, the provisions of this book shall not be applied retroactively to existing installations and/or systems that were in compliance with the Rules and Regulations/Specifications and Requirements in effect at the time of installation. In cases where modifications are being made, those modifications shall be installed to conform to the specifications and requirements of this book.

1.4 ALTERNATE MATERIALS, EQUIPMENT AND PROCEDURES

If the contents of this book are not applicable to the equipment to be installed, or if an alternate installation method or alternate usage of material is being considered that is not covered in this book, National Grid shall be contacted for definition or clarification before proceeding with the installation. Sufficient technical documentation, such as a manufacturer's written instruction, must be submitted to substantiate any claims made regarding the safety of such alternatives.

2.0 DEFINITION OF TERMS

The following definitions of terms used in this book have been assembled from various sources, and have been edited to be meaningful for use in this context and in the gas utility business.

Accessory: A device or material used to conduct gas or used in conjunction with an "appliance". In this book, some examples of accessories are valves, thermostats, appliance connectors, pressure regulators, draft hoods and interior house piping.

AGA: American Gas Association; an organization made up of most American gas utilities, producers and transporters, which sets standards and disseminates information throughout the gas industry in the interest of bettering industry practices and advancing safety.

Appliance: A self-contained device, such as a range or boiler, that converts energy into heat or other useful purpose. In this book, appliance usually relates to furnaces, boilers or water heaters.

Applicant: A potential customer.

Booster: A centrifugal blower selected to increase gas pressure when the pressure in the gas main at the customer's location is insufficient for a customer's requirements. Boosters are usually required only in industrial or commercial applications. A booster is a machine that is designed to operate on a flat pressure vs. flow curve, which enables it to provide variable flow at an essentially constant pressure. Boosters for natural gas service normally are selected to increase pressure to no more than 28" of water column (W.C.), and are normally furnished hermetically sealed.

BTU, Btu: Abbreviation for British Thermal Unit. A Btu is a unit of energy defined as the amount of heat required to raise one pound of water one degree on the Fahrenheit scale, normally from 60 degrees F to 61 degrees F.

BTUH, Btuh: Abbreviation for British Thermal Units per hour. Also expressed as Btu/Hr. A standard measure of energy input and output. Typically used in the gas utility industry as a measure of the total, or capacity, of a gas appliance, such as a boiler or a furnace.

Building: A structure that stands alone or is separated from adjoining structures by fire walls with all openings therein protected by approved fire doors. In certain applications, a party wall may be required instead of a fire wall.

CFH, cfh: Abbreviation for cubic feet per hour. A standard measure of gas flow. Generally understood to mean, and often used interchangeably with, SCFH or Scfh, or standard cubic feet per hour, meaning gas measured at "standard conditions", or 60 degrees Fahrenheit and atmospheric pressure (14.7 psia or 30" mercury absolute). Typically used in the gas utility industry to express gas flow to a customer's premises and through the customer's piping. For gas flowing at the pressures generally used in a customer's premises (about 6" W.C.), flows expressed in cfh can be assumed, for use in calculations such as determining pressure drop in piping and valves, to mean scfh, with a negligible margin of error. (This assumption is not valid for metering and billing calculations where the pressures are corrected back to 7" W. C., or 0.25 pounds per square inch [PSIG].)

Connection Point of Service: That point in the gas service line where responsibility ends and the customer's responsibility begins; or that point where gas service piping ends and customer-owned piping begins. Also known as Connection Point, Connection Point of Gas Service, National Grid/Customer Connection Point of Gas Service, Point of Delivery, Point of Service and Customer Interface. The Connection Point of Service may be located physically at different points in the piping, depending on the meter header configuration used, as defined on Construction Standards.

Construction Standard: A technical instruction, usually a drawing, but often including diagrams and tables, prepared and agreed to within National Grid as a standard method of performing a task, and used for the installation of gas facilities. See Project Manager for a copy of the latest job specific Construction Standard.

Contractor: A licensed/qualified installer of gas utilization equipment and associated piping, ductwork and controls.

Conversion, Gas Conversion: An installation where an appliance originally designed for use with a fuel other than natural gas has been modified to use natural gas, without extensive modifications to the original appliance. A typical gas conversion modifies only the burner of the appliance.

CSA - CSA International - an organization that tests equipment and accessories to insure it is suitable for use in a specific manner or certified to be listed to a specific Standard.

Customer: A user of gas. A customer may be a person, firm, partnership, corporation, association, developer, builder, or governmental agency to whom gas is supplied and billed by National Grid . All National Grid customers are provided, emergency assistance at no charge, covering generic concerns relating to the meter, the gas service, gas odor reports, low or high gas pressure, gas service outages, and other unusual conditions relating to the gas supply.

Residential Customer: A customer supplied by National Grid with gas service at premises used as his/her residence, or a landlord's residence, through a separate meter.

Commercial Customer: A customer supplied by National Grid with gas service at his/her business premises through a separate meter.

Multiple Dwelling Customer: A customer supplied by National Grid with gas service at premises used as his/her residence, but in a multiple dwelling building, normally through a separate meter, but sometimes through a common meter as conditions warrant.

Interruptible Customer: A customer supplied by National Grid with gas service at his/her business premises through a separate meter, that may be interrupted at critical times as agreed to by the contract with National Grid . These customers **shall** have the capability of burning a second fuel, when the gas service is interrupted.

***Temperature Controlled Customer*:** A customer supplied by National Grid with gas service at his/her business premises through a separate meter, that will be interrupted at an annually pre defined temperature as agreed to by the contract with National

Grid. These customers **should** have the capability of burning a second fuel, when the gas service is interrupted.

Transportation Customer: Residential or commercial customers who purchase natural gas directly from a gas supplier, rather than from a utility. The customer contracts with a gas broker, who arranges monthly with a supplier, a gas pipeline company and National Grid to have quantities of gas transported directly to him/her (the customer). Transportation customers are billed both by the gas broker and by National Grid. The broker's bill reflects the commodity cost, the transportation cost (interstate pipeline) and the broker's commission.

***Customer Owned Piping*:** Is defined as all piping above ground and below ground installed after the meter. It is the customer's responsibility to install, test, maintain and keep records of this piping.

Dekatherm: A therm multiplied by 10 (10 therms). A commonly used quantity of gas used for billing purposes. Also see ***therm.***

Elevated Pressure Gas supplied to a customer's equipment at pressures greater than 7" W.C. (0.25 PSIG).

Easement: Right to pass over, occupy or use another's land for the placement and access of company service facilities.

Fire Wall*:* Similar to a Party Wall in construction, is generally an *internal* wall. However, openings, between adjoining areas, such as fire doors, or extensions of facilities, are permitted in firewalls. Both party walls and firewalls may have different construction requirements and/or different fire ratings, depending on the type of building. Consult state and local codes for further clarifications.

Gas Business Lead: The National Grid Gas Sales and Marketing employee who is the prime contact for the customer when a new installation or a conversion is undertaken. The Gas Business Lead provides economic, technical and policy information regarding the use of natural gas for all applications; e.g. heating, water heating, process uses, etc. ***New Construction Representatives*** handle gas heating for all new home and development construction and ***Commercial and Industrial Representatives*** handle the ***Commercial Industrial and Multi family*** market. ***Key Account Executives*** handle large buildings and chain accounts (e.g. schools, hospitals, department stores).

Gas Distribution System, Low Pressure: A gas distribution piping system in which the pressure is substantially the same as the standard pressure delivered to the customer and where service regulators are not installed.

Gas Distribution System, High Pressure: A gas distribution piping system in which the pressure is nominally higher than the standard pressure delivered to the customer and therefore requires a service regulator. gas distribution system may furnish gas to the customer's service location at several different pressures, depending on the geographical area served. For the purposes of this book, all pressures are referred to as high pressure. For information, pressures serving the areas may be: Intermediate - nominally *50"* w.c. (2 psig); Medium nominally 5 or 15 psig; or high 35-99 psig or higher.

Gas Service, Gas Service Line: A gas service, or gas service line, is the pipe that provides gas from a gas main in a public area to a customer's building. The gas service is installed and owned by National Grid in most cases. ***Gas service line means the piping, including associated metering and pressure reducing device(s), that transports gas below grade from a main to the outside of the building foundation wall where the meter is located outside the building. If the meter is located inside the building, the service line terminates at the first accessible fitting inside a wall of the customer's building.*** In some specific cases, because of unique physical conditions, contractor installed, buried, customer-owned piping must be ***treated as a gas service,*** and must therefore be installed in strict accordance with Section 8 of this book.

Gas Technical Lead: The National Grid person from the Gas Sales Project Management or C.M.S. (Customer Meter Services) who is the technical contact for the customer when a new installation or a conversion is undertaken.

IAS: International Approval Service – An organization that tests equipment to insure it is suitable for use in a specific manner.

Integrated Schedule: Also National Grid/Builder Integrated Schedule. A preliminary schedule used in RUD projects as well as selected commercial gas-only jobs, that specifies design and construction activities, milestones and commitments agreed to between National Grid and the builder(s).

Installer: See Contractor.

Labeling: "appliances shall be listed and labeled" (no longer MEA required, OTCR (Office of Technical Certification and Research) created to recognize code-prescribed and alternative materials)

Listed: Equipment or material included in a list published by an organization acceptable to National Grid, such as the IAS or Underwriters Laboratories (UL) **MEA**, and concerned with product evaluation that maintains periodic inspection and evaluation of the production of listed equipment or materials. A typical listing states that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

Low Pressure Service: Gas supplied to a customer from a low pressure gas main.

Meter: The instrument used to measure and indicate and/or record the volume of gas that has been delivered to a customer.

Meter Bar: A specialized item of hardware that functions as a connecting device between the gas service line and the gas meter.

Meter Set: The term used to describe the meter and its related piping and equipment. Often synonymous with ***meter header, meter installation.***

Meter Header: The piping and equipment installed at a customer location relating to and in support of the meter.

Multiple*-Family *Building: A structure, including row houses, enclosed within exterior walls or fire walls, built, erected and framed of component structural parts, and designed to contain five or more individual dwelling units for permanent residential occupancy.

Multiple Services to a Building - only one service will normally be permitted to a building; a separate building shall consist of either a detached, separate structure, or an attached structure separated from the first structure by a party wall.

Nominal: The standard pressure at which National Grid furnishes gas to customers. Nominal pressure depends on the pressure of gas main at a given installation. When served from a high pressure main, nominal pressure is ***6" W.C.*** When served from a low pressure main, nominal pressure can vary from 4.0" W. C. to 9.5" W. C. Nominal pressure is taken to be the pressure measured at the connection point of service. See Section 6.0 of this book for more information.

Party Wall: A party *wall shall* contain no openings therein. A party wall shall be continuous from the lowest floor level of the building through the roof membrane, and shall terminate in a two foot parapet (except where properly sealed at the roof level). Party walls shall bear the proper fire rating as per the State and local Codes, and shall be smoke tight at the exterior walls. They shall also be capable of supporting either side of the roof assembly in the event of a collapse.

Project Manager: National Grid's primary contractor liaison for large volume equipment installations. The PM is responsible for many of the new gas equipment installations in the non - Residential (other than 1 to 5 family) markets.
To qualify to be a PM installation the site requires either a new or replacement gas service to be installed , or any added load with a cumulative of 500 cfh or above. PMs also handle all new or replacement Temperature Controlled installations (T.C.)

Regulator: A device used to reduce the pressure of gas from a higher pressure at its inlet to a lower pressure at its outlet, maintaining that pressure essentially constant, while also controlling the flow of gas; usually mounted directly in gas piping.

Regulator, Line: A regulator (see definition above) used on elevated pressure installations (pressures greater than the nominal 6" W.C.), that is mounted in the house line between the service regulator and the appliance regulator, and reduces gas pressure from that elevated pressure to the typical nominal houseline pressure of 6" W.C.

***Regulator, Service*:** A regulator that reduces and controls gas main pressure to the pressure of the customer's house line. Usually set by National Grid to supply gas at 6" W. C., gas at a higher pressure can be furnished if the end-using equipment is specified by the manufacturer to require a higher pressure. This regulator is furnished, installed and maintained by National Grid.

Regulator, Appliance: A regulator (see definition above) mounted at the appliance, (normally furnished with the appliance) that reduces the house line pressure to the pressure utilized by the appliance.

School: A place, public or private, where children or adults gather for educational purposes.

Security Valve: A control valve, installed on a meter header, usually for a large load, that is set to close automatically upon sensing one or more gas parameters, usually high and low pressure. A meter header using a security valve is normally designed by National Grid.

Sediment Trap: "a tee fitting with a capped nipple in the bottom opening of the run of the tee or other device approved as an effective sediment trap – to collect solid foreign particles to prevent such material from entering close-fitting parts or small passageways (e.g., valves and orifices)

Service Riser: (Sweep el) That portion of gas service line where the piping comes out of the ground.

Tariff: A compilation of written definitions, statements, rates, rules and regulations that together describe basis for doing business, and that have been approved by the Rhode Island Department of Public Utilities.

Technical Lead: See Gas Technical Lead:

Therm: A unit of heating value equivalent to 100,000 BTUs. Gas is normally billed by the therm, or by the decatherm, which is a therm multiplied by 10 (or 10 therms). A cubic foot of gas is generally equal to 1,000 - 1,060 BTUs as supplied by National Grid .

UL: - Underwriters Laboratory - an organization that tests equipment and accessories to insure it is suitable for use in a specific manner or certified to be listed to a specific Standard.

W.C., w.c.: Water column; the standard scale of measurement, expressed in inches of water colunm, used in the natural gas industry to measure gas pressure. The units of inches of water column (W.C.) are commonly used for pressures below 1 psig. 1 psig = 27.8" W.C. Gas customers are typically furnished natural gas at a pressure of 6" W. C. which is about 1/4 psig.

3.0 GENERAL

3.1 AREA/GEOGRAPHICAL CONSIDERATIONS

The working area of National Grid Energy's Gas Business Unit encompasses the entire State of Rhode Island. The reader is strongly encouraged to check with the village, town, city and county governments applicable to his/her installation, to determine if regulation changes have been made, or to determine if any new regulations have been enacted, since the creation of this document.

NOTE:

The knowledge of the existence or absence of regulations within a given jurisdiction is the responsibility of the contractor.

3.2 COMMUNICATION / COOPERATION

It is our goal at National Grid to ensure that all of our customers experience safe, trouble-free and dependable gas service. Achievement of this goal begins early in the process of any gas installation. We believe that this can best be accomplished through close cooperation and communication with our customers and their contractors, to assure a quality job, during all phases of the planning and installation of a gas service. Therefore, it is vital that both customer and contractor provide us with preliminary information as early as is feasible in the development of plans for the installation of a new gas service or an increase in gas load. With this information we can ensure that the scheduling of our construction work, meter installation and other service work is appropriate. It will also provide us with an early opportunity to advise customers and contractors if any unique job characteristics exist concerning gas equipment and metering facilities. This kind of communication and cooperation, along with careful adherence to the instructions and specifications in this book, is crucial in preventing delays at any point in a job, and avoids problems that may be difficult to correct later on. We believe that this is the most effective way to ensure complete customer satisfaction with our gas service.

3.3 MEANING OF "**SHALL**" IN THIS BOOK

When used in this book, the word **shall** is to be understood to mean that the contractor/customer must comply to the fullest extent with the specification, action or physical requirement described. Failure to comply will result in refusal to provide a meter or connect to our gas system.

3.4 STATE AND LOCAL CODES

The specifications and requirements in this book are intended to supplement or amplify any State code or ordinance. If a conflict exists between a National Grid requirement and a State code requirement, the more stringent shall apply. **It is the Contractor's responsibility to be aware of the code requirements for the area of his installation. National Grid does not assume the obligation of enforcing State code requirements.**

3.5 RESPONSIBILITY FOR CODE APPLICABILITY

The use of the information and standards contained in this book by any contractor in no way releases them from the responsibility of becoming aware of and implementing state or national codes that may be applicable in the location where the installation is located, except that the standards and requirements contained herein **shall** always apply when they are more stringent.

3.6 INSPECTIONS, CERTIFICATES, PERMITS

If the local jurisdiction where an installation is being planned requires an inspection, a certificate or a permit, it is the owner /contractor's responsibility to make the appropriate arrangements.

3.7 ACCESS TO CUSTOMERS' PREMISES

National Grid shall have the right of access, at all reasonable times, to all its property installed in or on the customer's premises. This shall include items such as buried service lines and valves, exposed service lines and valves, gas meters, gas regulators, or gas regulator vents. National Grid shall reserve the right to erect, remove, operate, or maintain our facilities, and to read and test our gas meters on the customer's premises.

3.8 IDENTIFICATION OF EMPLOYEES

Every National Grid employee who is authorized to enter the customer's premises for the purpose of reading or testing meters, investigating odor complaints, or for other purposes, is supplied with an identification card bearing his/her photograph. Employees must, upon request, show their identification cards. If anyone claims to represent the Company and fails to display an identification card upon request, the customer is advised to deny admittance to that individual and to notify both National Grid and the police.

3.9 UNAUTHORIZED CONNECTIONS

National Grid shall have the sole right to make all gas service connections to its gas distribution system.

3.10 SEALS AND TAMPERING DEVICES

No person, except a duly authorized National Grid employee/contractor **shall** be permitted to break or replace a seal or lock, to alter or change a gas meter or its connections or location, open or alter a meter by-pass valve, or to alter a gas pressure regulator setting.

3.11 DISCONNECTION OF SERVICE

National Grid possesses the sole right to disconnect, remove or reset gas services and/or meters, and to admit gas to any new system of piping or to any old system of piping from which the use of gas has been temporarily discontinued. When installers find it necessary to disconnect a meter or to temporarily shut off the gas, they are requested to re-connect the meter and to re-light the appliance. It is not necessary to call National Grid.

3.12 REACTIVATING GAS SERVICE FOLLOWING A WARNING TAG VIOLATION

3.12.1 When National Grid issues a Warning Tag to the customer that involves shutting off the gas supply to an individual appliance and/or a particular section of gas piping due to a hazardous condition, service does not need to be restored by National Grid. Once repaired, gas service may be restored to the effected appliance and/or piping by a licensed qualified contractor.

3.12.2 When National Grid issues a Warning Tag that involves the gas supply being shut-off and locked at the meter, the contractor or customer shall notify National Grid that the hazardous condition has been corrected and request that National Grid turn on the gas supply.

3.13 NATIONAL GRID EQUIPMENT ON PRIVATE PROPERTY

All National Grid equipment located on the customer's premises, such as the gas service line, meter, regulators, meter piping, etc., remain National Grid property, and may be removed by National Grid in the event such equipment is no longer needed.

3.14 DEMOLITION

Prior to any demolition of any existing building where gas and/or electric service is installed, the gas and electric must be shut off and the gas service lateral cut by National Grid at the property line. No building demolition shall be started until gas meters and regulators have been removed and the gas service has been retired (physically disconnected) by National Grid. **Call (781) 466-5496**

3.15 INTERCONNECTIONS

A supplementary fuel supply for stand-by use can not be connected downstream of a gas meter.

3.16 BACK-PRESSURE, AND SUCTION PROTECTION

When the nature of a customer's utilization equipment may induce back-pressure or suction in the piping system carrying gas, suitable protection devices shall be installed and maintained by the customer. The contractor is referred to IFGC. National Grid's project manager should be contacted when this application is to be used.

3.17 PROTECTION WHEN CQMPRESSED AIR OR OXYGEN CAN ENTER GAS PIPING

Protection is required whenever an installation uses compressed air or oxygen that might accidentally, or for other reasons, cause air or oxygen to enter the gas piping. Protection devices shall be installed and maintained by the customer, National Grid's project manager should be contacted when this application is to be used.

3.18 ADEQUACY AND SAEFTY

National Grid shall not be required to supply gas service until the customer's installation has been approved by the local authorities having jurisdiction. National Grid reserves the right to withhold its service or discontinue its service, whenever an installation or part thereof is deemed by National Grid to be unsafe, inadequate or unsuitable for receiving service or interferes with or impairs the continuity or quality of our service to our customers or to others. An example of a situation where National Grid will refuse service is that in which a piping pressure test shows unacceptable results.

3.19 CODE COMPLIANCE

Gas appliances and gas piping installations on the customer's premises shall be installed in compliance with the minimum safety requirements of these standards and the IFGC and or the National Fuel Gas Code. These provisions shall be applicable to new installations and to modifications of existing appliances or systems. Any appliance or system found to be in non-compliance with National Grid standards or other applicable

codes shall be subject to the provisions of Warning Tag Procedure (see Definitions, Section 2.0).

3.20 REVISIONS OF THIS BOOK

The information in this book will be periodically revised, updated or amended **on-line only** as required by industry developments to protect the mutual interest of the customer and National Grid. The printed versions will no longer be available and shall not be referenced any longer. The on-line version will be the only valid issue of the Blue Book.

4.0 NEW GAS SERVICE INSTALLATION PROCESS

4.1 GENERAL

4.1.1 To initiate a new gas installation or to advise National Grid of an additional gas load, call **1-877-MyNGrid**, and a Gas Marketing and Sales Telerep will coordinate your request.

4.1.2 A logical progression of events and requirements for having a new gas service installation is provided in Section 4.2. It is important for contractors and customers to become familiar with this material in order to determine how a new gas service installation or a conversion progresses through the National Grid system.

4.1.3 For any new installation, the customer or his/her contractor shall provide National Grid with verifiable load information including:

- Gas pressure required at service termination point,
- New, existing and future projected loads.

Information provided to National Grid by the customer or his/her contractor regarding a proposed gas installation or an increase in load shall generally be required in writing.

4.1.4 The applicant or customer shall furnish at the premises, at his/her expense, appropriate piping and equipment for gas utilization purposes. Piping shall comply with requirements in Section 5.0, 7.0 and 8.0 of this book. Gas utilization equipment shall comply with Section 9.0 of this book.

4.1.5 Customers already using gas service from National Grid shall advise the company of any addition or substantial change in his/her equipment, such as increasing a boiler size to accommodate a new building wing or adding a swimming pool heater, or generator, prior to making such additions or changes. Any requests for equipment requiring pressure greater than **3.5" w.c.** must be approved by National Grid before the equipment is purchased. In some instances elevated pressure is not available.

4.1.6 For all new installations, the customer shall be expected to provide, at his/her expense, any and all permits or certificates (except street excavation permits)

usually issued by public agencies, that are associated with piping and appurtenances downstream of the meter, as part of the requirements in furnishing gas service downstream of the meter. Any easements required for the job shall also be provided by the customer at his/her expense. Plumbing permits shall be obtained by the plumbing contractor.

4.1.7 National Grid shall not be obligated to begin construction on the gas service or to supply gas to the customer until:

- The applicant furnishes all necessary permits to National Grid, and easements and/or rights of way are granted;
- The customer's application has been approved by proper officers or duly authorized representatives of the company;
- Necessary payments are made by the applicant;
- A signed contract between the customer/owner and the contractor is provided to National Grid.

4.1.8 Prior to the beginning of every job, when the Gas Business Lead deems appropriate, meetings will be held as required. At these meetings, the design and construction process will be discussed. The meetings will be arranged so that the various contractors, Gas Business Lead and Project Manager , and any other relevant representatives will be able to attend.

4.1.9 For residential and smaller commercial jobs, a planned meeting will occur before the job begins, when deemed necessary by the Gas Business Lead. For large jobs, the following planned meetings will be held:
1. A "Design" meeting at the planning stage, before many utility locations details have been worked out; and
2. An "Installation" meeting, when excavation is about to begin, and drawings are available. To provide for a well organized and trouble-free job, it is strongly recommended that, as a minimum, the General Contractor, the Plumbing and HVAC contractors attend. The agenda will include Integrated Schedule and Rules and Regulations for Gas Installations, and other relevant items affecting the job, such as locations of utilities, trenching, regulator vents, relevance of tariffs to the job, and any other potential problems regarding the job. National Grid shall coordinate these meetings and contact the appropriate parties. Other meetings will also be encouraged in order to provide for smooth and trouble-free jobs.

4.1.10 Appendix B contains requirements for construction and other information relating to the construction process. This material is intended to assist in providing a better understanding of needs, thereby allowing for better planning on a job. Although many of the materials and issues covered in this Appendix are relevant to National Grid oriented installations, the information presented is valuable for any installation in terms of understanding construction policies and philosophy.

4.2 REQUIREMENTS FOR HAVING A NEW RESIDENTIAL AND SMALL COMMERCIAL GAS SERVICE INSTALLED

4.2.1 Upon contacting the Telerep, advise if the installation is a residential, commercial or industrial building, and, if you are a builder. The Telerep will determine if gas is available at your location. If gas is available, the Telerep will assign the job to the appropriate sales representative or Gas Business Lead, who will then identify the proper application forms and send them to you along with a packet of relevant information. Residential applicants may initiate the application process by telephone. Commercial and industrial customers are required to initiate their applications in writing.

