O & M PLAN MANUAL