Please note that if gas is not immediately available in your area, the information in the following sections is not necessarily applicable. The Telerep will explain the process to be used.

4.2.2 The Gas Business Lead assigned to you will help determine the Rate and Service Classification most favorable to your current requirements. National Grid does not warrant that the choice will be most favorable to all possible future requirements of any applicant or customer.

4.2.3 The customer is advised that a search will be made regarding the gas history of the premises with National Grid, as well as the history of the individual applicant. If any credit arrears are reported or meter tampering or theft of service is found, it is possible that service could be denied.

4.2.4 Following receipt of the application, the Gas Business Lead/or Project Manager will schedule a field visit to the location and if the job requires a service only, will determine the preferred meter location with the customer.

4.2.5 For installations requiring a service only, the National Grid Gas Business Lead will cosign an application with the customer. In addition, National Grid must see a signed contract between the customer/owner and the contractor before National Grid will begin work. No exceptions will be made to this requirement.

4.2.6 National Grid will install the required facilities in accordance with a mutually agreed upon Customer/National Grid Agreement Date. The Gas Marketing and Sales organization will track the installation with the contractor and customer for a timely completion and meter set, assuming all permits have been properly obtained.

Note:

The installation schedule is not applicable to gas main installations, but only to residential and small commercial gas services

4.2.7 It is the contractor's responsibility to obtain any necessary certificates or permits from governing authorities to ensure that a meter is set on the agreed upon date. In addition, it is the contractor's responsibility to arrange for pressure tests.

4.2.8 When an installation requires both gas main and service, the Gas Business Lead will sign an application with the customer indicating the date and arrange for field measurements and design of the needed gas facility.

Note:

It is the contractor's responsibility to arrange a pressure test with the authority having jurisdiction to ensure that a meter is set by the agreed upon date. Pressure tests on commercial and industrial installations shall be witnessed by the local agency.

4.2.9. On conversion from liquid or solid fuels to gas, it is recommended that the chimney should be cleaned and inspected, by the installing character.

5.0 GAS SERVICE LINE(S) TO A BUILDING OR OTHER GAS USAGE

5.0.1 National Grid will normally provide only one gas service to a building, unless the need for more than one service is deemed necessary by Gas Technical Lead. Depending on the locality, more than one service to a building may require approval from the local authority. See 5.1.3.

5.0.2 If Gas Technical Lead determines that more than one gas service is required to supply gas to a building, the local codes may require that the structure be built using party walls to isolate each area served by a gas service.

5.0.3 In Rhode Island, when more than one gas service is installed in a building, a permanent, weather resistant placard shall be prominently placed near each building entrance point to provide accurate information on the number of services to the fire department when isolation of the gas service is required. It is the contractor's responsibility to provide for the installation of, and the customer's responsibility to maintain, the placard.

5.1 LOCATION OF GAS SERVICE LINE(S)/LATERAL(S)

5.1.1 For new construction, National Grid will install gas service piping in areas free of paved driveways or other paved areas. If it becomes necessary to locate a gas service line where it will be under a driveway or walk, the contractor shall not pave the driveway or walk until the gas service line has been installed. Alternately, the customer may opt to install a PVC sleeve a minimum of 18" below grade in the area to be paved through which the gas service can be installed after the paving installation. This should first be discussed with National Grid who will advise the correct size sleeve and location, and obtain approval for the installation.

5.1.2 The contractor shall notify Technical Lead as early as possible of any such paving as indicated in Section 5.3.1.

5.1.3 A new gas service line shall not be installed under or through buildings. Where it is deemed prudent to install a gas service under an enclosed porch, or similar areas occupied by people (such as a sidewalk cafe), National Grid shall install the service through a continuous steel sleeve, up to one foot on either side of the

enclosure above it (e.g., the porch), and shall seal and vent the sleeve above grade to the atmosphere.

5.1.4 National Grid shall designate the exact location of the meter and service riser.

5.1.5 Any change requested by the customer to the location of an existing service line, if approved by National Grid, shall be made at the expense of the customer. The customer shall be responsible for hiring a contractor to install gas house line piping, meter header, regulator vent piping and/or interconnections with facilities.

5.2 SERVICE ENTRANCE TO EXISTING BUILDINGS

5.2.1 Where the service enters the building underground through a poured concrete wall, a sleeve for the gas service shall be installed by the builder during construction. Technical Lead shall designate the size and location of the sleeve.

5.2.2 Service Entry to Existing Buildings - Where an inside meter location has been selected, the gas service entry point below grade shall be enclosed in a protective pipe sleeve following specification. The boring of the entrance hole, excavation, installing the sleeve and, sealing of the space between the sleeve and gas piping, shall be the responsibility of National Grid.

5.3 CONNECTION POINT OF SERVICE, NATIONAL GRID/CUSTOMER CONNECTION POINT OF GAS SERVICE

5.3.1 The connection point of service (that point in the gas service line where responsibility ends and the customer's responsibility begins) shall be defined physically according to the applicable Construction Standard.

5.4 RESTORATION ON PRIVATE PROPERTY

5.4.1 For private property an agreement will be made before work begins on the restoration of the property. The amount of restoration performed by National Grid will be determined on a case by case basis.

6.0 GAS PRESSURE

6.1 NOMINAL METER OUTLET PRESSURE WHEN SERVED FROM HIGH PRESSURE DISTRIBUTION SYSTEM

6.1.1 On the high pressure portion of its distribution systems, where a service regulator is installed in conjunction with the gas meter, National Grid provides gas to customers at a nominal pressure of 6” W.C. The nominal pressure is measured immediately downstream of gas meter or service regulator, whichever is further downstream.

6.1.2 Operating / Running pressure at the meter or regulator outlet typically can be as high as 7" W.C. or as low as 4" W. C. and can vary slightly for each installation depending on load diversity, pressure drops through the meter set piping, service regulator performance, and pressure drop through the gas meter.

6.1.3 When purchasing gas utilization equipment to operate on gas from high pressure distribution system, it is recommended that equipment be chosen to function effectively based on nominal pressure of 6" W. C. at the outlet of the meter or service regulator, whichever is further downstream.

NOTE:

It is policy, whenever practicable, to deliver the minimum meter outlet pressure to meet the requirements of the customer's gas utilization equipment to ensure safe, efficient operation of all properly adjusted appliances. In all cases, National Grid has the sole responsibility for the determination of which gas distribution system, low pressure or high pressure, will supply the approved load and what gas pressure can be supplied.

6.2 METER OUTLET PRESSURE WHEN SERVED FROM NATIONAL GRID LOW PRESSURE DISTRIBUTION SYSTEM

6.2.1 On the low pressure portion of its distribution systems, where no service regulator is installed, National Grid provides gas to customers at the front wall (point of entry) of pressure that can vary between 4" and 9.5" W. C. When purchasing gas utilization equipment to operate on gas from low pressure distribution system, it is recommended that the equipment be chosen which requires no more than 3.5 W.C. pressure at the burner.

6.3 PRESSURE AND CONTRACTOR'S PIPING

6.3.1 The contractor shall ensure that the customer's house line and all associated interconnecting piping into system are properly sized to prevent excessive pressure losses at the gas utilization equipment. The contractor must also ensure that the customer's installed gas utilization equipment is compatible with available nominal gas pressure. Contractors are advised that the gas pressure available at the inlet of the manufacturer's burner gas train (before the appliance regulator) will be equal to the pressure at the gas meter outlet MINUS the pressure drop in the customer owned gas piping system.

6.4 ELEVATED METER OUTLET PRESSURE ON HIGH PRESSURE DISTRIBUTION SYSTEM

6.4.1 In certain instances, such as with industrial processing or commercial equipment, there may be a need for gas pressure higher than nominal 6" W.C. at the meter outlet.

Elevated pressures are not available throughout the entire service territory, thus all requests for elevated pressure must be approved in advance by the National Grid Project Manager or by Gas Sales and Marketing.

6.4.2 If elevated pressure is requested, National Grid will normally supply gas pressures of 1/2 PSIG or more in increments of 1/2 PSIG for commercial and industrial customers. National Grid will supply elevated pressure to a customer on a case by case basis. Please note that special permission may be required

from local authority having jurisdiction in certain situations. Fixed factor metering can be used to meter ½ psig installations when a diaphragm meter is used and up to 1 psig on a rotary meter. These meter sets will utilize threaded piping and fittings. When a pressures greater than 1 psig is required and low flow conditions require metering at that pressure (rather than line pressure), these meter sets MUST be welded by National Grid at the Customer's expense.

6.4.3 If the customer needs elevated pressure because of gas utilization equipment requirements, the customer or customer's contractor shall provide the appropriate information in writing to support the elevated pressure request. This information shall be submitted to National Grid as soon as possible for evaluation and approval.

6.4.4 Along with the customer's application, the customer shall provide National Grid with the manufacturer's specifications for the gas utilization equipment. The literature furnished shall provide an explanation of the need for elevated gas pressure requirements. Upon verification of the equipment pressure requirement, if the above acceptance criteria are met and the National Grid gas system at the location can supply the elevated pressure, National Grid will furnish gas to accommodate the higher pressure need.

6.4.5 The customer shall be responsible to pay for any additional costs associated with the meter set when the construction estimate does not pass revenue test.

6.4.6 The minimum design pressure in high pressure distribution system varies depending on differing loads and weather conditions, as well as normal periodic maintenance within system. These factors can cause occasional periods of low gas pressure in the customer's houseline. Therefore, it is policy to supply gas at the meter outlet or regulator of a value no greater than the minimum pressure of high pressure gas main serving that area.

NOTE:

Customers, Owners and/or Contractors shall contact National Grid if they are planning to make any additions or modifications to a gas piping system so that National Grid may provide a safety review of your plans.

6.4.7 Under certain conditions where the customer's load requirements and gas utilization equipment qualify, National Grid will discuss with the customer the availability of supplying line pressure where there is no service regulator at the meter header. In these cases, the customer is advised that the gas pressure would vary nominally with any variations in high pressure gas distribution system.

6.5 ELEVATED METER OUTLET PRESSURE ON LOW PRESSURE DISTRIBUTION SYSTEM

6.5.1 In certain geographical locations, only low pressure gas is available via gas distribution system. In these areas, if elevated meter outlet pressure is required, a gas booster may be necessary. Contact the Project Manager for details.

6.6 LOCAL CODES RELATING TO ELEVATED GAS PRESSURES

6.6.1 When gas pressure greater than the nominal 6" W.C. is required, the code requirements of the prevailing jurisdiction shall also be met along with requirements. Contractors shall be familiar with these codes and obtain any necessary approvals from regulating agencies before submitting the application to National Grid.

7.0 METERS AND REGULATORS

7.1 PREREQUISITES AND NOTIFICATIONS FOR NEW GAS METERS

7.1.1 At least one gas appliance, properly installed and connected to the gas piping system, is required as a prerequisite before National Grid will install a new meter and turn on the gas supply to the customer.

7.2. METER SET LOCATION REQUIREMENTS

7.2.1 All meter sets shall be located on the outside of any building unless it is impractical or unsafe.

7.2.2 All meter sets shall be installed following the clearance requirements indicated in IFGC code books as well as National Grids Blue Book.

7.2.3 Outside and inside gas shut-off valves shall be readily accessible at all times to National Grid and emergency service personnel and shall not be covered or obstructed.

7.2.4 The installation of meter sets in driveways, under windows, under building overhangs or near fresh air intakes should be avoided where practical. In those cases where the regulator vent cannot be located to meet clearance requirements, National Grid or contractor shall be responsible for installing regulator vent piping. Check with Gas Technical Lead

7.2.5 Meter set locations shall be sufficiently removed or separated from the bottom termination of a stairway so as not to constitute a hazard. When required distances cannot be maintained, such as for buildings with limited width, the contractor shall be required to provide suitable protection.

7.2.6 Outdoor and indoor meter set locations that may be exposed to vehicular or other equipment damage shall be avoided unless no other feasible location exists. If one or more of the criteria in Section 7.7 of this book are met, protection posts shall be required. National Grid, or the contractor installing the service shall provide protection posts protecting the service at the time the riser is installed. The customer will supply and install all protection posts to protect all piping downstream of the riser. Protection posts are in be installed per National Grid Construction Standard MTRS6060.

7.2.7 Meter sets shall not be installed below ground in vaults

7.2.8 The metering of large quantities of gas or the installation of meter sets and regulators in schools, commercial buildings or industrial buildings, including multiple meter headers, may require meter rooms, or special construction or piping. Consultants and installers of such facilities are advised to consult with Gas Project Manager to discuss what to expect regarding role and their own role in preparing for the upcoming installation.

7.2.9 Although it is not desirable and should be avoided, gas meters may be placed under windows provided that the following conditions are met:

- No other suitable location is available
- Proper regulator venting is provided

7.3 INSTALLATION AND INTERCONNECTION REQUIREMENT

7.3.1 The meter header shall be installed according to the National Grid construction standard.

7.3.2 National Grid will supply and install, at the time of meter installation, the meter swivels, nuts, bolts, and gaskets required to connect the meter to the meter header.

7.3.3 When National Grid installs the meter header, the contractor shall be responsible for houseline interconnections. Houseline interconnection to the meter set and the installation of service regulator or relief valve venting shall be performed according to National Grid specifications as provided in the appropriate National Grid construction standard(s) Check with the Gas Technical Lead if you are required to run vent piping for proper sizing.

7.3.4 Exceptions to the approved construction standards shall be reviewed and approved through National Grid before the start of construction.

7.3.5 Horizontal meter headers or very Large volume customers, the meter header will be custom designed and installed by National Grid.

7.3.6 Piping and fittings used on outside meter sets shall be welded and painted steel pipe, or screwed and painted black pipe. See Section 8.0 of this book for piping requirements regarding materials, coatings and construction.

7.3.7 The customer's pipe connecting to the meter header shall be installed and supported following the IFGC, and National Grid Construction Standards

7.3.8 Prior to requesting a meter installation, the contractor shall be responsible for the installation of plugs or caps on any open ended pipe or fittings on the meter header or customer house line to prevent entry of dirt and debris ensuring the integrity of the gas piping system.

7.4. INDOOR METER SET REQUIREMENTS

7.4.1 Meter sets shall be approved for indoor installation only when, in judgement, an outdoor installation is impractical or unsafe.

7.4.2 Indoor meters shall be installed according to the National Grid Construction Standards only when outside locations are unattainable.

NOTE:

In cases where the service regulator must be installed inside the building, the service regulator and meter shall be located immediately downstream of the exposed service line valve.

7.5 INDOOR METER SET REQUIREMENTS FOR LARGE INSTALLATIONS

7.5.1 Where practicable, the regulator, valves and other gas equipment shall be installed within a separate room that is designed for two-hour fire resistance and effectively sealed from the remaining space in the building. These meter rooms shall also meet all code requirements.

- The customer shall post a notice prohibiting unauthorized persons from entering the meter room to prevent tampering. A conspicuous and permanent notice shall be posted on doors or access leading to the specific installation indicating the actions to be taken, and the telephone number of the proper person to be called, in the event a gas odor is detected. The lettering shall be of bold type, at least one inch in height, properly spaced to provide good legibility and contrast with background.

- Gas meter rooms shall be properly ventilated, lighted, and kept free of trash and rubbish at all times. Outside air for ventilation of a meter room shall be furnished as a separate supply, and shall not be shared with any other room.

- Meter rooms **shall not** be used for storage purposes, including building materials or equipment.

- Meter rooms **shall not** be used in the volume calculation in determining the combustion and ventilation air available for gas utilization equipment.

- Any public hall above the basement or above the lowest story if there is no basement;

7.5.2 For a retrofit or expansion in a multifamily dwelling in Rhode Island, where a gas meter is already installed in a boiler room, one addition gas meter may be installed provided the additional meter is:

- Installed adjacent to the existing gas meter;

- Is used in conjunction with the supply of gas for a gas fired heating boiler or a gas fired water heater used as a central source of supply heat or hot water for tenants.

7.6 MULTIPLE METER HEADER REQUIREMENT

7.6.1 Gas meters, along with associated customer owned piping at multiple meter locations, shall be plainly identified by the installing contractor using a metal tag or other permanent means. These markings shall clearly identify the building or part of the building being supplied by the piping on each meter. These markings shall be completed by the contractor before National Grid will install the gas meter and turn on the gas supply.

7.7 METER SET PROTECTION REQUIREMENT

7.7.1 When a customer cannot provide either an indoor or outdoor location for meters, regulators and associated piping that is free from the possibility of vehicular, equipment or other physical damage, the Customer will provide protection posts according to National Grid Construction Standards**.** The Customer is responsible for the installation of these posts. Such instances include locations near vehicles, or materials in motion, driveways, parking areas, storage rooms, or other similar situations. National Grid will not install the meter until this requirement is completed. National Grid will install any posts required to protect the gas riser at the time of the Gas Service Installation.

7.7.2 In areas where vandalism might be anticipated, a protected meter area may be required, or meters may need to be protected by a suitable wire fence if specified by National Grid. Specified protection shall be installed according to the National Grid Construction Standard.

7.7.3 It is National Grids position that, when the specifications established in National Grid Construction Standard MTRS6060 are not followed, National Grid will not set the new meter until adequate protection is provided.

7.8 METER HEADER PAD REQUIREMENTS FOR LARGE GAS INSTALLATIONS

7.8.1 The customer shall be responsible for the installation of a concrete gas meter pad for all rotary and turbine meter installations where a meter pad is required. Meter pads are required to support the weight of the meter and its associated gas header piping, valves and in some cases the weight of gas house line interconnection piping.

7.9 WALLS TO SUPPORT METER HEADER REQUIREMENTS

7.9.1 Vertical headers do not require a wall to support the piping, meter, and regulator.

7.9.2 In cases where National Grid Construction Standards shows meter set piping supported by a wall, a wall shall be constructed to support the meter set if one does not already exist. In some cases, where a wall does not exist, a horizontal meter set may be specified instead if space requirements are adequate.

7.10 RELOCATION OF GAS METER SETS

7.10.1 Gas meter relocation, such as moving a meter from one outdoor location to another outdoor location, or from an inside location to an outdoor location, shall be performed at the customer's expense. It is National Grid policy to avoid

moving any inside meter to another inside location, or an outside location to an inside location unless no other feasible location can be reasonably found.

7.10.2 To request meter relocation, contact National Grid at **(781) 907-3960** A representative will schedule a field visit by National Grid who oversees the design, policy requirements, field measurements and scheduling.

7.10.3 Contractors performing the relocation of the customer owned-piping shall be responsible for:

- Interconnection of piping with the National Grid piping at the connection point of service
- Providing proper meter header protection, if needed;
- Obtaining necessary piping permits from local authorities.

7.11 GAS SERVICE REGULATOR AND VENTING REQUIREMENTS

7.11.1 National Grid will select, furnish, install and adjust all service regulators when the gas is supplied by high pressure gas distribution system. All questions related to regulator and relief valve set points shall be referred to National Grid

7.11.2 All service regulator vent piping and related components shall be installed according to IGFC and manufacturer's instructions.

7.11.3 OUTSIDE METER SETS:
Service regulator vent piping shall be sized according to manufacturer's installation specifications and attached Appendix Aof this book.

7.11.4 INDOOR METER SETS:
All service regulators and relief valves installed indoors shall have the vent piped to the outdoors. All regulator vent installations shall be in compliance with the National Grid Construction Standard Number 020013-CS.

7.11.5 All vent lines on indoor or outdoor installations should have an insulating fitting installed as close to the service regulator or relief valve as practical.

7.11.6 All vent lines on indoor or outdoor installations shall be equipped with an approved insect and rain resistant cap on the terminal end.

7.11.7 Service regulator vents shall not be covered over, plugged up, or otherwise obstructed.

7.11.8 Termination locations of regulator or relief valve vents shall be protected from damage caused by submergence in areas where flooding or ice accumulation may occur. In areas where frequent flooding occurs, the vent shall terminate above the high-water mark.

7.11.9 The lengths of vent run and number of fittings shall be kept to a minimum. It will be necessary to increase the pipe size of the vent piping when long runs

cannot be avoided. Appendix A, National Grid Gas Technical Lead or manufacturer's instructions shall be consulted to decide appropriate vent sizes and other information on service regulator venting.

7.12 METER BYPASS REQUIREMENTS

7.12.1 Meter Bypasses will be determined on a case by case basis by a National Grid representative.

7.13 TELEMETERING INSTALLATION REQUIREMENTS

7.13.1 Customers Interruptible service shall be remotely monitored using telemetering equipment. This requirement may result in additional cost to the customer.

7.13.2 The customer shall be responsible for the installation of a dedicated, voice-grade telephone line routed to a location designated by Gas Project Manager, terminating with an appropriate network interface.

7.13.3 The customer shall be responsible for any trenching, drilling, conduits, restoration, supports, etc. that may be required to reach the National Grid telemetering device.

7.13.4 National Grid will install the interconnecting cable between the customer-provided interface and the telemetering device.

7.14 METER INSTALLATION, PURGING AND RELIGHTING

7.14.1 For commercial, industrial and multi-meter installations that add loads requiring increased meter or regulator size where National Grid is required to shut down the existing gas service, the contractor may be required to purge air from the system upon reconnection, and to relight all gas utilization equipment affected by the shutdown.

7.14.2 For all commercial new meter sets, the installing contractor shall be responsible for purging the house line and for starting up the equipment.

7.14.3 For residential new meter sets, National Grid will purge the gas piping system and light all operating gas appliances at the time of the new meter set. Appliances that are not ready for operation at the time of the meter set shall be started up by the installing contractor.

7.14.4 Where the gas service is turned off for Company purposes, National Grid will be responsible for the turning off all affected appliances, performing an integrity test of the gas piping system prior to the turning on and gassing in, and relighting all affected appliances.

7.14.5 For new meter sets serving large input gas utilization equipment, the burner installer shall be responsible for purging as per IFGC instructions.

8.0 CUSTOMER-OWNED GAS PIPING SYSTEMS

8.1 GENERAL

8.1.1 Before proceeding with the design and installation of gas piping systems, contractors are advised to refer to the IFGC. It is strongly recommended that a review of the State requirements also be performed to ensure that the proposed installation is in compliance with local codes.

8.1.2 When a new appliance or other gas load is added to an existing gas piping system, the contractor/customer shall verify the capacity of the existing piping for adequacy according to the capacity table(s) in IFGC. If necessary, existing gas piping shall be replaced with larger piping or additional piping installed that also conforms to the IFGC capacity tables.

8.1.3 The customer shall not be permitted to use an abandoned service line as a houseline.

8.1.4 For customer-owned gas piping installations that meet the definition of a gas service**,** the contractor shall perform an acceptance test to verify the condition of the cathodic protection measures installed, where the type of piping warrants such protection. This test, which shall be performed after installation of the pipe and prior to setting of the meter, only indicates the condition of the cathodic protection at the time of testing. Any corrective action required by virtue of the test results shall be the contractor's responsibility. National Grid reserves the right to perform a cathodic protection acceptance test on any given installation.

8.1.5 Gas Pipe Bonding: “Each above ground portion of a gas piping system that is likely to become energized shall be electrically continuous and bonded to an effective ground fault current path. Gas piping shall be considered to be bonded where it is connected to gas utilization equipment that is connected to the equipment grounding conductor of the current supplying that equipment”.

8.2 PIPE SIZING

8.2.1 All gas piping, including trunk and branch lines, shall be adequately sized according to the IFGC. Gas Ranges shall have a minimum pipe size of ¾” nominal size.

8.2.2 It is policy to standardize on the use of piping tables in accordance to IFGC when offering technical assistance for sizing gas pipe operating at pressures less than 1 psig.

8.2.3 The allowable pressure drop in house piping where gas is supplied by low pressure gas distribution system, as measured from the meter outlet to the inlet of the gas appliance, under maximum expected flow conditions ***shall not exceed*** requirements in IFGC.

8.2.4 For sizing a houseline, whether it is connected to a National Grid high pressure or low pressure main, contractors are advised that the length of house piping to be used in sizing the pipe shall be measured from the connection point of service to the desired usage point.

8.2.5 A diversity factor shall be used to determine the maximum gas consumption for commercial and industrial establishments and in multiple tenant buildings where several appliances or loads are supplied from a common gas pipe line. In these cases, using a diversity factor in sizing the piping can result in significant savings in houseline and meter header costs. These factors can involve some complexity. For example, surveys have shown that different usages affect the load patterns where ranges are used, but range usage does not affect heating load patterns.

8.2.6 For many typical cases (such as the standard residential combination of a boiler, a water heater and a range), a valid indication of whether the house piping system is sized properly is a series of pressure measurements taken immediately upstream of each appliance with all appliances operating. If each appliance delivers its rated input, and the minimum inlet pressure required by the manufacturer is maintained, this piping will be accepted by the National Grid representative.

For multiple appliance or load situations, such as apartment buildings or industrial complexes with many different loads, this criterion will not hold true because of the effect of diversity factors.

8.3 PIPING DRAWING

8.3.1 For buried customer-owned piping installations, where the supply line is defined as a service, such as a remote meter location, it is mandatory that a piping drawing or plan be provided to National Grid's Project Manager for review and approval prior to starting work on a job. This drawing shall indicate the proposed location, sizes of each branch, the various loads, connection point or service, cathodic protection measures, piping material and joining methods. It is especially important that the piping location information provided be accurate. At the end of the job, an as-built version of this drawing shall be submitted to National Grid prior to acceptance of the job.

8.4 GAS PIPING MATERIALS

8.4.1 GENERAL

Materials used for gas piping shall be selected according to the provisions of IFGC, local codes and the requirements listed in the following sections.

8.4.2 GAS PIPING MATERIALS, INDOORS

For indoor gas piping, materials used shall be one or a combination of the following, complying with the latest ANSI standards for wrought iron or steel pipe, ANSI B36.10:

- Bare steel of standard weight (Schedule 40) with screwed or welded joints. ASTM A53, ASTM A-106 or API-5L Grade B pipe shall be used as a minimum.

- Galvanized pipe, of standard weight (Schedule 40), ASTM A53, with screwed joints.

- Threaded gas fittings for steel or wrought iron pipe shall be 150 pound, malleable iron, forged steel, black iron or galvanized steel.

- ***Plastic*** pipe of any type is ***prohibited*** for indoor use.

- ***Cast iron*** pipe is ***not permitted*** under any circumstances.

- ***Copper Tubing*** is ***not permitted*** under any circumstances.

- **Corrugated Stainless Steel Tubing**: CSST technology provides another option for gas piping in addition to steel or galvanized pipe. It is to be used where permitted by local codes. Only CSST material that does not require Electrical Bonding shall be permitted to be used.

8.4.3 GAS PIPING MATERIALS, OUTDOORS, ABOVE GROUND

- For piping outdoors, above ground, including regulator vent piping, galvanized pipe, properly coated black iron pipe with screwed joints shall be used, unless welded joints are required. If steel pipe with welded joints is required, ASTM A53 continuous weld pipe shall be used as a minimum, but ASTM A106 is recommended. Where permitted, plain steel pipe may be used with screwed ends. In this case, the minimum material selected shall be ASTM A53 continuous weld pipe as well.

- ***Cast iron pipe*** *is* not permitted under any circumstances.

8.4.4 GAS PIPING MATERIALS, BELOW GROUND, GENERAL

For buried customer-owned gas piping applications, only three materials, properly installed according to the specifications in the book, are acceptable These materials are:

- Coated steel pipe with a cathodic protection system to prevent corrosion. Steel pipe construction may be either welded or threaded. See Section 8.4.5 for details.

- Polyethylene (PE) plastic piping. Plastic piping is the material of choice for gas utilities because it is low in cost, easy to handle and install, and in noncorrosive underground. See Section 8.4.6 for details.

- ***Cast iron pipe is*** not permitted under any circumstances.

- **CSST is approved for below ground usage per manufacturer's instructions**

8.4.5 GAS PIPING, BELOW GROUND, STEEL PIPE OPTION

- Steel pipe shall meet the requirements of ASTM A106 or API 5L, with a minimum of schedule 40 wall thickness. This piping is commercially available with factory-applied protective coatings for buried applications (mill wrapped). Piping may be installed either by welding or by use of field threading techniques and threaded couplings. All bare sections of piping and fittings, welded or threaded, shall be field coated and wrapped according to the coating and wrapping techniques of Section 8.10 of this book.

  In addition, a cathodically protected system shall be required for steel pipe installed below ground to be fully effective in preventing corrosion.

  Uncoated steel pipe and uncoated portions of steel pipe where welded or threaded joints have been made shall not be permitted below ground.

  Installation requirements and details for steel piping installed below ground are provided in Sections 8.10 through 8.11.

8.4.6 GAS PIPING BELOW GROUND, PLASTIC PIPE OPTION

Polyethylene (PE) pipe or tubing PE 2406 (medium density yellow) or PE 3408 (high density black) conforming to ASTM D2513, Specifications for Thermoplastic Gas Pressure Pipe Systems, shall be used.

PE plastic pipe may not be used for gas piping inside or beneath buildings, or for venting gas pressure regulators.

The following specifications shall be used for PE fittings:

- ASTM D2683 Specification for Socket Type Polyethylene Fittings for Outside Diameter Controlled PE Pipe and Tubing

- ASTM D3261 Specification for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

- ASTM F1055 Standard Specification for Electrofusion Type PE Fittings for Outside Diameter Controlled PE Pipe and Tubing

NOTE:

All PE pipe, tubing and fittings are normally marked by the manufacturers with the appropriate ASTM code-indicating conformance to the specified standards. Installation requirements and details for plastic piping are provided in Section 8.12

TABLE 8.1

PLASTIC PIPE SDR RATINGS AND WALL THICKNESSES

SIZE	SDR RATING	WALL THICKNESS

½"CTS	SDR 7	.090"
1" CTS	SDR 11.5	.099"
1 ¼"	SDR 10	.166"
2"	SDR 11	.216"

8.4.7 GAS PIPING BELOW GROUND, COPPER TUBING NOT AN OPTION

8.5 VALVES

8.5.1 Listed, design-certified manual shut-off valves shall be used as main shut-offs for gas appliance installations according to the requirements in IFGC.

** CAUTION **

NEVER FOR ANY REASON - remove the core nut from a gas valve, or attempt to disassemble a valve stem when the gas pressure is on.

8.6 STEEL GAS PIPING, WELDING REQUIREMENTS

8.6.1 GENERAL

When welded construction is used, above or below ground, indoors or outdoors, welders shall be certified by recognized certification and testing agencies for pipeline welding in accordance with API 1104 or ASME Section IX. Written welding procedures shall be followed to ensure the acceptability of field welds. Welders' certifications shall be available at the construction site.

8.6.2 RESIDENTIAL, COMMERCIAL, INDUSTRIAL, MULTI-FAMILY INSTALLATIONS IN RHODE ISLAND

IN RHODE ISLAND:

The maximum design/operating pressure for gas piping systems located inside buildings shall not exceed ***5 psig*** unless:

1. Approved by National Grid.
2. The piping system is welded and one or more of the following conditions are met:

- The piping is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.
- The piping is located inside buildings or separate areas of buildings used exclusively for:
- Industrial processing or heating,

- Research,
- Warehousing, or
- Boiler or mechanical equipment rooms.

8.6.3 ALL PUBLIC AND PRIVATE SCHOOL BUILDINGS, INCLUDING COLLEGES

All steel gas piping larger than 4" in size, regardless of operating pressure, shall be welded. **Must be approved by State or Local Inspectors before being used.**

8.6.4 TESTING REQUIREMENTS OF PIPING AFTER THE METER

PRESSURE TEST REQUIREMENTS for **Rhode Island See IFGC**

8.6.5 STANDARDS FOR NON-MERCURY GAUGE

The rules in this section establish the minimum standards for non-mercury gauges to test gas piping, drainage and vent systems.

Minimum requirements – Each gauge shall meet the following requirements:

a) The gauge shall be manufactured and used in accordance with the ASMEB40.100-1998 Standard for Pressure Gauges and Gauge Attachments, which incorporates ASME B40.1-1998 and ASME B40.7-1998, and the manufacturer shall provide with the gauge a written statement that the gauge is manufactured in accordance with such ASME standard;

b) The gauge shall be labeled with the name of the manufacturer;

c) The gauge shall be kept in a padded separate rigid box and the manufacturer's instructions for use and protection of the gauge shall be complied with,

d) The units of measurement "psi" shall appear on the face of the gauge;

e) The gauge shall be kept in good working order.

8.6.6 WELDER QUALIFICATIONS

a) Welders qualifications. Welders installing gas piping within buildings at any pressure shall be qualified for all pipe sizes, wall thicknesses and all positions in accordance with either API 1104 latest edition, or ASME Section IX Boiler and Pressure Vessel Code, and re-qualified on an annual basis. The qualification testing shall be performed by an agency listed with the department of buildings, and the inspector shall have a minimum radiography qualification of Level II in accordance with the American Society of Non-Destructive Testing Recommended Practice Document No. SNT-TC-1A, Supplement A. Copies of the certified welder qualification reports shall be

maintained by the responsible welding contractor and shall be made available to the department of buildings upon request.

b) Welding requirements. All welded gas distribution and meter piping main and branch supplies to customer equipment operating in excess of 3 psig inside buildings shall be butt welded; and shall be subject to controlled inspection. Radiography shall be performed on all butt welds in gas meter and gas distribution piping operating at pressures exceeding 3 psig, within buildings, in accordance with API 1104 latest or ASME Section IX Boiler and Pressure Vessel Code latest edition.

8.7 GAS PIPING (INDOORS AND OUTDOORS) ABOVE GROUND, INSTALLATION REQUIREMENTS, GENERAL

8.7.1 Gas piping in concealed locations shall be installed according to the requirements in IFGC or local codes. If it is desired to locate concealed gas piping in partitions, piping shall be located in hollow partitions, such as in ventilated chases. Concealed piping in solid partitions is prohibited.

8.7.2 Gas piping inside or outside of any building shall not be run in or through an air-duct, clothing chute, chimney or flue, ventilating duct, dumb waiter or elevator shaft.

8.7.3 No other piping or wiring shall be located in a casing containing a gas line.

8.7.4 Gas lines passing through concrete or masonry floor slabs shall be enclosed by a sleeve or thimble.

8.7.5 Gas piping through foundation walls below grade is no longer permitted according to the requirements in IFGC (Section 404.4)

8.7.6 The use of gas piping as a grounding electrode is prohibited. Underground gas piping shall be insulated electrically where it connects to piping within the building.

8.7.7 Sediment traps for gas piping shall be installed according to the requirements in IFGC and local codes. When not incorporated as part of the equipment, a sediment trap shall be installed downstream of the equipment shutoff valve (exception: dryers, ranges, outdoor grills and illuminating appliances)

8.7.8 Where a branch outlet is placed on a main supply line before it is known what size pipe will be connected to it, the outlet shall be of the same size as the line that supplies it.

8.7.9 Shutoff valves controlling several gas piping systems shall be accessible for operation and shall be installed so as to be protected from any physical damage. Gas shutoff valves shall be plainly marked with a metal tag by the installer so that each piping system supplied by the valve can be readily identified.

8.7.10 Gas piping shall not be supported by other piping but shall be supported directly by the building structure itself with pipe hooks, metal straps, bands, or hangers

suitable for the size of the pipe, and of proper strength and quality at proper intervals so that the piping cannot be jarred or displaced accidentally from its original position.

8.7.11 Listed and approved flexible connectors shall be used for final connections to gas appliances provided the flexible connectors are used on moveable equipment such as gas dryers and gas ranges only, and are placed on the appliance side of the appliance shut-off valve. Certain manufacturers of selected equipment supply flexible connectors for permanent mounted gas utilization equipment. In those cases, the manufacturer's specified flexible connectors shall be installed according to the manufacturer's installation instructions and local codes.

8.7.12 Flexible connectors shall not pass through floors or partitions.

8.7.13 For steel gas piping installed outdoors above ground, piping shall be protected with a suitable oil based painting system, or by use of one of the coating systems identified in Section 8.9 of this book. If galvanized pipe is used, painting is not required, but it is recommended that the exposed threads be painted.

8.8 GAS PIPING OUTDOORS, BELOW GROUND, INSTALLATION REQUIREMENTS

8.8.1 Rhode Island Regulations require that buried gas piping meet IFGC code requirements. These concerns are critical because underground conditions promote corrosion. In order to comply with these laws, the materials and rules in the following sections are provided to ensure that gas piping meets the required standards.

8.8.2 The customer is responsible to mark out all Customer Owned gas and other utilities located on their private property. The number to call to get the facilities marked out is 811.

8.8.3 Only personnel qualified to perform the specific pipe-joining processes used for any given installation, such as welding for steel and heat fusion for plastic, shall perform this work.

8.8.4 Remote meter sets and meter pads present unique problems. These meters are normally limited to commercial and industrial facilities where multiple buildings are supplied gas from a single meter set location. There are, however, some applications where National Grid requires that a meter be installed remotely from a building due to the inability to locate the meter inside or directly near the building. For these cases, the meter sets are, where practical, installed as close to buildings as possible so that customer piping need not be buried.

These installations, where the piping must be treated as a gas service, require special attention and piping specifications, and are addressed accordingly in Sections 8.9 through 8.14 of this book.

8.8.5 When buried piping downstream of the meter is required, the piping shall be designed and installed according to code requirements.

8.8.6 For buildings where the gas pressure exceeds 1 psig at the point where the service line enters the building, all exterior wall openings that are both below grade and within 10 feet of the gas service line entry point shall be made gas tight. Where such openings are provided for gas service lines, the gas pipes shall be protected from damage by settlement or corrosion.

8.8.7 Customer-owned gas piping shall enter buildings above grade wherever possible to avoid the additional expense of cathodic protection requirements.

8.8.8 Where underground installation of gas piping beneath buildings or portions of buildings is unavoidable, the piping shall be encased in a conduit. The conduit shall extend into a normally usable and accessible portion of the building, and at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall extend at least 4 inches outside the building, be vented above grade to the outside, and be installed in such a way as to prevent the entrance of water. National Grid should be contacted for any questions or clarifications.

8.8.9 All piping below ground shall be installed with a minimum of 18 inches of ground cover and clearance of 6 inches from other sub-surface facilities or materials. Where other subsurface facilities prevent the installation of gas piping at this minimum depth, the area with less cover shall be protected by a steel schedule 40 pipe casing two pipe sizes larger than the gas pipe or a 1/4" thick steel plate that extends 12" horizontally each side beyond the limits of the gas piping.

8.8.10 Where steel pipe is used, below grade piping and fittings shall be fully coated and cathodically protected according to National Grid Specifications as defined in Sections 8.9 through 8.11 of this book, and the National Grid Construction Standard.

8.8.11 Back fill around pipe shall consist of loose dirt or sand, must be free of rocks, building materials or other debris.

8.8.12 Where plastic pipe is used**)** (where code permits), connections between metallic and plastic pipe shall be made (below grade) only with fittings approved by the pipe manufacturer. Information concerning these fittings can be obtained by contacting National Grid. The recommended ways to make this transition connection are: See Section 8.12 for plastic pipe installations.

Use of an approved service riser assembly;

- Use of an approved transition fitting. These fittings are couplings that have been tested and approved by National Grid based on their ability to resist longitudinal pullout forces.

8.8.13 All piping shall be pressure tested according to IFGC requirements.

8.9 STEEL GAS PIPING, CORROSION PROTECTION REQUIREMENTS, COATING AND WRAPPING

8.9.1 For steel pipe, above ground or below ground, the following information shall be used for coating and wrapping. If bare steel pipe (as opposed to mill wrapped pipe) is used below ground, the following procedures are **mandatory.** If bare steel pipe is used above ground, these procedures are optional, as opposed to use of oil based painting systems.

8.9.2 Steel piping shall be given a primer coating and then wrapped with a tape suitable for underground use. Do not use Electrical Tape. The pipe surface shall be clean and free of rust prior to applying the primer coat. Tape wrapping shall be spirally wound with a half overlap on each turn it is recommended that the exposed threads be painted.

8.9.3 The following materials are acceptable for coating and wrapping steel pipe:

- Polyken Technologies Pipeline Primer #1027 or equal, in conjunction with Polyken Tape #936 or equal, or Polyken Gas Utility Tape or equal.

- Tapecoat Company CT Coldprime or equal in conjunction with Tapecoat Pipe Tape H-30 or H-50 or equal.

8.10 STEEL GAS PIPING, CORROSION PROTECTION REQUIREMENTS, INSULATING JOINTS

8.10.1 Insulating couplings or fittings shall be used to electrically separate the underground portion of steel piping from the above-ground piping or the piping in a building. The insulators shall be located on the above ground portion of a riser and on the pipe immediately after entering a building wall. No other connections shall be made to the underground portion of piping that could result in an electrical ground to the piping, since this will cause the insulators to be ineffective. Insulating unions, threaded or insulating couplings, or insulating flanges are typically used for these connections. Insulated compression couplings shall be used on outdoor installations only.

8.11 STEEL GAS PIPING, CORROSION PROTECTION REQUIREMENTS, MAGNESIUM ANODES

8.11.1 Magnesium anodes shall be electrically attached to the underground steel piping using a thermite welded (often called “cadweld”) connection. These anodes are available in 3 pound and 17 pound sizes with a wire connection lead attached.

8.11.2 One 3-pound anode shall be installed where the total underground piping length is 10 feet or less. When the total length of underground pipe is greater that 10 feet, install one 17-pound magnesium anode for every 100 feet of underground piping.

Note:
Always bury an anode with the container it comes in.
Do not remove it from the cardboard box!

8.11.3 The anode shall be buried in the soil approximately 2 feet to the side and below the level of the piping at a location near the center of the section pipe being protected.

8.11.4 The wire lead shall be attached to a bare steel area of the pipe using a thermite weld kit, using a #15 Green Cap cartridge specifically manufactured for attachment to schedule 40 pipe. After attaching, the coating in the thermite-welded area shall be restored (re-coated) so that no bare metal remains.

8.12 PLASTIC PIPING, INSTALLATION REQUIREMENTS (Where allowed by Code)

8.12.1 Rhode Island state code requires that plastic pipe and fittings shall be installed by qualified personnel according to the manufacturer's written installation instructions.

8.12.2 Before using materials, visually inspect for damage such as gouges, scratches and kinks, and discard any damaged materials.

8.12.3 PE pipe and tubing must be laid on undisturbed or well-compacted soil or other continuous support. Suitable rock-free back-fill shall always be placed around the pipe or tubing.

8.12.4 In addition to the minimum depth of coverage, consideration must be given to future loading and activity above and around the piping to determine if encasing the pipe in a steel sleeve is necessary.

8.12.5 Pneumatic or mechanical tamping shall not be used within 12" of the plastic piping.

8.12.6 Pipe or tubing must be free of cuts and scratches deeper than 10% of the wall thickness. Defects in pipe, tubing or fittings cannot be repaired. Therefore, the damaged pipe, tubing or fittings must be replaced. PE pipe shall not be used inside buildings or above ground.

8.12.7 PE pipe and tubing shall be joined by heat fusion or by mechanical fittings (mechanical service head adapters).

8.12.8 Mechanical fittings shall not be used where pressure exceeds 5 psi or pipe size is greater than 4" diameter, except in certain instances where a customer-owned piping system qualifies.

8.12.9 Heat fusion joints shall be made according to the manufacturer's recommended heat fusion procedures.

8.12.10 Miter joints are not permitted.

8.12.11 Joints shall not be located in pipe bends.

8.12.12 See the pipe manufacturer’s requirements for minimum bending radius of plastic pipe.

8.12.13 Heat fusion joints shall be performed only by personnel qualified in the appropriate joining techniques.

8.12.14 A #14 AWG, minimum, insulated solid copper wire shall be installed alongside but not touching the plastic pipe to facilitate locating with a pipe locator. Tracer wires shall terminate in an accessible location above ground so that a pipe locator can be connected.

8.12.15 A bright-colored plastic warning tape shall be buried approximately 12" directly above the plastic pipe and at least 6" below grade to mark the location of the pipe and to warn future excavators.

8.12.16 Insulating couplings or fittings shall be used to electrically separate the underground portion of plastic piping from the above-ground steel piping or the piping in a building. This is necessary to protect the gas riser, and also is necessary for anodeless, pre-coated riser.

8.12.17 For RI: Plastic Fuel Gas Piping installations shall be performed by trained, qualified and certified personnel by the pipe manufacturer.

8.13 GAS PIPING THROUGH BUILDING WALLS, ABOVE OR BELOW GROUND, INSTALLATION REQUIREMENTS

8.13.1 That portion of customer-owned outdoor steel gas piping, above ground that runs through an external building wall (the wall piece) shall be coated or wrapped using one of the coating and taping systems listed in Section 8.10 of this book. This requirement shall be applicable to all steel pipe, including black pipe, and to piping above ground that runs through walls. PVC tape is not acceptable for wrapping pipe for this purpose. "If galvanized pipe is used, taping of the pipe is not required, but it is recommended that the exposed threads be painted."

8.13.2 For wall penetrations below ground, refer to the appropriate National Grid drawing for installation requirements and details. Note that a sleeve is required for this application.

8.14 PRESSURE TESTING OF GAS PIPING

8.15.1 All pressure testing of gas piping shall be performed according to the procedure in IFGC requirements.

9.0 GAS UTILIZATION EQUIPMENT

9.1 GENERAL

9.1.1 APPLIANCES- ACCESSORIES AND EQUIPMENT APPROVAL

All of the gas appliances and accessories that National Grid services, and referred to in this book shall be design-certified by a nationally recognized testing and/or listing agency, such as CSA or Underwriters Laboratories, M.E.A., to comply with the applicable American National Standard.

9.1.2 INSTALLING CONTRACTOR'S RESPONSIBILITIES

The work performed by the contractor shall comply with the applicable Building Code of Rhode Island, and all departments and bureaus having jurisdiction over the installation. The contractor shall obtain all necessary permits and certifications that may be required for the job.

Requirements for gas utilization equipment, collected together in the following sections, are intended to supplement or amplify, but not substitute for, any applicable State, City, or Town codes, regulations or ordinances. If there is a conflict between the National Grid requirement and the municipal requirement, the more stringent requirement will govern.

In all cases, it is the installer's responsibility to comply with all local municipal requirements. National Grid does not assume the obligation of enforcing or inspecting for compliance with municipal code requirements.

9.1.3 CO ALARMS

Carbon Monoxide (CO) is a highly toxic gas. It is the product of incomplete combustion of fossil fuels such as oil, natural gas, propane, gasoline, wood and coal. CO is very dangerous because it is colorless, odorless and tasteless.

Rhode Island Code requires the installation of CO Alarms in all new and existing 1 and 2 family houses, apartment buildings, hotels dormitories, nursing homes and schools, where fossil fuel burning furnaces or boilers are installed.

Rhode Island Code requires the installation of CO Alarms in newly constructed dwelling units and in dwellings units offered for sale.

National Grid recommends the installation of CO Alarms in all areas and recommends annual maintenance of the heating system.

For the correct location of CO Alarms and for the full text of the Rhode Island CO Alarm Law. See attached Appendix C.

9.1.4 ASSEMBLY OF EQUIPMENT

The installing contractor shall assemble the equipment according to the installation instructions of the manufacturer.

9.1.5 GAS UTILIZATION EQUIPMENT INSTALLED IN RESIDENTIAL GARAGES

Gas utilization equipment installed in residential garages and in adjacent spaces that open to the garage and are not part of the living space or dwelling unit, shall be installed so that all burners and burner ignition devices are located at a

minimum of 18" above the floor unless the equipment is listed as "Flammable Vapor Ignition Resistant".

9.2 NATIONAL GRID "NATURAL GAS PRESSURE, IGNITION & DRAFT TEST"

On new gas meter installations National Grid will perform a natural gas pressure test (lock up & run), ignition and draft test on new natural gas utilization equipment; however, it is up to the installing contractor to insure the equipment meets the manufacturer's installation guidelines.

9.3 GENERAL REQUIREMENTS, SPACE AND WATER HEATING EQUIPMENT INSTALLATIONS

9.3.1 Certified Rating plates shall be securely fastened to the appliance.

9.3.2 A complete set of manufacturer's operating, installation and maintenance instructions shall be made available.

9.4 COMBUSTION, DILUTION AND VENTILATION AIR (FRESH AIR) REQUIREMENTS

9.4.1 Air for combustion, dilution and ventilation air installed in any size room shall be installed according to the requirements of IFGC.

9.5 VENTING OF CATEGORY I GAS UTILIZATION EQUIPMENT ONLY

9.5.1 Venting of all equipment shall be provided according to the latest version of the National Fuel Gas code, IFGC.

9.5.2 Rhode Island, refer to the IFGC Fuel Gas Code for multi-story venting installations. Gas vents serving equipment on more than one floor, a single or common gas vent shall be permitted in multistory installations to vent Category I equipment located on more than one floor level, provided the venting system is designed and installed in accordance with this section and approved engineering methods.

Equipment separation. "All equipment connected to the common vent shall be located in *rooms that do not communicate with occupiable and/or habitable spaces. (*rooms with outdoor access only)

9.5.3 Use of "Wye" connectors are recommended in all Category I venting systems. Use of a standard tee at any point in a venting system is also acceptable. When using either type of fitting, the body of the wye or tee shall be the same full size as the common vent. For example, in a case where two appliances are to be commonly vented, each of which require a 4" separate vent connector, and the common vent required is 6" (arrived at by using the vent tables), a 6 x 6 x 6 wye or tee using reducing collars on the two inlets is acceptable. A 4 x 4 x 4 wye or tee with a reducing collar on the common outlet is not acceptable.

9.5.3.1 A 6 x 6 x 4 tee, where the 4" size (typical for use in venting a water heater) is the bull of the tee, which allows for the main body of the tee to be the same size as the common vent, or 6") a 4" reducing collar would also be required on the inlet leg of the tee); or

9.5.3.2 A 6 x 6 x 4 wye, where the side connection entering at an angle is 4", but the main body of the wye is 6" (also required a 4" reducing collar on the other inlet of the wye.

9.5.4 Use of draft hoods on gas designed equipment shall not be altered.

9.6 VENTING OF GAS UTILIZATION EQUIPMENT - CATEGORIES II, III AND IV

9.6.1 Venting for Category II, III and IV equipment (as defined in IFGC) shall be installed according to the manufacturer's installation instructions.

9.7 CHIMNEYS

9.7.1 The contractor shall perform an inspection on the chimney venting system to ensure it confirms to nationally recognized standards. The contractor shall not install a flue connector into a chimney breech opening that is smaller than the connector, or extend the breaching beyond the chimney lining. Under no circumstances shall this rule be violated.

9.7.2 For the proper sizing of vents connected into Type B Double Wall Vents, Interior and Exterior Masonry Chimneys, please follow the Venting tables listed in IFGC. Special care must be taken when venting new equipment into an existing exterior masonry chimney. For additional information on Venting and Combustion Air, please refer to: "Choosing a Furnace or Boiler" in Appendix B.

9.8 SPILL SWITCH REQUIREMENTS

9.8.1 A manual reset thermal cut-off device (spill switch), UL tested and approved, shall be required on all natural-draft, gas-fired equipment used for space heating; i.e., all boilers, furnaces and conversion burners. This device shall shut off the gas to the burner in the event of chimney blockage or continued back draft. It is important to note that, as of January 1, 1991, boiler manufacturers are **required** by Federal law to provide both a **spill switch and flame roll out switch** on all **new** atmospheric gas boilers and furnaces having a rating of 300,000 Btuh or less. interpretation of this ruling is to expand the requirement for spill switches to all natural draft appliances regardless of vent size, or whether or not the appliance is installed in a residential, commercial, industrial or multi-family establishment. For gas **conversion burners** that are installed in residences and other occupancies that utilize masonry chimneys or gas vents, a manual-reset thermal spill switch is also required. Add-on spill switches shall also be UL tested and approved.

In Rhode Island, when multiple gas appliances having inputs above 300,000 BTU's (300 CFH) are connected to a common vent/chimney, each individual Spill Switch must be electrically wired in series with each other.

9.9 INSTALLATION OF HEAT PRODUCING EQUIPMENT IN FLAMMABLE OR CORROSIVE ATMOSPHERES

9.9.1 In operations where there is use of flammable liquids or agents, or aerosol sprays using halogenated hydrocarbons such as carbon tetrachloride, special care shall be taken in the installation of heat-producing equipment. Flammable liquids clearly must be kept a significant distance away from gas burning flames for safety reasons. Not so apparent, however, halogenated hydrocarbons tend to break down in temperatures above 500 degrees F and form toxic fumes. These fumes are extremely corrosive and will accelerate damage to heatproducing equipment, flues and exposed metal surfaces.

9.9.2 It is imperative that all air for combustion come from out-of-doors in environments of this nature, unless the equipment can be isolated from the contaminated atmosphere.

NOTE:
NATIONAL GRID REQUESTS THAT ANY CUSTOMER WHO PLANS INSTALLATIONS IN THIS TYPE OF ATMOSPHERE CONTACT NATIONAL GRID !

**** *CAUTION* ****

The contractor is advised to become fully aware of the boiler control requirements as provided for in the latest revisions of ASME CSD-1 and Rhode Island State Code These documents may require additional safety controls over and above those required by this book or as furnished standard from the manufacturer for selected commercial, industrial and multi-family establishments.

9.10 GAS CONVERSIONS AND CONVERSION BURNER REQUIREMENTS

9.10.1 Conversion burners and associated equipment for gas conversions shall be installed according to the burner manufacturer's installation instructions, IFGC and ANSI Z21.8.

9.10.2 Burner flame shall not impinge upon any surface or obstruction in the combustion chamber. The heating contractor shall place the burner in the combustion chamber so that the burner head is centered.

9.10.3 When installing conversion equipment, the combustion chamber and flue passage ways of the existing appliance shall be thoroughly cleaned using wire brushes and a vacuum.

9.10.4 Conversion burner nozzle shall not extend into combustion chamber.

9.10.5 Combustion chamber shall be installed on dry-base boiler if upshot gas burner is not used.

9.10.6 Burners shall be adequately supported, i.e., burner legs shall be required, or burner shall be resting on a firm and level foundation, where applicable.

9.10.7 Burners shall be properly attached to boiler flange.

9.10.8 Unit shall be inspected and tested for gas tightness. All openings around the boiler base at floor level, doors and at gun entrance shall be properly sealed with masonry cement or equivalent to prevent air leakage into the boiler. Clean outs and burner blast tube, except fire door, shall be sealed with non-asbestos type furnace cement.

9.10.9 Unless otherwise specified by the burner manufacturer, always install a gas designed double-acting barometric draft regulator in the vent connector. Gas designed barometric draft regulators shall be installed according to manufacturer's installation instructions (power burner only).

A manual reset or single use type thermally actuated spill switch shall be installed on the double-acting barometric draft regulator. This switch is wired into the burner circuit to shut the gas off in case of a sustained back draft or blocked chimney condition.

9.10.10 Stack switches or stack aquastats shall be removed from electric circuit so they do not function as operating gas controls.

9.10.11 Base of chimney shall be cleaned, and the chimney wire brushed from top to bottom. If not properly cleaned, oil residue left on the gas vent will dry out over time, flake off, and drop downward, possibly building up to cause a blocked chimney condition.

9.10.12 Vent connector shall be properly sized. Check the existing vent connector size against the proposed firing rate of the gas burner to determine if the vent connector is too big or small. Replace the vent connector if its size does not correspond with the vent tables in IFGC.

9.10.13 Contractors are advised that gas conversion burners are not delivered adjusted for
proper input and combustion air. Therefore, appropriate adjustments **shall be** made to ensure proper draft, proper CO readings and other items necessary for safe operation. Contractors installing conversion burners shall perform this combustion efficiency test to ensure the safety of the newly installed equipment.

9.11 GAS FIREPLACES (VENTED DECORATIVE GAS APPLIANCES)

9.11.1 In all cases, these appliances shall be installed according to applicable state codes, the manufacturer's installation instructions and other specific conditions of approval.

9.11.2 Existing masonry fireplace flues must first be investigated and determined to be adequate, unobstructed, and with no upper-story openings or connections. All applicable clearances, air for combustion and ventilation requirements shall be observed.

9.11.3 Approved factory-built fireplaces, where installed indoors, must be vented through an approved Type B vent or lined chimney. All applicable clearances, air for combustion and ventilation requirements shall be observed.

9.12 ILLUMINATING DEVICES

9.12.1 All gas lights shall be listed by the IAS, CSA, UL or other qualifled technical listing organization. Gas lights shall be installed according to their listings, all local codes, National Grid requirements and the manufacturer's installation instructions.

9.12.2 Gas pressure regulators shall be installed for all illuminating appliances.

9.12.3 Gas lamps designed for post mounting shall be securely and rigidly attached to a post.

9.12.4 Adequate concrete shall be used around the base of the supporting lamp post and underground piping shall not be embedded in post concrete.

9.12.5 A shutoff valve shall be installed on the line to the gas light at the point where it connects to the house riser and shall be in an accessible location.

9.12.6 Where permitted by local authorities having jurisdiction, outdoor gas torches, used to symbolize some event or to adorn landmarks, entrances, etc., may be installed. These devices often require high gas inputs, and therefore, the contractor/customer shall proceed with caution. National Grid shall be consulted on all such installations.

9.12.7 New pedestals for gas torches shall be supported by an adequate concrete base. Gas pipe shall not be embedded in this base. Existing columns, which are used to support gas torches, may encase inlet gas piping subject to approval of the manner of connection by National Grid.

9.12.8 No gas torch flame shall be less than 7' above the immediate ground level.

9.13 NATURAL GAS COMBUSTION ENGINES

Natural gas-fired combustion engines are generally utilized for engine-driven air conditioning, cogeneration, heat pump and other gas engine driven applications. National Grid is to be consulted regarding any proposed installations. All installations shall be performed according to the manufacturer's installation instructions, Rhode Island Codes. National Grid 's shall be consulted prior to proceeding with any plans to install natural gas combustion engines.

9.14 COMPRESSED NATURAL GAS (CNG,) STATIONS

Compressed Natural Gas (CNG) stations shall not be planned without consultation with National Grid.

9.15 UNVENTED ROOM HEATERS

Unvented room heaters shall be tested in accordance with ANSI Z21.11.2 and shall be installed in accordance with IFGC and the manufacturers installation instructions. They

may not be used as the primary heat source. Unvented room heaters must be equipped with an oxygen depletion sensor safety shutoff system. Unvented room heaters are currently prohibited in Rhode Island.

9.16 OTHER EQUIPMENT

Any gas utilization equipment not covered in this manual shall be installed according to the IFGC and local codes. National Grid shall be consulted for further guidance on any equipment not covered in this book.

9.17 COMBO WATER HEATERS

Water heaters utilized both to supply potable hot water and provide hot water for space heating applications shall be listed and labeled for such applications by the manufacturer and shall be installed in accordance with the manufacturers installation instructions.

Appendix A

APPENDIX A

SERVICE REGULATOR VENT PIPING REQUIREMENTS

1.0 Contractors shall size and lay out service regulator vent piping in accordance with the following requirements:

1.1 Vent lines for gas pressure service regulators shall be piped using rigid steel Schedule 40 pipe, sized in accordance with Tables 2 through 7 of this Appendix, and installed in accordance with the National Grid Construction Standard SERV-6225 and the instructions contained in this Appendix. All service regulator vent lines shall be located such that, should venting to the atmosphere occur, a hazard is not created.

1.2 Vent piping installed outdoors shall be galvanized or primed and painted with screwed ends. For those cases where vent pipe is installed with welded end connections, the pipe shall be primed and coated with a painting system suitable for outdoor applications. Vent piping installed through outside walls shall be protected against corrosion in accordance with the requirements contained in Section 8.0 of this book.

1.3 Where there is more than one service regulator or relief valve at a meter header location, each regulator shall have its own separate vent line to the outdoors. Manifolding of vent lines shall not be permitted.

1.4 Regulators shall not be vented commonly with external relief valves or devices requiring atmospheric air pressure to balance a diaphragm.

1.5 National Grid Technical Lead will provide size and termination location, as part of the installation design when vent lines are required. The contractor shall furnish the labor, materials and the layout for the installation of the regulator vent line.

1.6 The size of service regulator vent lines shall not be less than the size of the connection on the regulator vent.

1.7 All vent lines shall have an insulating union installed as close to the regulator as possible. The insulating union will be provided by National Grid.

1.8 Vent line termination points shall be provided with approved rain caps and insect-resistant screens. National Grid shall furnish the contractor with these combination rain caps and insect-resistant screen devices at the construction site meeting with the installing contractor. The contractor shall provide the labor to install the devices. Combination vent caps are available for the following pipe sizes as shown in Table 1.

TABLE 1

NATIONAL GRID COMBINATION VENT CAPS

NATIONAL GRID ITEM ID	VENT PIPE DIAMETER
301023	3/4"
786214	1”
301026	1-1/4"
301035	2”
301036	3”
301037	4”

1.9 Vent line piping shall contain a minimum number of bends and elbows. Each fitting offers resistance to gas flow, that can be expressed as an **equivalent length** of pipe. Equivalent lengths for elbows are given underneath each table in Tables 2 through 7 of this Appendix. The equivalent length of the fittings shall be **added to the actual length of piping** when selecting vent pipe size.

1.10 Where vent pipe size in the tables is larger than the regulator vent outlet, a pipe reducer (increaser) shall be installed as close to the regulator vent as possible, preferably immediately at the regulator vent outlet.

1.11 Vent piping is not permitted to be installed below-grade. If it penetrates a building foundation wall above ground, the piping shall meet the same requirements as buried gas piping regarding corrosion protection, i.e., coating, wrapping, cathodic protection, etc. in accordance with the Section 8.0 of this book.

1.12 Regulator vent piping for outdoor regulators shall only be required to clear a building overhang or to provide the required clearances above the ground, or away from building openings or windows. Clearance for a given installation shall be as specified in the National Grid construction standards.

1.13 For Tables 2 through 7 which follow, the maximum length of vent pipe and number of fittings allowed in each case **shall not be exceeded under any circumstances.**

RECOMMENDED VENT LINE SIZING CHARTS

If length exceed the lengths on the chart, contact National Grid's technical lead.

TABLE 2

For regulators with 3/4" screwed end connections and 3/4" regulator vent opening, that reduce pressure in mains operating at pressures between 99 psi and 124 psi.

3/4" Regulator Vent Pipe			
Max. Length	12'	10'	8'
Number of 90° Elbows *	1	2	3

* Each elbow equivalent length = 2.0'

TABLE 3

For regulators with 3/4" x ¾" or ¾" x 1" screwed end connections and 3/4" or 1" regulator vent opening, that reduce pressure in mains operating at pressures between 99 psi and 124 psi.

1 1/4" Regulator Vent Pipe			
Max. Length	20'	17'	13'
Number of 90° Elbows *	1	2	3

* Each elbow equivalent length = 3.5'

GAS SERVICE REGUIATOR VENT SIZING CHARTS

TABLE 4

For regulators with 3/4" x ¾" or ¾" x 1" screwed end connections and 3/4" or 1" regulator vent opening, that reduce pressure in mains operating at pressures between 99 psi and 124 psi.

1" Regulator Vent Pipe			
Max. Length	15'	12'	10'
Number of 90° Elbows *	1	2	3

* Each elbow equivalent length = 2.6'

TABLE 5

For regulators with 3/4" screwed end connections and 3/4" regulator vent opening, that reduce pressure in mains operating at pressures of 60 psi or less.

3/4" Regulator Vent Pipe			
Max. Length	29'	27'	25'
Number of 90° Elbows *	1	2	3

* Each elbow equivalent length = 2.0'

GAS SERVICE REGUIATOR VENT SIZING CHARTS

TABLE 6

For regulators with 1 1/4" body size and 3/4" regulator vent opening, that reduce pressure in mains operating at pressures of 60 psi or less.

1 1/4“ Regulator Vent Pipe	2” Regulator Vent Pipe
Maximum Length = 43'	Maximum Length = 60'
Number of Elbows* = 3	Number of Elbows* = 3

* Each elbow equivalent length = 3.5'

NOTE
1-1/4” Regulators with 1-1/4” bodies and 3/4” vent openings shall have 1-1/4” size vent lines as a minimum

TABLE 7

For regulators with 2" body size 1" regulator vent opening that reduce pressure in mains operating at pressures between 60 psi and 124psi.

2” Regulator Vent Pipe
Maximum Length = 23'
Number of Elbows = 1

* Each elbow equivalent length = 5.2'

APPENDIX B

APPENDIX B

CHOOSING A FURNACE OR BOILER

Higher Efficiency. Its Advantages and Disadvantages

Since the energy crisis of the 1970's consumers have been motivated to demand higher efficiency furnaces and boilers, and to increase the thermal insulation and tightness of their homes. As a result, manufacturers have responded with the higher efficiency heating units which are widely in use today, and builders have responded with the increase in tighter construction methods for homes now equally widely used. As a result of these new trends, a significant amount of attention has been focused on certain technical topics in the heating business which have traditionally been accepted as cut and dried, but recently have caused some controversy. It was discovered, to the dismay of many, that these long-accepted ways of installing heating appliances are no longer valid. The changes faced by today's furnace and boiler installers include increased efficiency, reduced dilution air, increased air contamination and decreased heating loads. It has been common to discover that new installations are deficient because of improper combustion, dilution and ventilation air, and even improperly selected boiler or furnace sizes. Therefore, the following information is provided to help ensure that new installations and conversions are properly designed and installed. The correct place to begin is for to selecting a furnace or boiler for your installation.

Increased Thermal Efficiency Proper Venting

Increased thermal efficiency of newer units means, among other things, that for a given retrofit installation in a building that has not been modified using insulation and/or caulking, a smaller capacity unit will often do the same job as the older unit did. But it is possible that the older unit may not have been sized correctly! Indeed, many older units were oversized. Therefore, it can be problematic to simply substitute a new unit of the same input as the older one., Increased efficiency of abeating unit typically means a lower flue gas temperature, since most higher efficiency units wring out more Btu's from the flue gases in their heat exchangers. This lower outlet temperature means that the flue gases start their trip out the vent much closer to their dewpoint. Thus, condensate will be produced in the vent earlier in the on-cycle, and more condensate per total unit volume of flue gases will be produced in the new units than in the older, less efficient units. This means that the "wet time" in the vent will be longer, during which time the condensate stays in the stack without being vaporized by flue gases.

Since many Category I, mid-efficiency units are fan-assisted, the draft hood is eliminated, thereby essentially eliminating dilution air to the vent, reducing the total vent flow. Combining this characteristic with the use of vent dampers, off cycle loss of gases through the vent is reduced drastically. As a result, no dilution air can be relied on during the off cycle to help dry the stack. In addition, these characteristics combine to leave a vent pipe even colder during the off-cycle than in older less efficient units, requiring a longer time to heat up during the on-cycle.

In summary, comparing a newer, more efficient unit to an older less efficient unit of the same input, a smaller volume of flue gases will flow in the new unit at a lower temperature through a colder vent, which must be relied upon to remove essentially the same amount of water vapor as was produced in the old unit. The capacity of these gases to vaporize the moisture is significantly less in the new unit as compared to the old. The result is longer wet time in the new unit's vent, a condition which promotes corrosion very quickly, especially if chlorine from indoor air condition is absorbed into the condensate, producing hydrochloric acid. A corroded vent can release deadly carbon monoxide into the living space. An equally deadly scenario is the deterioration that takes place in a masonry chimney, where the mortar disintegrates, the lining collapses, and the chimney becomes blocked, also spilling flue gases into the living space.

Special care must be taken when replacing older heating equipment that will be vented into an existing exterior masonry chimney. Please follow the Venting tables listed in NFPA-54 or the FGCNYS.

Tighter Buildings: Combustion Air

If the building has been upgraded with new insulation, thermal-pane and tightly sealed windows, along with caulking and wrapping, the thermal characteristics of the building have been altered to make it more thermally efficient. The increased thermal efficiency of a building means the heating load is lower. The tightness of the building means the infiltration losses have been decreased, but the combustion air requirements, which formerly depended on a certain amount of infiltration, must be closely re-examined. If infiltration, and therefore some of the source of combustion air, has been drastically reduced, the reduction can increase spillage of combustion products upon start-up of a draft hood appliance. Secondly, the lowered rate of air change means that any source of combustion air contamination, such as chlorides from hairsprays, etc. will remain at an elevated concentration rather than be diluted. Contaminants containing chlorine have been shown to greatly increase the corrosivity of flue gas condensate, forming hydrochloric acid.

All of these characteristics taken together require that a vent be sized as carefully as possible, with special attention not to over-size the vent. In the past, gas furnaces and boilers released more than 25 % of their input energy into their vents. This generous amount of heat flowing through the vent made vents much more forgiving of design errors. Now, proper venting of higher efficiency furnaces and boilers requires more knowledge and greater care on the part of the installer.

A Case of Improper Venting

Clearly, a great deal of attention must be paid to venting of modem boilers/furnaces. Take as an example, a typical situation where a person installs a new boiler to replace an aging, less efficient one. In assessing the situation, it is determined that a newer, Category I, mid efficiency, fan assisted unit is a sound, economical choice. It seems logical that a unit of the same input rating should be selected. A contractor is hired, and installs most things properly, but vents the unit to the same outside chimney used for the older unit. After a period of time, the consumer calls National Grid Energy Delivery to trouble-shoot a "leak" in his newly installed boiler. He is dismayed to discover that there is no real leak, but that his chimney is condensing. He decides that this is not a real problem, and that there is no need for further action. Soon his chimney tiles begin to collapse inside, and begin to block the vent gases to the point where the unit shuts down on high pressure. Now he has a very large repair bill on his hands to rectify his collapsed chimney. All of this could have been prevented by selecting the correct venting arrangement. In this case, an approved, listed chimney liner system, properly sized and installed, would have saved a large sum of money and many headaches.

Pre-Sale Inspection

The heating contractor seeking to sell a furnace should begin approaching a job by first carefully assessing the heating load of the structure, the suitability of the existing system vent, and the environment into which the unit will be placed. It is also important that sales and installation personnel understand the venting characteristics of the different types of appliances available on the market, as well as the differences in combustion, dilution and ventilation air requirements of the newer, higher efficiency units. Computer heat loss programs exist in the market today that make this tedious task less demanding.

Special care must be taken when replacing older heating equipment that will be vented into an existing exterior masonry chimney

Retrofit furnaces or boilers should not be recommended to the consumer on the basis of rules-of-thumb regarding the heat load, nor should it be assumed that the existing venting system can be used without modification. It is imperative that the selection and sales process include a pre-sale inspection of the existing furnace or boiler, the venting system, and the building. It is important to recognize that every furnace or boiler is not equally well suited to every installation. The inspection will help the seller to accurately determine which furnace or boiler can be recommended to the consumer, and will avoid problems for all parties involved.

APPENDIX C

RHODE ISLAND
DIVISION OF
STATE FIRE MARSHAL

Smoke Alarm and Carbon Monoxide Brochure

STATE FIRE MARSHAL
24 CONWAY AVENUE
NORTH KINGSTOWN, RI
02852

DAYS 401-294-0861
24 Hr. 401-222-2331
FAX# 401-295-9092
TTD# 401-295-9078

ONE, TWO, AND THREE FAMILY DWELLINGS
SMOKE ALARMS

- As of February 20, 2004 all new residential units require hard-wired, interconnected smoke alarms with battery back up in the following areas:
  Outside each bedroom area and inside each bedroom
  On each additional level including basements.

- In addition, interconnected heat detector(s) shall be installed in all integral or attached garages in dwelling units permitted or constructed after **February 20, 2004**.

- Wireless detectors shall be allowed provided that they are monitored by an approved system or panel and provided that such system meets all the audible requirements.

- While not required, it is highly recommended to place an additional smoke alarm at the top of the basement stairs.
-
- Existing construction permitted after **June, 1976** are required to maintain the previously required smoke alarms and they should be hardwired and interconnected. *These detectors shall be located outside the bedroom areas and on each level.*

- If the above units do not have the previously required hard-wired systems they shall be allowed to have battery operated alarms. Battery operated alarms shall not replace hard-wired alarms.

- Three family dwellings shall have hardwired, interconnected smoke alarms installed by **July 1, 2008.** Interconnected in common areas, separate from within each separate dwelling unit. (Also hard-wired)

- All other existing construction shall require smoke alarms outside each bedroom area and on each level. These will be permitted to be battery operated.

ONE, TWO, AND THREE FAMILY DWELLINGS CARBON MONOXIDE (CO) DETECTORS

- All new residential (including apartments and condominiums) require hard-wired, interconnected CO alarms with battery back up outside the bedroom areas.

- In addition, the local authority having jurisdiction may require additional smoke or CO coverage in rooms or living areas having pull out sofas or other means of sleeping arrangements if in his/her judgment the room may be used for sleeping quarters on a regular or intermittent basis.

- Any dwelling permitted after **January 1, 2002** shall be required to have hardwired CO alarms with battery backup.

- All other existing construction shall be allowed to have battery operated CO alarms or plug in units. Plug in units must be restrained.

- Exception: Dwellings that do not contain any fuel burning appliances, a fireplace or an attached or integrated garage are exempt from CO requirements. If any of these items are introduced later, then detection is required.

Fire Marshal's Web Site
http:\\www.fire-marshal.ri.gov

Fire Safety Code Web Site
http:\\www.fsc.ri.gov

REFERENCES; Rhode Island Uniform Fire Code 1 2003 Edition; Rhode Island Life Safety Code 101 2003 Edition; NFPA 72 2002 Edition; NFPA 720 2003 Edition

PLACEMENT OF SMOKE AND CO ALARMS

- Ceiling mounted: At least 4 inches from any adjoining wall surface
- Wall mounted: Between 4 and 12 inches from the ceiling
- Peaked or sloped ceilings: Within 36 inches of the peak or high side of the slope, but no closer than 4 inches vertically or from an adjoining wall surface.
- Detectors shall not be installed within 36 inches of heating or cooling register, the tip of a ceiling paddle fan, a kitchen door or a bathroom door containing a tub or shower.
- Detectors within a 20 foot horizontal path of a cooking appliance shall be equipped with an alarm-silencing means or be of the photo electric type.
- Where stairs lead to other occupied levels, a smoke alarm or smoke detector shall be located so that smoke rising in the stairway cannot be prevented from reaching the smoke alarm or smoke detector by an intervening door or obstruction.
- For stairways leading up from a basement, smoke alarms or smoke detectors shall be located on the basement ceiling near the entry to the stairs.
- Near the first bedroom door in a hallway closest to the living area.
- Carbon monoxide detectors shall be installed as per manufacturer’s recommendations outside each sleeping area.

.

APARTMENTS/TOWNHOUSES/CONDOMINIUMS

- Each dwelling unit shall comply with all of the requirements of one and two family dwellings for smoke and carbon monoxide alarms.

- In addition, every building meeting this definition having between four and seven units shall be required to have a local fire alarm system that will include detection in all common areas, pull stations, etc; and occupant notification.

- Every building meeting this definition having more than seven units shall be required to have a municipally connected fire alarm system.

Exception:

1) Buildings that have units with suitable fire resistance separation may be exempt from fire alarm system requirements.

2) Buildings that have central heating plants that do not transfer heat via ductwork, and that have suitable separation from the rest of the building, and where dwelling units do not have any other fuel burning appliances, fireplaces or attached or integral garages, then they may be exempt from CO requirements.

Contact your local Fire Marshal
for compliance information

OTHER FACTS
AND RESPONSIBILITIES

- All detectors and devices shall be installed according to manufacturer's recommendations.

- Smoke alarms shall not remain in service longer than 10 years from the date of installation unless otherwise specified by the manufacturer.

- It shall be the responsibility of the owner to maintain in operable condition smoke and carbon monoxide detection systems, installed as required pursuant to this chapter, and the owner shall make operable, within seven (7) days after being notified by certified mail by the occupant and/or enforcement official, any inoperable system.

- The cost of inspection ($30.00) shall be borne by the seller.

- Owners of existing residential properties, previously required to install smoke detectors, shall maintain those detectors in good operating condition.

- The above smoke and carbon monoxide detectors may be installed as either separate or combination units approved by the AHJ.

- The fire department for the community in which the dwelling is located should inspect the smoke and carbon monoxide detector systems of the dwelling within ten (10) days of a request from the owner.

- Once received smoke alarm and CO certificates are good for 60 days.

- It is recommended that you have your inspection scheduled at least 2 weeks before your closing to allow time for any necessary corrections.

APPENDIX D

Properties & General Combustion Characteristics of Natural Gas

Pipeline natural gas is one of the most popular fuel choices today. It is called "natural gas" because it is found in the earth as a natural material generated as a result of decaying organic matter. Most pipeline natural gas is called "associated gas" because it is a co-product associated with the oil recovery process. However, other sources of supply include coal bed methane, landfill methane, non-associated gas directly recovered from gas drilling operations, imported re-gasified liquefied natural gas (LNG) and refinery gases. Pipeline natural gas varies in composition depending on the geographic location the gas is being utilized. In fact, one of the many positive attributes of pipeline natural gas is that it can be mixed and blended from various sources and delivered through the interstate pipeline system as a "combined product" sufficient for most end use applications.

However, if the composition of natural gas supplied within a distribution system varies significantly, adjustments to appliances and other devices may be required. Other adjustments that must be considered, although not an issue for most areas served by National Grid, is the effect of elevation on combustion as appliances are certified and tested at sea level and do not take into account the effects elevation has on measured gas / air density. Fortunately, in most cases, after the original installation and adjustment, further adjustments are not necessary if the appliance is installed and maintained properly in accordance with the Manufacturers recommendations and standard good industry practices.

Most pipeline natural gas supplied in commerce is composed of 80-95% methane which is the principal constitute of natural gas. Methane is the same substance produced via decay of organic matter in some swamps, sewers and landfills however, unlike gas from these sources pipeline natural gas contains other hydrocarbon and non-hydrocarbon constituents including:

- Ethane
- Propane
- Butane(s)
- Pentane(s)
- Hexane(s)
- Trace hydrocarbon constituents
- Carbon Dioxide
- Nitrogen
- Trace Sulfur Compounds including gas odorants
- Moisture

Important parameters that describe the combustion characteristics of pipeline gas that are calculated from the composition constituents include:

Gross Heating Value (also called the "higher heating value" or "heat content") – the amount of energy per standard cubic foot of gas transferred as heat from the complete, ideal combustion of the gas with air, at standard temperature, where all the water formed by the combustion reaction condenses to liquid.

Relative Density (ideal specific gravity) – the ratio of the specific weight of a gas to the specific weight of dry air at the same conditions of pressure and temperature. It is simply the average molecular weight of the gas divided by the average molecular weight of the gas.

Wobbe Index (also called the interchangeability factor) – a numerical value that is determined by dividing the square root of the relative density (a key orifice flow parameter) into the heat content (or Btu per standard cubic foot) of the gas. Basically, the Wobbe Index indicates the relative amount of energy that would flow through a small burner orifice jet.)

It should be noted that pipeline natural gas is non-toxic although sometimes listed as a "hazardous material" due to its flammability. Pipeline natural gas is also typically 40% lighter than air (if air is assumed to have a specific gravity of 1, natural gas would then have a specific gravity of approximately .6 depending on the composition as stated above).

Generally speaking, typical pipeline natural gas distributed in National Grid's service territory can have heating values in the 1010 – 1060 Btu/scf range with a specific gravity ranging from .58 to .62. This can result in a Wobbe Index range of approximately 1321 – 1360. It should be noted that gas compositional changes may occur and typically should not result in Wobbe Index variations in excess of +/- 4% of the typical adjustment gas, or historical supply at the time of installation. It is anticipated that delivered compositions will not vary above a maximum Wobbe Index of 1,400 and a heating value of 1,110 Btu/scf.

Due to possible variations in composition and resulting combustion parameters, it is important to follow the Manufacturers instructions for properly adjusting burners and setting appliances "on rate". Failure to do so may result in an over firing condition, combustion problems and lost efficiency. It is the responsibility of the installer to ensure appliances are installed correctly and properly adjusted for the gas received at the time of installation.

Pipeline natural gas used for combustion processes other than household appliances should consult and follow engineering & installation guidelines as to setting combustion devices "on-rate". Other applications including refueling stations, vehicle and stationary engines also need to consider the above mentioned potential variations in fuel composition and resulting combustion parameters.

It is important to note that all combustion devices should be maintained in proper working order and inspected regularly to ensure continued safe and efficient operation.

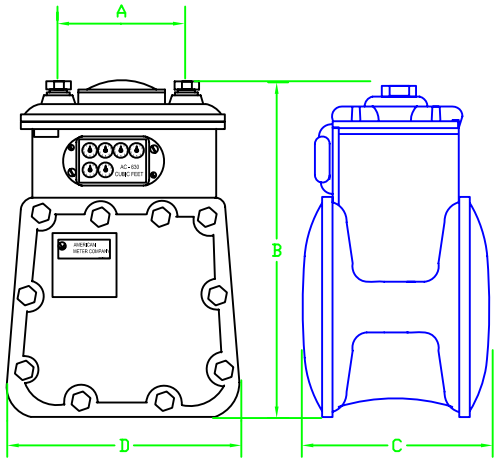
APPENDIX E

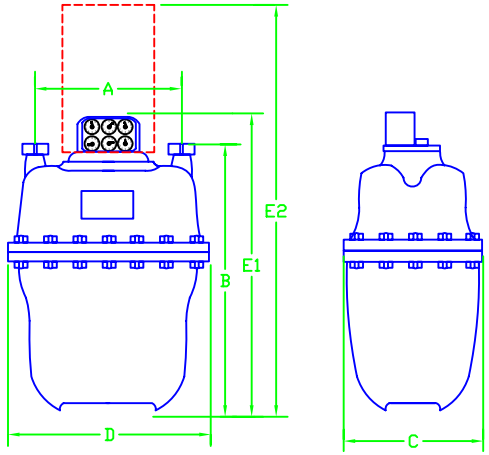
HARD CASE DIAPHRAM METERS

(For Indoor and Outdoor Applications)

Meter Class	METER TYPE	Manuf	A	B	C	D	E 1	E 2	REF DRAWING	WALL-CNTR OF SWIVL	SWIVL SIZE	PIPE SIZE
250	Metris 250TC	Sprague	7 3/4	11 1/8	6	7 3/4	-	-	A	7	20 LT	1 1/4
	AC250TC	American	6	13 7/8	8 1/2	9 5/8	-	-	A	7	20 LT	1 1/4
	R275TC	Rockwell	6	13 7/8	8 1/2	9 5/8	-	-	A	7	20 LT	1 1/4
400	400ATC (30-Lt)	Sprague	8 1/4	17 1/16	10 3/4	12 1/8	-	-	A	7	45 LT	1 1/4
	AL425TC (30-Lt)	American	8 1/4	14 7/8	10	10 3/4	-	-	A	7	45 LT	1 1/4
	R415TC (30-Lt)	Rockwell	8 1/4	14 7/8	9 3/8	11 1/8	-	-	A	8	45 LT	1 1/4
400	400ATC (45-Lt)	Sprague	8 1/4	17 1/16	10 3/4	12 1/8	-	-	A	7	45 LT	1 1/4
	AL425TC (45-Lt)	American	8 1/4	14 7/8	10	10 3/4	-	-	A	7	45 LT	1 1/4
	R415TC (45-Lt)	Rockwell	8 1/4	14 7/8	9 3/8	11 1/8	-	-	A	8	45 LT	1 1/4
600	AC630TC	American	8 1/4	15	10	10 1/2	-	-	A	7	45 LT	1 1/4
800	800ATC	Sprague	11	26 5/16	13 1/4	14 1/8	23 1/2	-	B	9	45 LT	1 1/2
	AL800TC	American	11	27	14 5/8	17 1/4	24 3/16	-	B	10	45 LT	1 1/2
	R750TC	Rockwell	11	27	14 5/8	17 1/4	24 3/16	-	B	10	45 LT	1 1/2
1000	1000ATC	Sprague	11	26 5/16	16 3/8	18	25	-	B	11	2 "	2"
	AL1000TC	American	11	27	13 3/8	14 1/4	23 1/2	-	B	9	2 "	2"
	R1000TC	Rockwell	11	27	14	14/34	23 3/4	-	B	10	2"	2"

NOTE: Meter class "400": NYC has 30-Lt connections
Long Island has 45-Lt connections

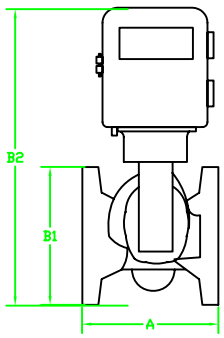


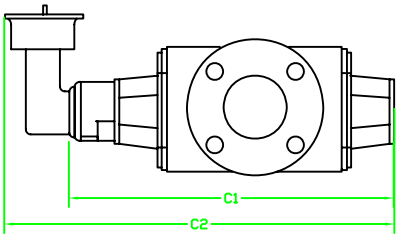


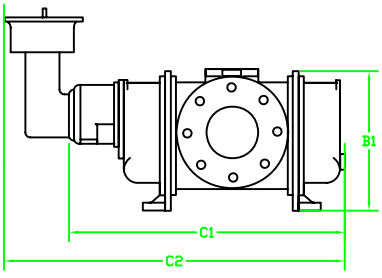
Meter Type	Mfg	A	B 1	B 2	C 1	C 2	Pipe Size
8CTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	19 1/4	2
11CTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	19 3/4	2
15CTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	20 11/16	2
2MTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	20 13/32	2
3MTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	21 5/8	2
5MTC (non-ID)	Dresser	6 3/4	6 31/32	-	-	24 1/2	3
7MTC (non-ID)	Dresser	9 1/2	8 7/8	-	-	24 3/16	3
11MTC (non-ID)	Dresser	9 1/2	8 7/8	-	-	27 3/4	4
16MTC (non-ID)	Dresser	9 1/2	8 7/8	-	-	32 7/16	4
8C-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	19 1/4	2
11C-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	19 3/4	2
15C-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	20 11/16	2
2M-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	20 13/32	2
3M-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	21 5/8	2
5M-ID (TC or nonTC)	Dresser	6 3/4	6 31/32	-	-	24 1/2	3
7M-ID (TC or nonTC)	Dresser	9 1/2	8 7/8	-	-	24 3/16	3
11M-ID (TC or nonTC)	Dresser	9 1/2	8 7/8	-	-	27 3/4	4
16M-ID (TC or nonTC)	Dresser	9 1/2	8 7/8	-	-	32 7/16	4
23M-ID (line mounted)	Dresser	9 1/2	8 7/8	-	-	32 3/16	4
38 M- ID	Dresser	18	18	-	-	36 3/4	6
56 M-ID	Dresser	21	18	-	-	40	8
9C - CMTC	American	6 3/4	6 31/32	-	-	19 1/4	2
1.5M - CMTC	American	6 3/4	6 31/32	-	-	20 13/32	2
3.5M - CMTC	American	6 3/4	6 31/32	-	-	21 5/8	2
7M - CMTC	American	9 1/2	8 7/8	-	-	24 3/16	3
11M - CMTC	American	9 1/2	8 7/8	-	-	27 3/4	4

Meters may be installed in a horizontal or vertical position. Vertical (top inlet) is preferred. Check for "Arrow" to indicating proper flow direction

If applicable, a restricting orifice should be installed at least 2 or 4 pipe diameters downstream of the meter. Before installing, remove plastic end caps and check for free rotation of impellers. Do not put meter under strain at inlet and outlet flange connections and apply no more than 80 FT-LBS of torque when tightening flange bolts. Add oil to all 3 oil reservoirs to the center of the oil level indicator. "Do Not Overfill"

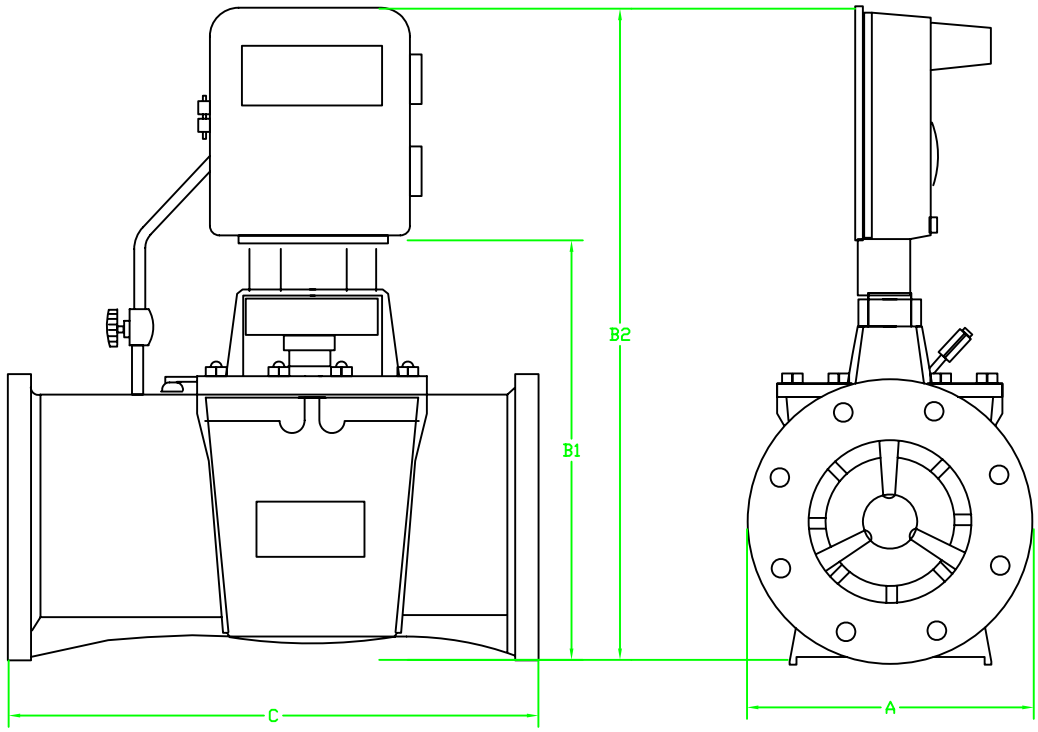






SENSUS/ROCKWELL TURBINE METERS

Meter					Inlet
Size/Type	A	B1	B2	C	Pipe Size
		Dimensions (inches)			
4"AAT18	9	14 3/16	23 11/16	14	4
4"AAT27	9	14 3/16	23 11/16	14	4
6"AAT35	11	14 3/16	22 1/2	16	6
6"AAT57	11	14 3/16	22 1/2	16	6
8"AAT60	13 1/2	19 11/16	29 3/16	21	8
8"AAT90	11	17 3/16	26 11/16	16	8
12"AAT140	13 1/2	19 11/16	29 3/16	21	12
12"AAT230	19	25 3/16	37 11/16	30	12
4"AAT18 (720#)	10 3/4	12 11/16	23 11/16	14	4
4"AAT27 (720#)	10 3/4	12 11/16	23 11/16	14	4
6"AAT35 (720#)	14	15 1/8	26 11/16	22 1/2	6
6"AAT57 (720#)	14	15 1/8	26 11/16	22 1/2	6
8"AAT60 (720#)	13 1/2	19 11/16	29 3/16	27 14	8
8"AAT90 (720#)	11	17 3/16	26 11/16	27 14	8
12"AAT140 (720#)	13 1/2	19 11/16	29 3/16	32 1/2	12
12"AAT230 (720#)	19	25 3/16	37 11/16	32 1/2	12



APPENDIX F

nationalgrid

TECHNICAL INSTRUCTION

Application of Coating Systems

Document Date: April 15, 2010

Lead Organization: System Integrity/Corrosion Control

Application: U.S National Grid

Brief History:

Revision Number	Description	Effective Date
Revision 0	Application of Coating Systems for New Construction and Maintenance, 030030-TI	April 15, 2010
Revision 0	Facility Coating Guide – Standard Drawing, 030031-CS	April 15, 2010
Cancelled	KeySpan Construction Standard, Coating Materials for Steel, New Construction and Maintenance CORR6500	April 15, 2010
Cancelled	KeySpan Work Method, Coating Systems for New Construction and Maintenance, CORR 5040	April 15, 2010
Cancelled	National Grid, Gas T&D Construction Standards, Chapter 3, Section 34, Coating and Wrapping	April 15, 2010
Cancelled	National Grid, Gas T&D Construction Standards, Chapter 4, Section 43.14, Above Grade Piping Protection	April 15, 2010
Cancelled	Rhode Island Operations Standards Manual, Section 3702, Installation - Cold-Applied Tape Systems, Section 3703, Installation – Mastic Systems	April 15, 2010

Key Changes:

Section	From	To

TABLE OF CONTENTS

		Page
1	**General**	**1**
	1.1 Purpose	2

	1.2 Responsibilities	3
2	**Definitions**	**3**
3	**Tools and Equipment**	**4**
4	**Safety**	**4**
5	**Operator Qualifications**	**4**
6	**Instructions**	**5**
	6.1 Handling and Storage of Coating Materials	5
	6.2 Pre-Coating Preparations	5
	6.3 Application of 35 Mil Cold Applied Tape	6
	6.4 Application of 35 Mil Cold Applied Moldable Tape	10
	6.5 Application of 35 Mil Repair Patch	10
	6.6 Application of Wax Tape	11
	6.7 Application of Keyhole Patch Pad and Mastic	12
	6.8 Application of Heat Shrink Sleeves, above and below grade, for steel pipelines less than 24in.OD.	13
	6.9 Application of Heat Shrink Sleeves on Directional Drill Steel Pipelines	15
	6.10 Application of Epoxy Material	17
	6.11 Application of Rust Protective Enamel	21
	6.12 Inspection and Testing of Field Applied Pipe Coating	21
7	**Data Capture**	**22**
8	**References**	**22**
9	**Attachments**	**22**
	Attachment 1: Facility Coating Guide-Standard Drawing	23
	Attachment 2: Heat Shrink Sleeve Manufacturers and Manufacturer's part numbers.	24
	Attachment 3: 35 Mil Cold Applied Tape Quantity Requirements	25
	Attachment 4: Wax tape quantity requirements for coating valves	26
	Attachment 5: Testing Voltage for Field Applied Coatings	27
	Attachment 6: Jeep Testing Data Sheet Example	28

1. General

1.1 Purpose

a. The purpose of this technical instruction is to provide instruction on the application of the coating systems used on the National Grid gas system for above and below grade steel pipe and fittings.

1) Steel pipe is supplied with factory applied coating. Some fittings are supplied with coatings applied. These coatings provide adequate protection so long as they are not damaged. Care must be exercised throughout storage, handling and installing procedures to maintain the integrity of these coatings. Whenever damage occurs, repairs shall be made as prescribed within this technical instruction.

2) Existing steel pipe and fittings that have coating damage or the coating has been removed to perform maintenance procedures shall be repaired as prescribed within this technical instruction.

Note: For the application of all available coatings, refer to Attachment 1, Facility Coating Guide-Standard Drawing.

1.2 Responsibilities

a. System Integrity or designee shall be responsible to:
   1. Work in conjunction with Materials & Standards to approve coating repair methods.

b. Corrosion Control or designee shall be responsible to:
   1. Apply coatings for new construction and maintenance as required (or requested)
   2. Perform visual inspection and electrical testing of pipe coating integrity as required or requested.

c. Materials and Standards shall be responsible to:
   1. Work in conjunction with System Integrity to approve coating materials.
   2. Work in conjunction with System Integrity to approve coating repair methods.

d. Instrumentation and Regulation (I&R) or designee shall be responsible to:
   1) Apply coatings for new construction and maintenance as required (or requested).
   2) Perform visual inspection and electrical testing of pipe coating integrity as required or requested.

e. Gas Operations/Construct & Maintain or designee shall be responsible to:
   1) Apply coatings for new construction and maintenance as required (or requested).
   2) Perform visual inspection and electrical testing of pipe coating integrity as required or requested.

f. Production or designee shall be responsible to:
   1) Apply coatings for new construction and maintenance as required (or requested).
   2) Perform visual inspection and electrical testing of pipe coating integrity as required or requested.

g. Customer Metering Services (CMS) or designee shall be responsible to:
   1) Apply coatings for new construction and maintenance as required (or requested.
   2) Perform visual inspection of pipe coating integrity as required or requested.

2. Definitions

May - Indicates an action or method that can be used at the discretion of the user. It is not required or expected.
Shall - Indicates a mandatory requirement.
Should - Indicates best practice and is the action that is expected to be performed as described unless there is a compelling reason not to do so.
SSPC-SP2 (Hand Tool Cleaning) - a method of preparing steel surfaces by use of non-power hand tools. Hand tool cleaning removes all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife.
SSPC-SP3 (Power Tool Cleaning) - a method of preparing steel surfaces by use of power assisted hand tools. Power tool cleaning removes all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill

scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Surface should not be buffed or polished smooth.

SSPC-SP5 (NACE 1) (White Metal Blast Cleaning) - a method of preparing steel surfaces by use of abrasives propelled through nozzles or by centrifugal wheels. White metal blast cleaning removes all mill scale, rust, rust scale, paint or foreign matter. A White Metal Blast Cleaned Surface Finish is defined as a surface with a gray-white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings. The surface, when viewed without magnification, shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint, or any other foreign matter.

SSPC-SP6 (Commercial Blast Cleaning) - a method of preparing steel surfaces by use of abrasives propelled through nozzles or by centrifugal wheels. Commercial Blast cleaning removes all mill scale, rust, rust scale, paint or foreign matter. A Commercial Blast Cleaned Surface Finish is defined as one from which all oil, grease, dirt, rust scale and foreign matter have been completely removed from the surface and all rust, mill scale and old paint have been completely removed except for slight shadows, streaks, or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues of rust or paint may by found in the bottom of pits; at least two-thirds of each square inch of surface area shall be free of all visible residues and the remainder shall be limited to the light discoloration, slight staining or tight residues mentioned above.

SSPC-SP10 (NACE 2) (Near White Blast Cleaning) – a method of preparing steel surfaces by the use of abrasives propelled through nozzles or by centrifugal wheels. Near White Blast-Cleaning removes nearly all mill scale, rust, rust scale, paint, or foreign matter. A Near-White Blast Cleaned Surface Finish is defined as one from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or light, tight residues of paint or coating that may remain. At least 95 percent of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discoloration mentioned above.

3. Tools and Equipment

Use all tooling and equipment as based on coating requirements.

a. Wire Brush
b. Brushes, gloves, rags
c. Knife
d. Chisel
e. Hammer
f. Torch with regulator, hose and propane tank (for shrink sleeves application)
g. Tape Wrapster (for cold applied 35 mil tape application only)
h. Power cleaning tools
i. Abrasive blasting equipment
j. Coating inspection equipment (i.e.: wet film gauge, dry film gauge, etc.)

4. Safety

a. All required PPE shall be worn
b. All required PPE shall be utilized

5. Operator Qualification

Personnel applying coating systems for new construction and maintenance shall be either Operator Qualified or directed and observed, per the Operator Qualification Plan, when performing the following tasks:

a. Task #11– Applying pipe coating in the field for maintenance
b. Task #23 – Inspecting the condition of exposed pipe or pipe coating
c. Task #70 – Properties of Gas / Abnormal Operating Conditions

6. Instructions

6.1 Handling and Storage of Coating Materials

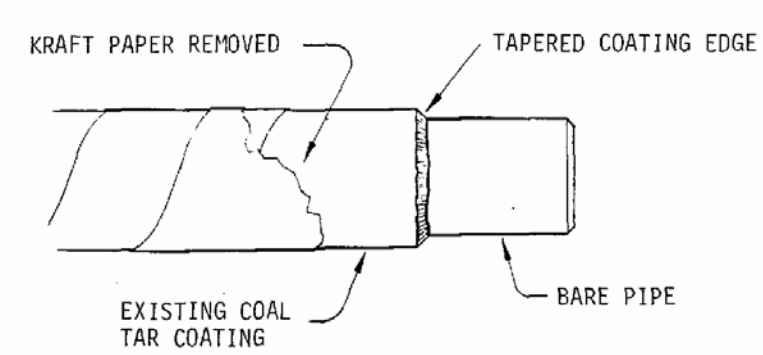
Field applied coating materials are to be protected prior to use by storing in a dry place (above freezing temperature recommended) and under cover until ready for use and per manufacturer's specifications. Tape containers should be handled carefully, avoiding damage. Materials that display evidence of damage or deterioration should not be used. Exposure of ultra-violet sensitive tape to sunlight shall be avoided.

6.2 Pre-Coating Preparations

a. Remove all mill scale, and loose or damaged coating as needed. Special care must be exercised so not to destroy the pipe to coating bond beyond the area to be stripped.

1) PE coatings (i.e., Pritec and X-Tru coating)
   i. Remove PE material using a knife, and pliers if necessary. The adhesive underneath shall be removed by scrapping, wire brushing, or solvent.
   ii. Properly dispose of all removed coating with general waste.

2) Coal tar coating removal
   Coal tar wrap may contain non-friable asbestos and the mastic may contain low levels of PCB's. Remove coal tar per approved procedure F-617, Handling Coal Tar Wrap.

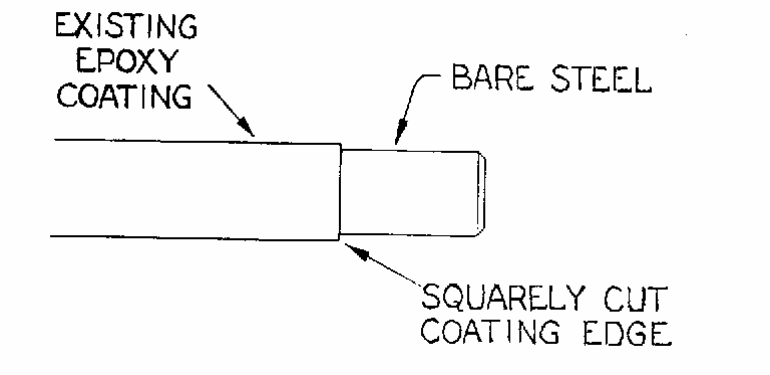


3) No-Oxide wrapped coating.

   i. Remove coating with a knife or other suitable tool by cutting, pealing and/or scraping.
   ii. Properly dispose of all removed coating with general waste.

4) Epoxy and thin film coating removal

i. The preferred method of removing epoxy coating is by shaving with a knife. If grinding or sanding is used, a full faced fresh air respirator and disposable coveralls will be required.
ii. Dispose of all coating removed by shaving with normal waste.



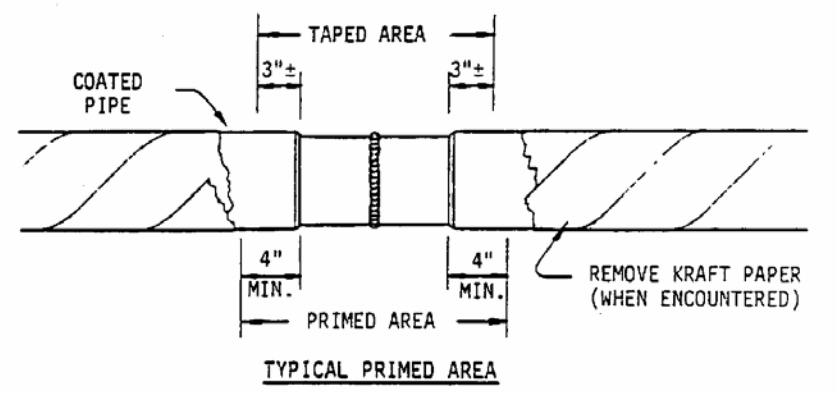
b. Prepare the metal surface.
All bared metal surfaces must be thoroughly cleaned following the surface preparation guidelines for each coating system. Dirt, grease and oil shall be wiped from these surfaces. Rust and scale can be removed by wire brushing. Weld spatter or other sharp points should be removed by filing or chiseling. Primer, when required, shall be applied as applicable for each coating system.

6.3 Application of Cold Applied Tape

Cold applied tape has a rubber mastic adhesive base with a vinyl backing and can be applied in temperatures ranging from 0° through 100°F. This tape is suitable for above and below grade applications. It is not suited for irregular shapes.

a. Surface Preparation
1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

b. Primer Application
1) A coat of primer should be applied at temperature above 32 °F, and shall be applied when ambient temperature is below 32 °F in accordance with manufacturer's recommendations.
2) The area to be primed should extend at least one half inch beyond the area to be taped.
3) The primer shall be stirred or shaken before each application.
4) Apply a thin brush coat of the adhesive primer to all the metal surfaces that will be receiving tape and adjacent existing coating.
5) Allow the primer to become tacky before applying tape. This time should be between five and ten minutes, depending on ambient temperatures.
6) Primer should not be applied on or near plastic pipe or tubing.



TYPICAL PRIMED AREA

c. Application of Cold Applied Tape

There are two recommended methods of applying cold applied tape, the spiral wrap (preferred method) and the cigarette wrap.

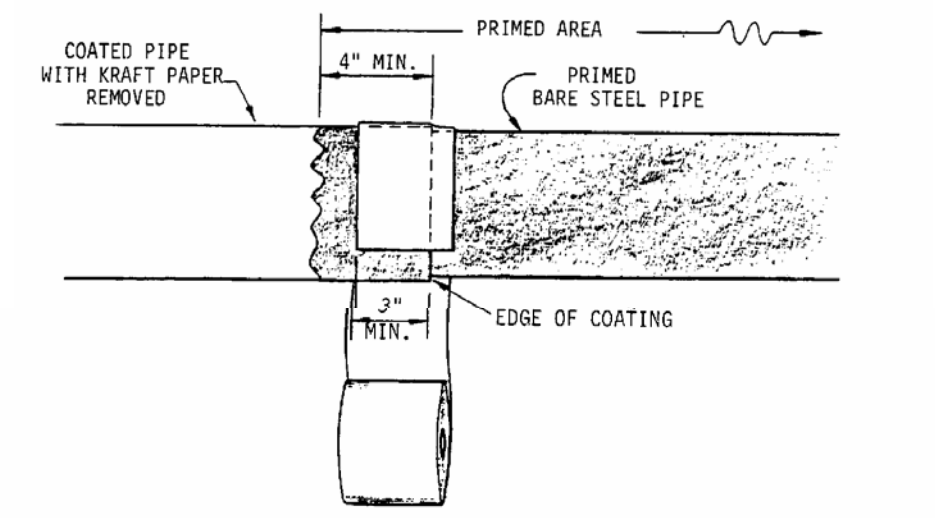
1) Spiral Wrap Method

NOTE: When applicable it is recommended to use a hand-wrapping machine.

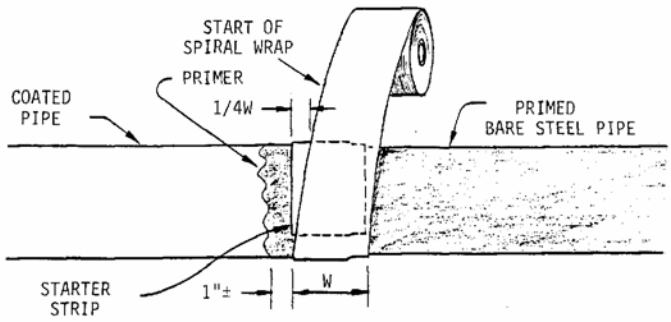
i. Remove the release liner.

1. When room available: Remove the release liner from the tape for approximately 6". Placing this section on the pipe, removing the release liner as the tape is applied.
2. When room to work is limited: Cut off a length of tape from the roll long enough to wrap a minimum 1 ½ times the circumference beginning. Make a small roll out of the cut piece of tape.

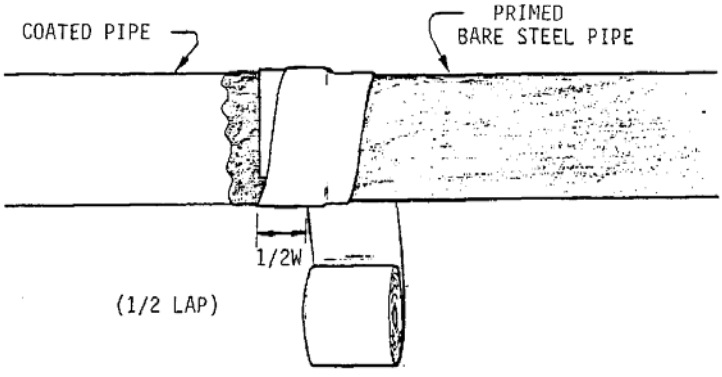
ii. Start by applying the tape on the existing coating a minimum of 3" back from the prepared edge. Pull only hard enough on the tape to make it conform to the irregular surfaces of the pipe or fitting. The proper amount of pull is being applied when the tape goes on without wrinkles or an excessive stretching of the tape. This tape should not be stretched when applying. Firm pressure is necessary on the roll or piece being applied. Wrinkles and air pockets should be worked out as the tape is placed.



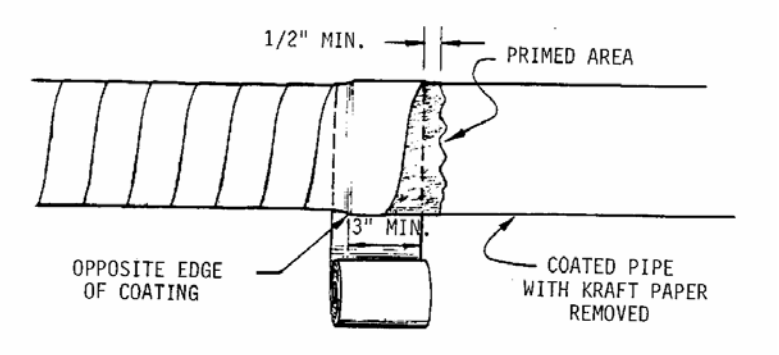
iii. Once the first lap has been completed, the spiral wrap should be started as shown below. The tape should be angled enough to overwrap 3/4 of the initial wrap on the first half spiral. Enough pressure should be maintained on the roll to remove any wrinkles in the applied tape.



iv. The first complete spiral (one revolution around pipe) should overwrap the starter strip by one half as shown below.



v. The one half overlap (approximately 50% over the previously applied strip of tape) should be maintained until the opposite end of the primed area has been reached.



vi. When the end of the joint being wrapped is reached, discontinue all pull on the tape during the last spiral. The outer layer's end shall face down to avoid the potential for peel-back during backfill.

vii. The release liner shall be appropriately discarded.

2) Cigarette Wrap Method
When conditions do not allow for spiral wrap the pipeline will need to be cigarette wrapped.

i. Start by precutting tape into a length that is 2.00" longer than the circumference of the pipe being wrapped, this will allow for an adequate overlap seal.
ii. Apply the tape so that the end of the wrap is facing down, remove release liner as the tape is applied, make sure to apply tape with tension in a uniform manner and wrinkle free using hand pressure to smooth and conform the tape when necessary.

1. When cigarette wrapping on 6" diameter and smaller pipe, the overlap should be a minimum of 2".
2. When the diameter is 8" or greater, you should have a minimum of a 50% overlap, providing mechanical strength, which is needed on larger diameter pipe.

iii. The seams should be smoothed down with the fingers of the palm of the hand to insure proper sealing and eliminate all air pockets. In all cases, the outer layer's end should face down.

6.4 Application of Moldable Cold Applied Tape

Moldable tape has a rubber mastic adhesive base with a vinyl backing and can be applied in temperatures ranging from 0° through 100°F. This tape is only suitable for below grade applications. It is available only in a two inch size and is used typically on below grade small diameter fittings (2 inches or less), weld beads, small holiday repairs, wire connections (i.e.: anode connection, tracer wire connections) and thermite-welds.

a. Surface Preparation

1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

b. Primer Application
   1) A coat of primer should be applied at temperature above 32 °F, and shall be applied when ambient temperature is below 32 °F in accordance with manufacturer's recommendations. The area to be primed should extend at least one half inch beyond the area to be taped.
   2) The primer shall be stirred or shaken before each application.
   3) Apply a thin brush coat of the adhesive primer to all the metal surfaces that will be receiving tape and adjacent existing coating.
   4) Allow the primer to become tacky before applying tape. This time should be between five and ten minutes, depending on ambient temperatures.
   5) Primer should not be applied on or near plastic pipe or tubing.

c. Moldable Tape Application

   1) Remove release liner as tape is being applied.
   2) Apply tape with sufficient pressure to conform and fill in the irregular areas of the substrate, using a 1-inch minimum overlap.
   3) Use hand pressure to mold and conform the tape to the pipe or fitting. Give special attention to areas such as threaded piping and irregular transitions areas. Tape wrinkles may be molded and sealed with hand pressure.
   4) Field applied tape shall extend at least 2" over the factory coating.

6.5 Application of Repair Patch

Repair patch has a rubber mastic adhesive base with a vinyl backing and can be applied in temperatures ranging from 0° through 100°F. This tape is suitable for below grade applications only. It is generally not suited for irregular shapes and is used primarily for repairing small damage to coating not requiring a full 360 degree wrap. It is available only in a 6" x 6" square patch and is used typically in below grade applications, such as: small holiday repairs, wire connections (i.e.: anode connection, tracer wire connections) and thermite-welds.

a. Surface Preparation
   1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

b. Primer Application
   1) A coat of primer should be applied at temperature above 32 °F, and shall be applied when ambient temperature is below 32 °F. in accordance with manufacturer's recommendations. The area to be primed should extend at least one half inch beyond the area to be taped.
   2) The primer shall be stirred or shaken before each application.
   3) Apply a thin brush coat of the adhesive primer to all the metal surfaces that will be receiving tape and adjacent existing coating.
   4) Allow the primer to become tacky before applying tape. This time should be between five and ten minutes, depending on ambient temperatures.
   5) Primer should not be applied on or near plastic pipe or tubing.

c. Repair Patch Application
   1) Center patch over the repair or holiday, remove release liner, using hand pressure.
   2) Press firmly down making sure the pad conforms to the surface of the pipe.

6.6 Application of Wax Tape

Wax tape is best suited for use on irregular-shaped fittings and in wet environments where it is not practical or suitable to use cold applied, repair patch or moldable tape.

- #1 wax tape is brown in color, and shall be used on below-ground applications only in accordance with Attachment 1: Facility Coating Guide-Standard Drawing. Primer for use with #1 tape is brown in color.
- #2A wax tape which is gray in color and should be used for above-ground use only. #2A tape will firm up after 1 - 10 days and is suitable for painting. Primer for use with #2A tape is Temp-Coat 3000, typically white in color.

a. Surface Preparation
   1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

b. Primer Application
   1) Wax tape primer shall be applied to the entire surface by brush or by hand. It is recommended that gloves be worn during primer and tape application. Only a thin film of primer is required.
   2) If the surface is wet or moisture is present, rub and press on primer into the surface, to displace moisture and ensure adhesion.

c. Wax Tape Application

   1) Apply wax tape in a spiral around the pipe or fitting, allowing for a minimum 25% overlap and enough slack so that it can be molded into conformity with an irregular surface.
   2) Press the wax tape into place making sure that there are no air pockets or voids underneath, and that it is in contact with the surface.
   3) Press and smooth out the lap seams to ensure that the laps are sealed.
   4) The fitting and bolts can be wrapped with either a spiral wrap or individual strips but regardless should overlap the previous layers by a minimum of 25%.
   5) Mill coated surfaces shall have a minimum overlap of ½ the pipe diameter but not less than 3” from the cut-back edge.
   6) Wax tape is extremely pliable and should conform completely to the irregular surface.
   7) No drying time is required.
   8) For #2 type wax tape (above grade), if tape is going to be painted, allow 1 to 10 days for the tape to firm up before painting.

d. Mechanical Over Wrap Application (below grade only)

   1) Mechanical over wrap shall be applied on 10” diameter and larger, and recommended on smaller diameters in aggressive soil conditions.
   2) Apply a spiral or cigarette wrap of plastic film completely over wax tape with a minimum overlap of 2”.

6.7 Application of Keyhole Patch Pad and Mastic

a. The Keyhole Patch-Pad is used to apply coating to a thermite-weld or coating holiday through a small diameter hole or keyhole. The components include two tools attached to extendable poles (a broom handle can be used) and a patch-pad with pre-applied coating.

1) Wire brush and clean the surface of any loose coating, rust, scale and foreign matter.
2) Secure the extension handles to the patch pad applicator and finishing tool.
3) Attach a velcro patch-pad to the velcro surface of the applicator tool. The patch-pad is pre-coated with anti-corrosion compound.
4) Lower the applicator tool with the pre-coated patch-pad attached into the keyhole and onto the pipe surface to be protected.
5) Use the finishing tool to hold the patch-pad to the pipe while lifting off the applicator tool and leaving the patch-pad on the pipe.
6) Use the finishing tool to press the pad firmly to the pipe, making sure that the coating compound is squeezed out on all edges and ensuring that the pad is firmly adhered.

b. A non-asphalt based primer-less brush applied mastic is used to coat irregular shaped fittings through a small diameter hole or keyhole where the keyhole repair patch cannot be applied. **Brush applied mastic shall not be used in any other application.**

1) Wire brush and clean the surface of any loose coating, rust, scale and foreign matter.
2) Apply mastic using a brush and allow to dry per manufacturers instructions.

6.8 Application of Heat Shrink Sleeves for above and below grade steel pipelines less than 24in. OD. (Non Directional drill applications)

Heat shrink sleeves should be used on weld joints on new steel installations where practical and should be installed per manufacturer's recommendations. Personnel shall be properly trained in the installation of applicable manufacture of the shrink sleeve being applied or Corrosion Control should be contacted for training & installation guidelines.

a. Surface Preparation
   1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

   NOTE: Pipe coated with Coal Tar - remove outer paper wrap 5" to 6" adjacent to cutback to expose coal tar. DO NOT use any power tool, grinder, hand sanding, or burning equipment to remove coal tar wrap. All removal and disposal procedures shall be per approved procedure, F-617, Handling Coal Tar Wrap, and use of appropriate PPE must be followed.
   Painted coatings - remove whitewash paint on the surface of coating to be covered by shrink sleeve.

   2) Wiping with a dry, clean rag may be necessary to remove the particles from cleaning.

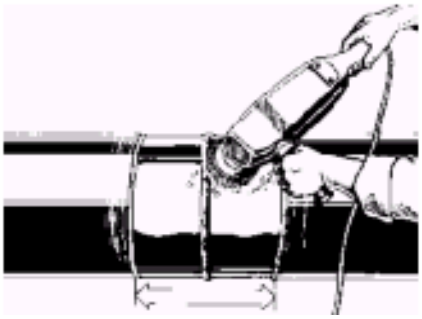
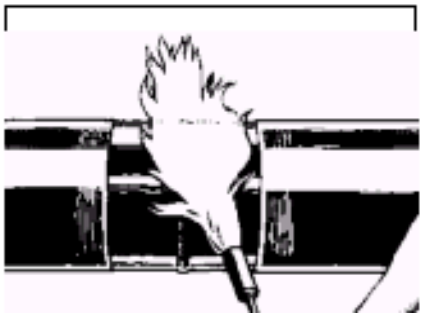
b. Preheating of Pipe
   1) The substrate should be heated to approximately 140 °F (60 °C) prior to the coating application to eliminate moisture and to ensure the surface is the appropriate temperature. It is recommended that a digital thermometer be used to monitor temperature. Do not use "Temp sticks" as they will leave a residue on the pipe. Remember to wear gloves.

c. Application of shrink sleeve

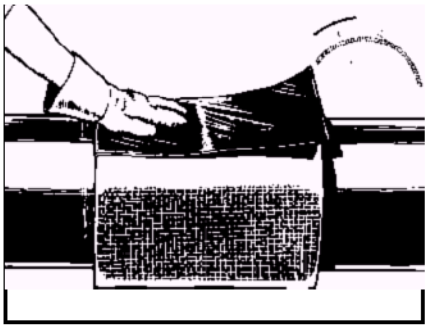
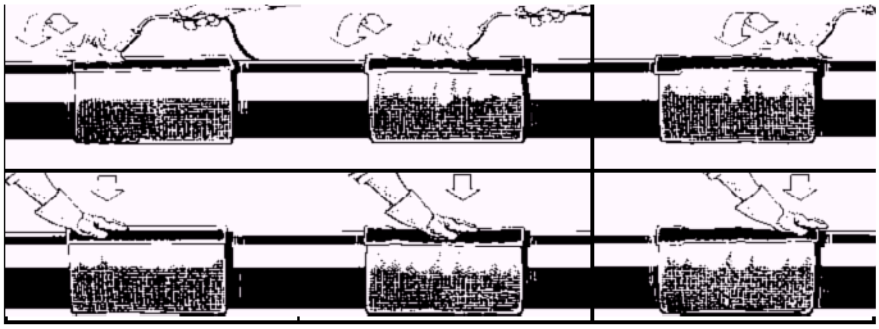
   1) Remove the protective release plastic from the coated sleeve if applicable. Center sleeve over the weld so it is evenly overlapping adjacent pipe coating. Wrap loosely around pipe.

      i. Clean overlap area of the sleeve to remove dirt and other foreign materials.
      ii. Edges of sleeve should extend 2" or more onto adjacent pipe coating.
      iii. Overlapping ends of sleeve should align evenly.
      iv. Position overlap to permit easy access for installing closure.

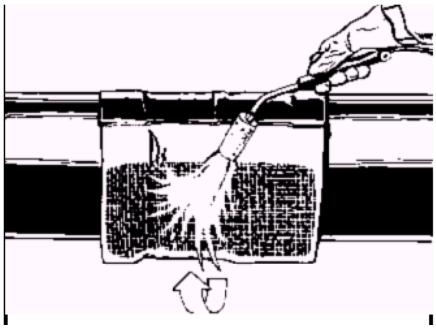
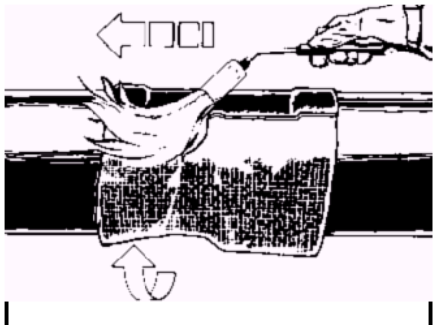
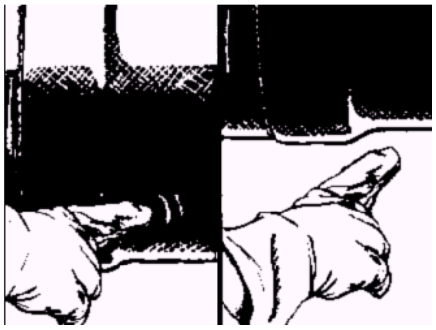
   NOTE: Two people working on opposite sides of the pipe are recommended for installing sleeves on pipe 16" diameter and larger.

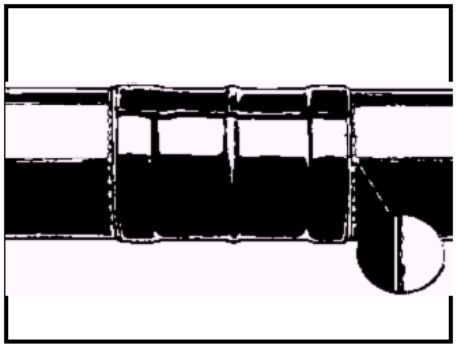

2) Press closure in position, centering over the exposed sheet end. The closure is pre-attached and already centered in position.

3) Using a torch, adjust flame length to approximately 20" (50 cm) to produce a blue tipped yellow flame. Using the yellow portion of the flame, heat the closure evenly until the pattern of the fabric becomes smooth and uniform. With gloved hand, smooth any wrinkles by working outward from the center.

4) Using the torch, begin at the center of the sleeve and heat circumferentially around the pipe, using a constant paintbrush motion. This is called sleeve recovery.



i. The sleeve is fully recovered when all of the following have occurred:

a. The sleeve sheet has a smooth surface.
b. There are no cold spots on the sleeve surface.
c. Weld bead profile can be seen through the sleeve.
d. After sleeve is cool, mastic flow is evident on both edges.
e. The sleeve has fully conformed to the pipe and adjacent coating.
f. The pattern on the backing has changed in appearance per manufacturer's specifications, (e.g. Raychem and Tapecoat; the diamond pattern on sleeve has turned smooth. Canusa; yellow color of sleeve has temporarily turned to orange).

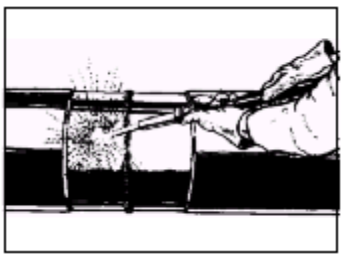
ii. During shrink down, occasionally check adhesive flow with a finger.

a. Wrinkles should disappear automatically.
b. While sleeve is hot, press or roll overlap and closure area to remove any air voids.

6.9 Application of Heat Shrink Sleeves on Directional Drill Steel Pipelines

Heat shrink sleeves should be used on weld joints on new steel installations where practical and should be installed per manufactures recommendations. Personnel shall be properly trained in the installation of applicable manufacture of the shrink sleeve being applied or Corrosion Control should be contacted for training & installation guidelines.

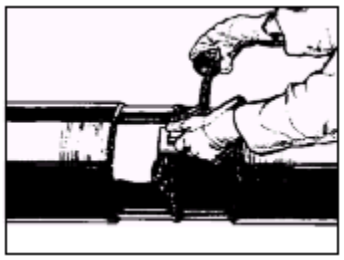
a. Surface Preparation
1) Surface preparation shall be per Blast Cleaning SSPC-SP6. In special cases, Power Tool Cleaning SSPC-SP3 is approved by Corrosion Engineering.



b. Preheating of Pipe
   1) The substrate should ALWAYS be heated to approximately 158 °F (70 °C) prior to the coating application to eliminate moisture and to ensure the surface is the appropriate temperature. It is recommended that a digital thermometer be used to monitor temperature. Do not use “Temp sticks” as they will leave a residue on the pipe. Remember to wear gloves.

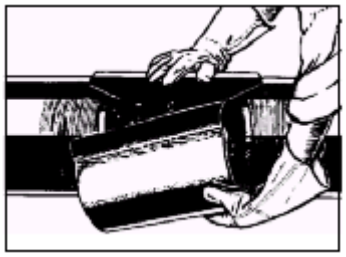
c. Primer Application

   1) Mix the two-component epoxy resin per the manufacturer’s instructions.
   2) If required, allow to sit in the mixing container the required time for activation, per manufacturer’s instructions.
   3) Apply primer only on the steel area.



d. Application of shrink sleeve

   1) Take the ready-to-fit wraparound sleeve and remove the release plastic about 6 inches from the end with the cutoff corners.
   2) Place the sleeve end centrally over the weld area at a right angle to the axis of the pipe. The sleeve should over-lap the mill-applied coating by at least 2 inches on both edges.
   3) Wrap the sleeve, with its integrated closure patch, around the pipe ensuring that the leading sleeve edge over-laps the other edge by 2 inches, at the same time removing the rest of the release foil.



   4) Next, using a medium flame with yellow tip and keeping it constantly moving in a paintbrush motion, uniformly heat the closure patch until the fiberglass weave shows through.

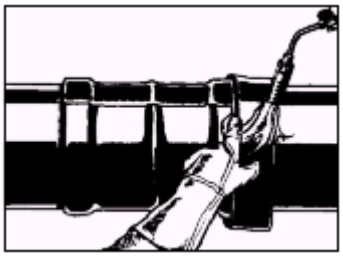
      i. With a gloved hand, smooth the closure patch firmly down, free from wrinkles.
      ii. Roll out the closure area with a silicone roller.

   5) Shrink the entire sleeve, using a long flame with yellow tip, beginning at the leading edge and moving the torch continuously in a paint-brush motion all around the sleeve.

6) Position the narrow heat-shrinkable strip centrally over the leading edge of the sleeve.

   i. Make sure the closure patch of narrow strip does not overlap the closure patch of main sleeve.
   ii. Check PE temperature prior to shrinking
   iii. Shrink the narrow strip closure patch in the same way as the sleeve.

.



7) The sleeve is correctly installed when:
   i. The complete sleeve is in contact with the surface of the pipe, and it is smooth and has no cold-spots or air pockets.
   ii. Adhesive flow is evident at both sleeve edges along the circumference of the pipe.
   iii. The overlap on the mill-applied coating is as specified.

6.10 Application of Epoxy Material

a. Below Grade Touch-up of factory epoxy coated fittings (one part epoxy).
This type of epoxy should be used for patches and/or repairs required for small voids and scratches in factory epoxy coated fittings. Epoxy should be kept in a warm area of the crew truck during cold weather and kept from freezing temperatures while in storage.

1) Surface Preparation
   i. Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

2) Liquid epoxy application

   i. Thoroughly stir before using.

   ii. Using a brush, apply coating in a thin layer. Temperatures should be between 0 and 90 °F. The lower temperatures will thicken the liquid and lengthen the drying and curing times required.

Ambient Temperature	Drying Time	Curing Time
72 °F	10 min	4-6 hrs
0 °F	20 min	8-16 hrs

b. Below Grade Field coating of weld joints and fittings (two part epoxy, PowerCrete R95 or approved equivalent)
This type epoxy may be used to field coat weld joints, pipe bends, fittings, valves on FBE or PowerCrete factory coated steel pipe. It can be used in directional drill and direct bury applications. It can also be used to coat any steel structure or odd shape in need of corrosion protection.

1) Storage and Handling
For optimum performance, store in a dry, well ventilated area. Maintain in original packaging and sealed until just before use. Avoid exposure to direct sunlight, rain, snow, dust and other adverse environmental conditions or contaminates. Avoid prolonged storage above 104 °F or below 40 °F.

i. Under these conditions, the shelf life unopened is approximately 2 years at 75 °F.

2) Surface Preparation

ii. The surface to be coated shall be clean and dry, cleaned of all coatings and free of all contaminates.
iii. Following cleaning, the steel surface shall be roughened or abraded with suitable hand or power tools, or particle blasted (sand or other suitable material). The surface shall not be burnished (polished). The surface to be coated shall be cleaned to the grade of SSPC-SP-10 (NACE 2) minimum (Near white metal blast cleaning) or better.
iv. The surface of the existing coating that will be overlapped, if present, shall be tapered, cleaned and abraded.

3) Temperature Considerations

i. If the surface to be coated is below 50 °F, preheating of the substrate is recommended. Preheat temperatures should not exceed 212 °F prior to the coating application.
ii. The application should only be done when the temperature of the steel is at least 5 °F higher than the dew point, as recommended by NACE.

4) Coating Application

i. The clean dry surface shall be coated within 4 hours of abrasion.
ii. Components “A” and “B” shall be adequately mixed with no included air in the ratio of 3.6:1 (part “A” to “B”).
iii. After mixing, the coating shall be applied to the abraded, dried and cleaned surface immediately. The pot life at 70 °F is approximately 14 minutes.
iv. Apply by troweling liquid onto the prepared surface.
v. The coating shall be applied to a minimum thickness of 40 mils. Existing coating shall be overlapped at least 1 inch.
vi. Following application, the coating shall be leveled (smoothed) and any air entrapment removed using tooth surface attached to the trowel or equivalent. All runs and sags shall be leveled.
vii. Coated surface shall not be touched for at least four (4) hours if the ambient temperature is near or above 70°F, or five (5) hours if ambient temperature is near 60

°F. If the curing time is reduced by applying an electric or gas-fired torch, the temperature of the coating shall not exceed 160 °F at any location.

viii. The wet coating shall not be contaminated with particles such as blowing sand, insects or foreign materials.

ix. Under no circumstances shall the pipe be installed before the coating has reached a minimum Type D Durometer (ASTM D2240) hardness reading of 75.

x. All application tools, brushes and rags should be disposed of with normal waste after product has hardened.

5) Inspection

i. Holiday checks shall be made using approved National Grid procedure. The total voltage used for the holiday checks will be 125 volts per mil and holidays found shall be patched by remixing and following the same application procedure. The patched holidays shall be retested.

ii. Coating thickness checks shall be made at an ambient temperature with a magnetic pull-off film thickness gauge that has been calibrated within the previous 24 hours, or immediately, if mishandled. The thickness of the calibration standard shall be at the upper and lower end of the specified thickness range. The thickness measurements shall be taken along the length of each joint of coated pipe at the 12 o'clock and 6 o'clock positions.

iii. Coating hardness checks shall be made at an ambient temperature with a Type D Durometer (ASTM D2240), lab calibrated within the previous sixty (60) days and verified daily, in good working condition and with no obvious damage. The checks shall be made at the 12 o'clock and 6 o'clock positions on the pipe.

iv. To be acceptable, the coating shall have a minimum of 40 mils dry film thickness and a Shore Durometer hardness of at least 75.

c. Above Grade coating of pipe and fittings (Carbomastic 15 or approved equivalent)
This type of epoxy should be used for coating new and existing above grade steel, as well as a touchup or overcoat of galvanized steel.

1) Storage and Handling

For optimum performance, store in a dry, well ventilated area. Maintain in original packaging and sealed until just before use. Avoid exposure to direct sunlight, rain, snow, dust and other adverse environmental conditions or contaminates. Epoxy paint should be stored indoors at temperatures between 45 and 110 °F .

i. Under these conditions, the shelf life unopened is approximately 3 years at 75 °F.

2) Surface Preparation

i. The surface to be coated shall be clean and dry, cleaned of all coatings and free of all contaminates. Employ adequate methods to remove dirt, dust, oil and other contaminates that could interfere with adhesion of coating.

ii. Non-immersion: Following cleaning, the steel surface shall be roughened or abraded with suitable hand or power tools. The surface to be coated shall be cleaned to the grade of SSPC-SP-2 minimum (hand tool cleaning) or better. SSPC-SP-3 is recommended.

iii. Immersion: Following cleaning, the steel surface shall be roughened or abraded with power tools, or particle blasted (sand or other suitable material). The surface shall

not be burnished (polished). The surface to be coated shall be cleaned to the grade of SSPC-SP-10 (NACE 2) minimum (near-white metal blast cleaning).

3) Temperature Considerations
   i. The material and the surface to be coated should be between 65 and 85 °F.
   ii. The minimum application temperature of the surface and material is 50 °F.
   iii. The maximum application temperature of the surface is 130 °F and 90 °F for the material
   iv. The minimum and maximum ambient application temperature is 50 and 100 °F respectively.
   v. The application should only be done when the temperature of the steel is above the dew point. The humidity range should be 35-85% but can be as low as 0% and as high as 95%.

4) Coating Application

   i. The clean dry surface should be coated within 4 hours of surface preparation.
   ii. Components "A" and "B" shall be adequately mixed in the ratio of 1:1 (part "A" to "B"). The mixed components may be thinned up to 25% (32 oz. per gallon) to enhance brushing and/or extend pot life. Only thinners recommended by manufacturer or the Materials and Standards section shall be used.
   iii. After mixing, the coating should be applied to the dried and cleaned surface immediately. The pot life at 75°F is approximately 2 hours (unthinned).
   iv. Apply by brushing onto the prepared surface. Use clean natural bristle brush or medium nap rolling. Avoid excessive re-brushing or re-rolling. Work coating into all irregularities. Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding.
   v. The coating should be applied to a minimum thickness of 3 mils over existing coating, 5 mils minimum on rusted steel, and 7-10 mils in one or two coats for severe exposures. Do not exceed 10 mils in a single coat.
   vi. Dry to touch is approximately 3.5 hours at 75°F. Coated surface should not be touched prior to this. Maximum recoat/topcoat times are 30 days for epoxies and 90 days for polyurethanes at 75°F. The minimum recoat/topcoat and final cure for immersion service is as follows:

Surface Temperature and 50% Relative Humidity	Dry to Recoat/Topcoat	Final Cure for Immersion Service
50 °F	5 days	15 days
60 °F	3 days	10 days
75 °F	24 hours	5 days
90 °F	18 hours	3 days

   vii. The wet coating shall not be contaminated with particles such as blowing sand, insects or foreign materials.
   viii. All application tools, brushes and rags should be disposed of with normal waste after product has hardened.

5) Inspection
    i. Visually inspect for voids and coating irregularities prior to curing and repair as necessary.

6.11 Application of Rust Protective Enamel (Rustoleum ™)

Rust protective enamel can be used for new installations and as a maintenance coating over previously painted steel. It is available in a spray aerosol or brush applied gallon can. It is used in above grade applications only.

a. Surface Preparation
    1) Surface preparation shall be per Hand Tool Cleaning SSPC-SP2, or Power Tool Cleaning SSPC-SP3 as required.

b. Application of enamel.

    1) Place drop cloths as necessary to protect surrounding area from spray mist or dripping paint. Cardboard can be placed between the meter and house/building as required.
    2) Mask off any details you don't wish to paint, such as the handle grips and wheels using masking tape and plastic wrap.
    3) Apply protective enamel to entire surface. Rust protective enamel should be applied above 50 °F only.
    4) Reapply until you achieve complete coverage and desired finish.
    5) Allow to dry per manufacturer's guidelines and recommendations.

6.12 Inspection and Testing of Field Applied Pipe Coating

a. Visually inspect all field applied coatings.
    1) Visual inspection of cold applied tape, repair patch, shrink sleeves and wax tape should show no voids, wrinkles or other defects.
    2) Visual inspection of epoxy repair and enamel coating should show no voids or other defects and proper thickness.

b. Electrical Test of Pipe Coating Integrity (Jeep Test) should be performed on field applied underground coatings per approved National Grid Technical Instruction. The testing voltage shall be as per attachment 6, Testing Voltage for a Field Applied Coatings.

c. All coating defects found during visual and/or electrical testing shall be repaired, re-inspected and retested in accordance with the procedures described in this document.

7. Data Capture

a. Data for Electrical Test of Pipe Coating Integrity should be recorded on Attachment 6 - Jeep Testing Data Sheet Example or equivalent data sheet. Note the fitting tested and the number of holidays detected.

b. The record should be kept as a permanent record in the historical job files.

c. The record should be kept in the applicable historical job files for as long as the facility remains in service.

8. References

Federal Codes, State Codes or Local Codes

Federal Codes
49 CFR Part 192.461, External Corrosion Control: Protective Coating

State Codes
16 NYCRR Part 255.461, External Corrosion Control: Protective Coating
220 CMR Subparts 101, 109 Code of Massachusetts Regulations, General Requirements, Design, Construction, Operation, and Maintenance of Intrastate Pipelines Operating in Excess of 200 psig
PUC 511 Subpart 03 subsection D item 1. New Hampshire code of Regulation Enforcement Procedures for Gas Pipeline Utilities, Inspection of Utilities, Operational checks of Corrosion Control Provisions.
State of Rhode Island Division of Public Utilities and Carriers, Rules and regulations Prescribing Standards for Gas Utilities, Master Meter Systems and Jurisdictional Propane Systems. Section 4, item b, Inspection of LDC's, Master Meter Systems and Jurisdictional Propane

Filed Document:

MA ☐	NH ☐	NY ☐	RI ☐

9. Attachments

Attachment 1: Facility Coating Guide – Standard Drawing [030031-CS]
Attachment 2: Heat Shrink Sleeve Manufacturers and Manufacturer's part numbers.
Attachment 3: 35 Mil Cold Applied Tape Quantity Requirements
Attachment 4: Wax tape quantity requirements for coating valves
Attachment 5: Testing Voltage for Field Applied Coatings
Attachment 6: Jeep Testing Data Sheet Example

Attachment 1: Facility Coating Guide- Standard Drawing [030031-CS]

Click Link Here for Standard Drawing- Facility Coating Guide [030031-CS]

Attachment 2: Heat Shrink Sleeve Manufacturers and Manufacturer's part numbers.

Pipe Size	Manufacturer	Below Grade (24" Sleeve)	Directional Drill (24" sleeve)	Above Grade (24" sleeve)
6" O.D	Raychem Tapecoat Canusa Durabond	WPCT 6626-24-UNI 600354 K60-170-600-YE-WW/T	DIRAX 6626-24-UNI Not Available TBK-65-170-600-BK R95	HTLP60 6626-24-UNI Not Available KLNN-170-600-BK
8" O.D	Raychem Tapecoat Canusa	WPCT 8626-24-UNI 600353 K60-230-600-YE-WW/T	DIRAX 8626-24-UNI Not Available TBK-65-230-600-BK	HTLP60 8626-24-UNI Not Available KLNN -230-600-BK
10" O.D	Raychem Tapecoat Canusa	WPCT 10750-24-UNI 600335 K60-280-600-YE-WW/T	DIRAX 10750-24-UNI Not Available TBK-65-280-600-BK	HTLP60 10750-24-UNI Not Available KLNN-280-600-BK
12" O.D	Raychem Tapecoat Canusa	WPCT 12750-24-UNI 600352 K60-315-600-YE-WW/T	DIRAX 12750-24-UNI Not Available TBK-65-315-600-BK	HTLP60 12750-24-UNI Not Available KLNN-315-600-BK
16" O.D	Raychem Tapecoat Canusa	WPCT 16000-24-UNI 600350 K60-400-600-YE-WW/T	DIRAX 16000-24-UNI Not Available TBK-65-400-600-BK	HTLP60 16000-24-UNI Not Available KLNN-400-600-BK
18" O.D	Raychem Tapecoat Canusa	WPCT 18000-24-UNI 600357 K60-450-600-YE-WW/T	DIRAX 18000-24-UNI Not Available TBK-65-450-600-BK	HTLP60 18000-24-UNI Not Available KLNN-450-600-BK
20" O.D	Raychem Tapecoat Canusa	WPCT 20000-24-UNI 600371 K60-500-600-BK-WW/T	DIRAX 20000-24-UNI Not Available TBK-65-500-600-BK	HTLP60 20000-24-UNI Not Available KLNN-500-600-BK
24" O.D	Raychem Tapecoat Canusa	WPCT 24000-24-UNI 600372 K60-610-600-YE-WW/T	DIRAX 24000-24-UNI Not Available TBK-65-610-600-BK	HTLP60 24000-24-UNI Not Available KLNN-610-600-BK

Attachment 3: 35 Mil Cold Applied Tape Quantity Requirements

Approximate linear ft. of pipe coated per roll based on a 75-ft roll assuming a 50% overlap.

Pipe Size	2" Tape Width	4" Tape Width	6" Tape Width
¾" Inch	22.75 Feet	68.24 Feet.	113.74 Feet.
1 Inch	18.16 Feet.	54.49 Feet.	90.82 Feet.
1 ¼ Inch	14.33 Feet	42.99 Feet	71.64 Feet
2 Inch	10.06 Feet	30.17 Feet	50.28 Feet
4 Inch	5.31 Feet	15.92 Feet	26.54 Feet
6 Inch	3.61 Feet	10.82 Feet	18.03 Feet
8 Inch	2.77 Feet	8.31 Feet	13 85 Feet
10 Inch	2.22 Feet	6.67 Feet	11.11 Feet
12 Inch	1.87 Feet	5.62 Feet	9.37 Feet
16 Inch	1.49 Feet	4.48 Feet	7.46 Feet
20 Inch	1.19 Feet	3.58 Feet	5.97 Feet

Attachment 4: Wax tape quantity requirements for coating valves

Approximate number of rolls required Based on a 25-ft roll and assuming a 25% overlap.

Size	Approximate # or Rolls
2-4 inch Valve	4 Rolls
6-8 Inch Valve	8 Rolls
10-12 Inch Valve	16 Rolls
16-18 Inch Valve	24 Rolls
20-24 Inch Valve	32 Rolls

Attachment 5: Testing Voltage for Field Applied Coatings

Coating Material	Jeeping Voltage	Voltage Calculation
Wax Tape	11,000 Volts	170 volts/mil
35 mil cold applied tape	7395 Volts	1250 x Square root Mil thickness
Shrink Sleeves	11,000 Volts	1250 x Square root Mil thickness
Epoxy Repair Patch	2100 Volts	

Attachment 6: Jeep Testing Data Sheet Example

JEEP TESTING DATA SHEET

Work Order No. _____

Street _____

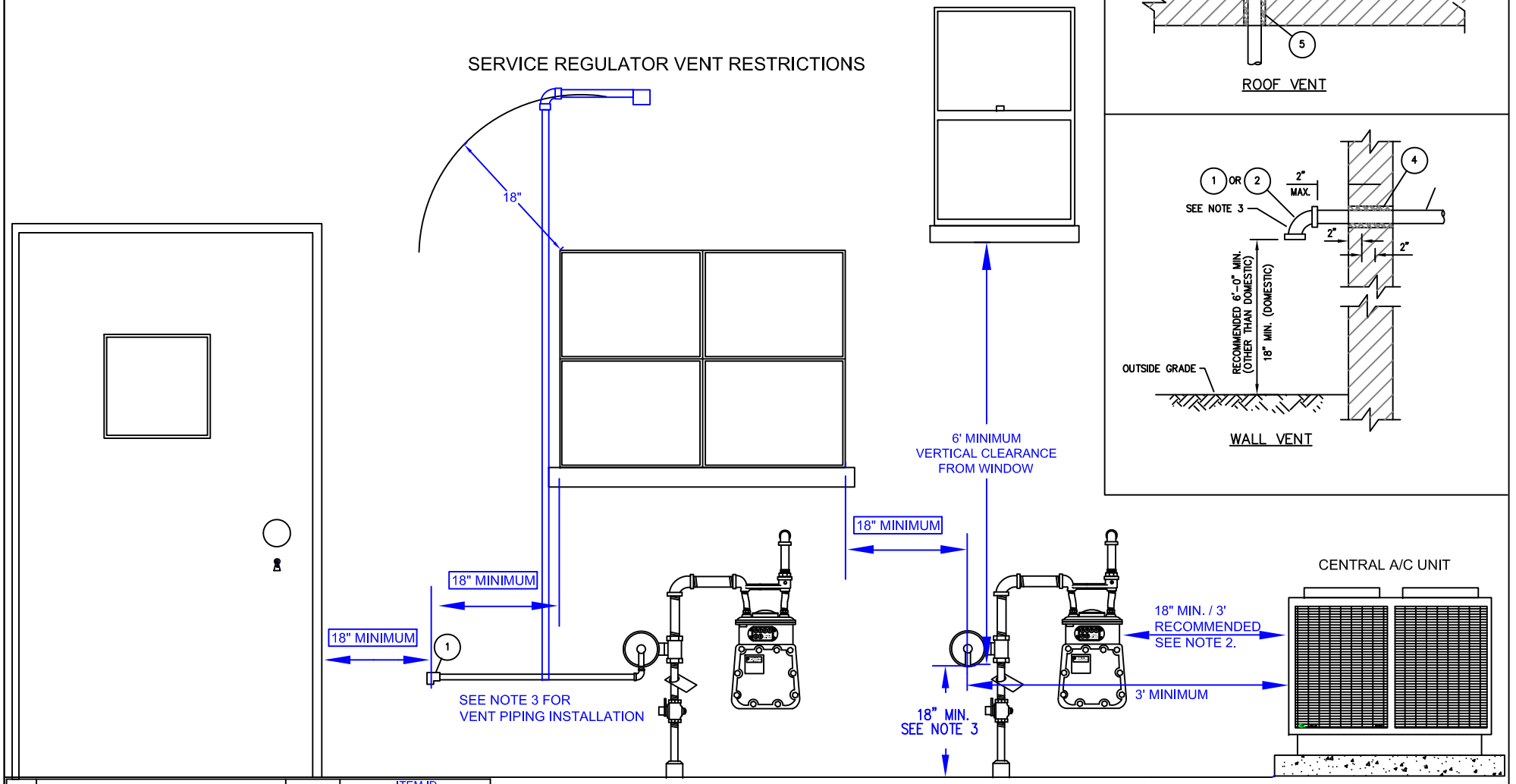
Village _____

Coating Type _____ Main Size _____

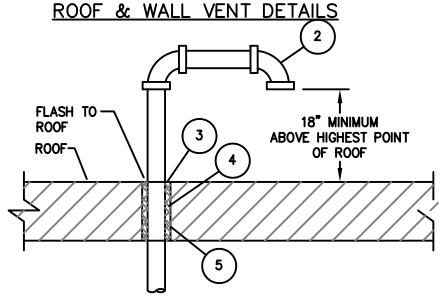
Date	Footage Tested	Holidays		Workers Employee Number
		Detected	Corrected	
TOTALS:				

DOORS, WINDOWS & GRAVITY AIR INLETS

SERVICE REGULATOR VENT RESTRICTIONS



ROOF & WALL VENT DETAILS



ROOF VENT

WALL VENT

#	ITEM	SIZE	ITEM ID ORACLE	ITEM ID PEOPLESOFT
5	PIPE SLEEVE		——	——
4	YARN PACKING		00588012	NON STOCK
3	SEALING COMPOUND		00126057	NON STOCK
2	ELBOW WITH RAIN & INSECT RESISTANT SCREEN	1"	00322596	NON STOCK
		1-1/4"	00322595	NON STOCK
		1-1/2"	00322587	NON STOCK
		2"	00322606	6010133
1	VENT ASSEMBLY, WITH RAIN & INSECT RESISTANT SCREEN	3/4"	00786211	NON STOCK
		1"	00786214	6009165
		1-1/4"	00786212	NON STOCK
		1-1/2"	00786215	NON STOCK
		2"	00786210	NON STOCK

nationalgrid ALL REGIONS

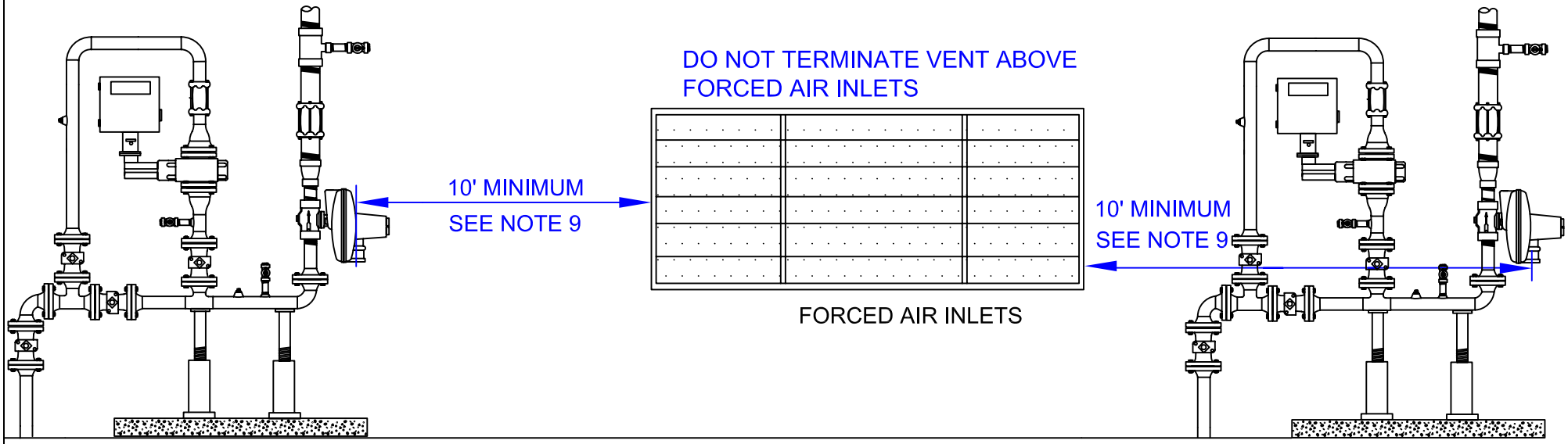
REVISIONS: MADE APPLICABLE TO ALL REGIONS
REVISED NOTES & ADDED NOTES 10 AND 11.

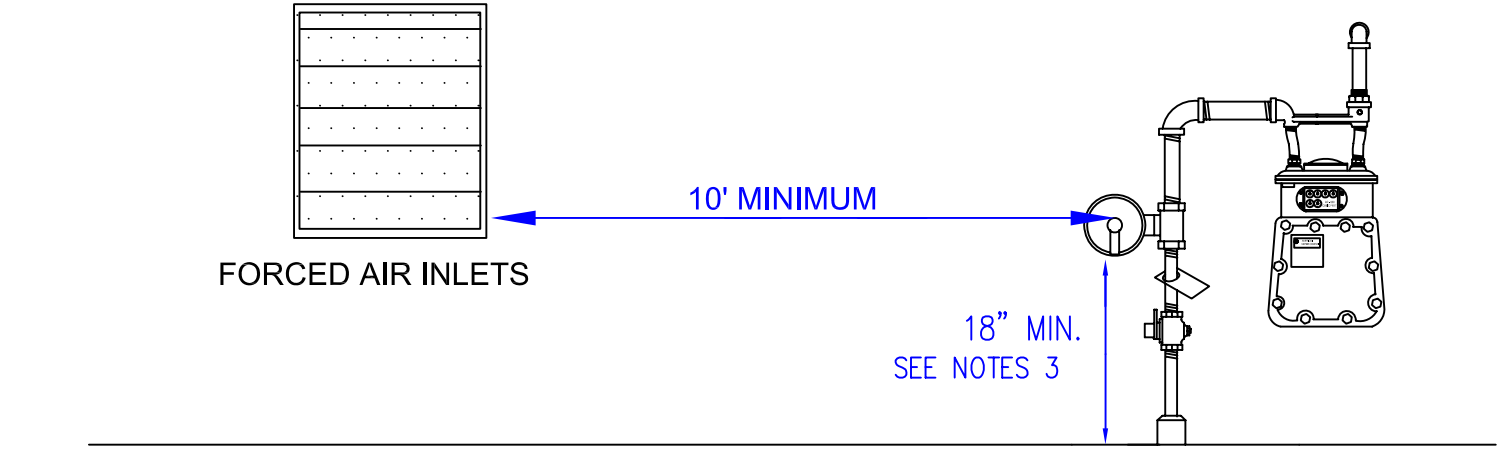
OUTDOOR LOCATION FOR REGULATOR AND RELIEF VALVE VENT TERMINUS

DATE: 07/01/2003
DESIGN: PAUL GUGLIOTTA
DRAWN: PAUL GUGLIOTTA

EFFECTIVE DATE: 05/21/2010
STD. DWG. NO. 020013-CS

LARGE COMMERCIAL & INDUSTRIAL INSTALLATIONS





NOTES:

1. A VENT CANNOT BE LOCATED UNDER AN OVERHANG THAT CAN TRAP GAS SUCH AS A PITCHED AWNING WITH SIDES.
   A VENT MAY BE LOCATED UNDER A FLAT SURFACE HORIZONTAL OVERHANG UNDER 6' IN LENGTH AS LONG AS THE OVERHANG HAS NO OPENINGS INTO THE BUILDING WITHIN 18 INCHES OF THE VENT TERMINUS.

2. REGULATOR VENTS TERMINUS SHALL BE LOCATED AT LEAST 3 FT FROM SOURCES OF IGNITION. IT IS RECOMMENDED THAT GAS METERS BE LOCATED 3 FEET FROM SOURCES OF IGNITION; HOWEVER, A MINIMUM DISTANCE OF 18" IS REQUIRED.

3. THE OUTSIDE TERMINAL OF EACH SERVICE REGULATOR VENT MUST:
   - HAVE A RAIN AND INSECT RESISTANT SCREEN AND BE POINTED DOWNWARD
   - BE LOCATED AT A PLACE WHERE ANY VENTING GAS CAN ESCAPE FREELY INTO ATMOSPHERE
   - BE AWAY FROM ANY OPENABLE WINDOWS, DOORS, SOFFIT VENTS OR ANY OPENINGS WHERE GAS CAN ENTER THE BUILDING. MAINTAIN A MINIMUM OF 18 INCHES HORIZONTAL CLEARANCE IF THAT OPENING IS WITHIN 6 FEET VERTICALLY OF THE VENT TERMINUS.
   - BE LOCATED A MINIMUM OF 18 INCHES ABOVE FINAL GRADE
   - BE LOCATED A MINIMUM OF 18 INCHES ABOVE KNOWN FLOOD LEVELS
   - BE PROTECTED FROM DAMAGE WHERE ICE ACCUMULATION MAY OCCUR

   IN LI AND NYC, ANY NEW SERVICES INSTALLED AFTER JUNE 10, 2007, 18" SHALL BE MAINTAINED FROM THE REGULATOR VENT TO GRADE. ON ANY RE-TUBE OR REGULATOR REPLACEMENTS, THE 18" CLEARANCE MUST ME ADHERED TO AS WELL. ALL PRE-EXISTING REGULATORS (INSTALLED BEFORE JUNE 10, 2007) MUST MAINTAIN A MINIMUM HEIGHT OF 14" FROM GRADE.

   IN **MASSACHUSETTS AND NEW HAMPSHIRE**, THE REGULATOR / RELIEF VENT TERMINUS SHALL BE A MINIMUM OF TWELVE (12) INCHES ABOVE OUTSIDE GRADE FOR SERVICES INSTALLED BEFORE JUNE 15, 2010; HOWEVER, WHENEVER WORK IS PERFORMED ON THE GAS SERVICE OR METER HEADER, THE VENT SHALL BE BROUGHT INTO COMPLIANCE WITH ITEM UNDER NOTE 11.

4. GAS METERS, REGULATORS AND VENTS MUST BE A MINIMUM OF 12" FROM A STANDARD ELECTRIC METER.
   STANDARD ELECTRIC METERS ARE NOT CONSIDERED A SOURCE OF IGNITION.

5. THE METER ASSEMBLY SHALL BE LOCATED TO PREVENT DAMAGE BY VEHICLES AND MECHANICAL EQUIPMENT.
   WHERE THIS IS NOT PRACTICAL, ADDITIONAL PROTECTION SHALL BE INSTALLED. SEE MTRS-6060.

6. OUTDOOR VENT LINES SHALL BE GALVANIZED OR PROPERLY COATED BLACK IRON PIPE. VENT LINES SHOULD BE SLOPED AWAY FROM THE REGULATOR (IF POSSIBLE) TO PREVENT CONDENSATION FROM ENTERING THE REGULATOR. DRIP LEGS ON VENT LINES THAT EXTENT VERTICAL ARE PERMITTED AND HELP INSURE WATER DOES NOT ENTER THE REGULATOR.

7. IF A VENT NEEDS TO BE EXTENDED, STRAIGHT PIPING IS PREFERRED, BUT IF NOT PRACTICAL, A VENT LINE "TRAP" IS ACCEPTABLE.
   - ON OUTSIDE METER SETS, AN INSULATED UNION (LI) OR INSULATED COUPLING (NY) IS PREFERRED ON ALL VENT LINES UNDER 3' AND REQUIRED ON ALL VENT LINES > 3'.
   - ON **ALL** INSIDE SETS, AN INSULATING UNION OR INSULATED COUPLING IS REQUIRED ON THE VENT PIPING.

   THIS INSULATED UNION OR INSULATED COUPLING SHALL BE LOCATED AS CLOSE TO THE REGULATOR AS POSSIBLE.

8. IT IS PREFERRED THAT THE METER AND RISER NOT BE LOCATED UNDER A WINDOW.

9. ON LARGE RESIDENTIAL, COMMERCIAL & INDUSTRIAL SETS WHERE LARGE FORCED AIR INTAKE SYSTEMS ARE PRESENT, ENGINEERING APPROVAL IS REQUIRED FOR REGULATOR/RELIEF VALVE TERMINATION POINTS.

10. VENT LINES *SHOULD BE INSTALLED ABOVE GRADE.* BELOW GRADE VENT LINES SHOULD BE AVOIDED. HOWEVER, WHERE IT IS NOT POSSIBLE, VENT LINES INSTALLED UNDERGROUND SHALL BE PROTECTED FROM CORRODING. THIS INCLUDES WRAPPING THE ENTIRE LINE WITH APPROVED COATING 030031-CS, INSTALLING A 3 LB SPIKE ANODE (OR LARGER) AND INSTALLATING AN INSULATING FITTING BETWEEN THE REGULATOR AND THE BELOW GRADE SECTION (TYPICALLY INSIDE THE BUILDING). FOR SITUATIONS THAT ARE NOT COVERED BY THE PROVISIONS OF THIS STANDARD, CONTACT GAS ENGINEERING.

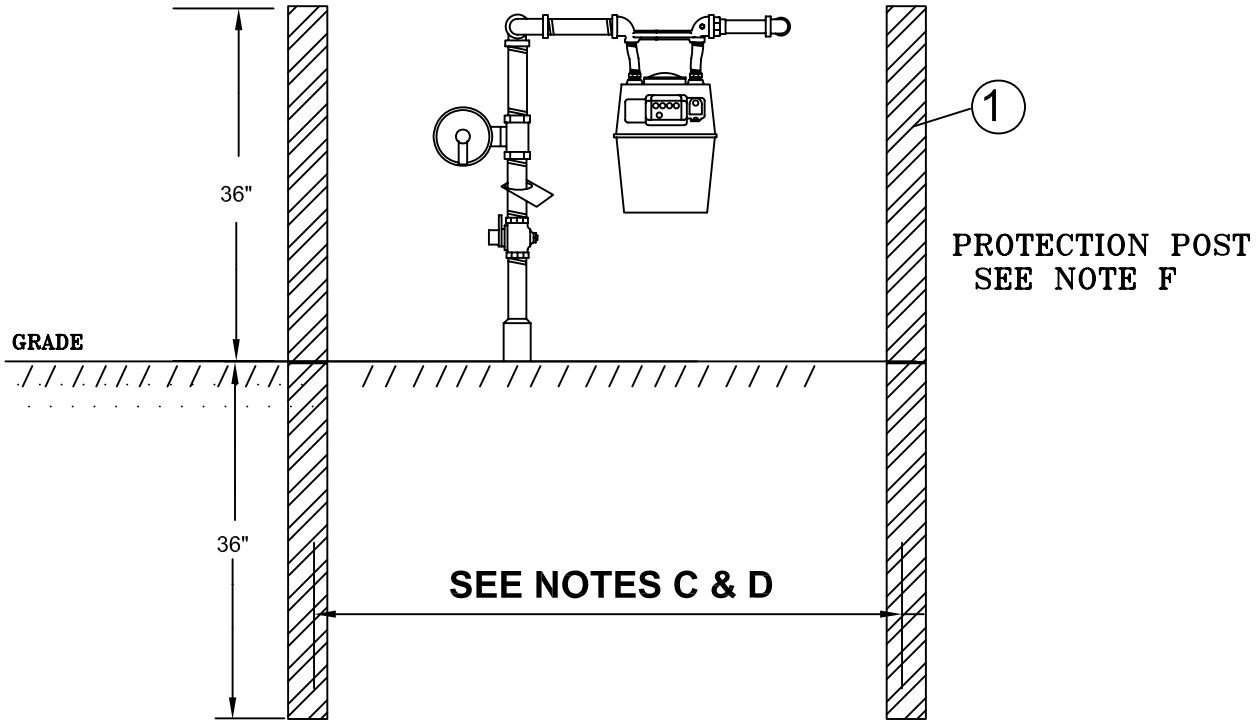
11. ON EXISTING INSTALLATIONS WHERE UNDERGROUND VENT LINE IS FOUND, THE VENT LINE SHOULD BE RELOCATED ABOVE GROUND. IF THIS IS NOT POSSIBLE, IT MUST BE PRESSURE TESTED AT 3 PSIG AND INSPECTED FOR CORROSION. IF IT PASSES THE PRESSURE TEST AND THE PIPE IS VISUALLY ACCEPTABLE, IT THEN SHALL BE CATHOLICALLY PROTECTED PER 030031-CS AND BROUGHT IN TO COMPLIANCE AS DESCRIBED IN NOTE 10.

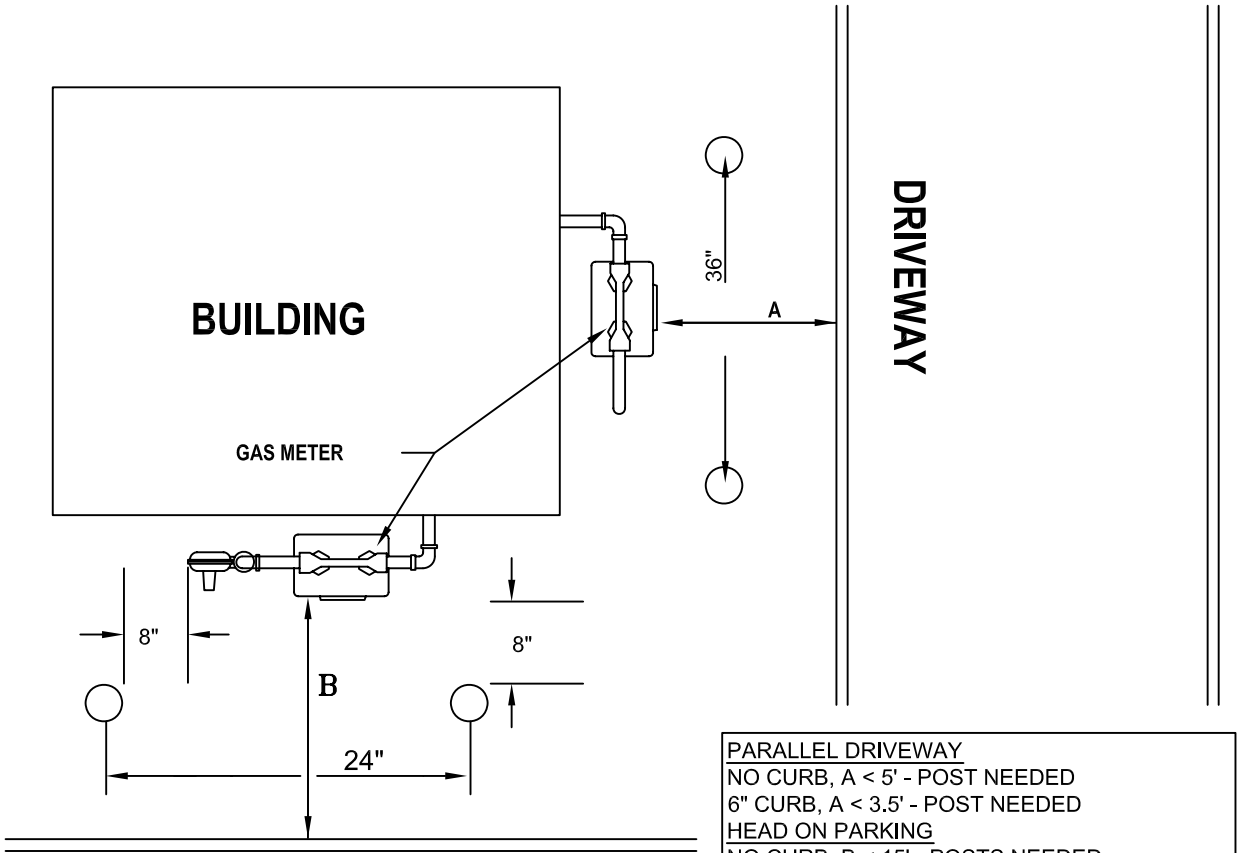
CLEARANCE GUIDELINES:

SITUATION	MINIMUM DISTANCE	ACCEPTABLE
STANDARD ELECTRIC METER OR ELECTRICAL OUTLET	12 INCHES FROM GAS METER OR REGULATOR VENT TERMINUS	Y
IGNITION SOURCE	12 INCHES MINIMUM FROM GAS METER (36" RECOMMENDED) AND 36 INCHES MINIMUM REGULATOR VENT TERMINUS	Y
WINDOW, DOOR, SOFFIT VENT, OTHER OPENINGS INTO BUILDING	18 INCHES HORIZONTAL AND 6 FEET VERTICAL BELOW / 18 INCHES VERTICAL ABOVE FROM REGULATOR VENT TERMINUS	Y
VENT TERMINUS UNDER FLAT OVERHANG	PROTRUDING LESS THAN 6 FEET	Y
VENT TERMINUS UNDER FLAT OVERHANG	PROTRUDING 6 OR MORE FEET	N
CENTRAL A/C UNIT	3 FEET FROM GAS METER OR REGULATOR VENT TERMINUS	Y
VENT TERMINUS UNDER AWNING/CANOPY WITH SIDES ENCLOSED	18 INCHES HORIZONTAL	Y
FORCED AIR INTAKE LARGE RESIDENTIAL, COMMERCIAL OR INDUSTRIAL	REQUIRES ENGINEERING APPROVAL	N/A
VENT TERMINUS CLEARANCE ABOVE FINAL GRADE	18 INCHES	Y
VENT TERMINUS CLEARANCE ABOVE KNOWN FLOOD LINE	18 INCHES	Y

NO.	ITEM	CODE NO.

BILL OF MATERIAL





PARALLEL DRIVEWAY
NO CURB, A < 5' - POST NEEDED
6" CURB, A < 3.5' - POST NEEDED
HEAD ON PARKING
NO CURB, B < 15' - POSTS NEEDED
6" CURB, B < 10' POSTS NEEDED

HEAD ON PARKING AREA

nationalgrid

LI–MA–NH–NYC

INSTALLATION OF PROTECTION POST OUTSIDE METER SETS

REVISIONS: ADDED 4.5" POST AS ALTERNATE

DATE: 07/01/2003	EFFECTIVE DATE: 01/17/2006
DESIGN: R. McLOUGHLIN	STD. DWG. NO. **MTRS-6060**
DRAWN: PG	

NOTES:

A. WHERE PRACTICAL, A METER AND REGULATOR ASSEMBLY SHOULD BE INSTALLED IN AN AREA AWAY FROM VEHICULAR TRAFFIC AND OTHER POTENTIAL HAZARDS.

B. A PROTECTION POST SHOULD BE INSTALLED WHENEVER THE METER AND REGULATOR ASSEMBLY IS REASONABLY SUBJECT TO DAMAGE.

C. A PROTECTION POST SHALL BE INSTALLED WHEN THE METER AND REGULATOR ASSEMBLY IS PARALLEL TO AND WITHIN 5 FEET OF A DRIVEWAY AND NO OTHER MEANS OF PERMANENT PROTECTION EXISTS. IF THE DRIVEWAY HAS A CURB OR RETAINING WALL WITH A MINIMUM HEIGHT OF 6 INCHES, THIS DISTANCE IS REDUCED TO 3.5 FEET. THE MINIMUM SPACING OF THE POSTS IS 36 INCHES.

D. A PROTECTION POST SHALL BE INSTALLED WHERE A METER OR REGULATOR IS PERPENDICULAR TO AND WITHIN 15 FEET OF A DRIVEWAY, HEAD-ON OR ANGLE PARKING AREA. IF THE DRIVEWAY HAS A CURB, TIRE STOP OR RETAINING WALL WITH A MINIMUM HEIGHT OF 6 INCHES, THIS DISTANCE IS REDUCED TO 10 FEET. THE MINIMUM SPACING FOR POSTS IS 24 INCHES.

E. THE PROTECTION POSTS SHOULD MAINTAIN A MINIMUM OF 8 INCHES OF CLEARANCE AROUND THE METER AND REGULATOR.

F. THE POST SHALL BE 3-1/2 INCHES OD MINIMUM STEEL PAINTED OR GALVANIZED, AND MINIMUM 5 FEET IN LENGTH. IF POST IS PURCHASED NON STOCK WITHOUT CONCRETE, FILL WITH CONCRETE (ITEM 2).

G. THE POST SHOULD BE SET 36 INCHES ABOVE AND 36 INCHES BELOW GRADE. ALTERNATES ARE PERMISSIBLE IF THE ABOVE MATERIAL IS NOT IN STOCK. OBTAIN APPROVAL FROM YOUR SECTION MANAGER OR CHECK WITH GAS ENGINEERING IF YOU ARE UNCERTAIN.

H. FOR CERTAIN COMMERCIAL AND INDUSTRIAL APPLICATIONS, ADDITIONAL PROTECTION MAY BE REQUIRED IN EXCESS OF THIS STANDARD.

2	CONCRETE – READY MIX 40 LB. BAG (SEE NOTE F)	00118021
1	POST 3.5” O.D. 6’ LONG – CONCRETE FILLED - PRIMED COATED OR POST 4.5” O.D. 5’ LONG GALVANIZED 0.237” WALL – **NOT CONCRETE FILLED**	00301033 00301828
NO.	**ITEM**	**CODE No.**

BILL OF MATERIAL

APPENDIX G

LINKS TO VARIOUS MANUFACTURERS:

HEATING MANUFACTURERS
AMERICAN STANDARD
AO SMITH
BAXI BOILERS
BOSCH
BUDERUS
BURNHAM
CARLIN
CARRIER
EMERSON
HONEYWELL CONTROLS
MIDCO ECONOMITE
MODINE
PEERLESS BOILERS
POWER FLAME BURNERS
REZNOR UNIT HEATERS
RHEEM
SLANT FIN
TAKAGI
TECHTANIUM
TRANE
TRIANGLE TUBE BOILERS
TURBO MAX
UTICA BOILERS
WALLHUNG BOILERS
WEIL-MCLAIN

CSST MANUFACTURERS
GASTITE
OMEGAFLEX TRAC PIPE COUNTER STRIKE
WARDFLEX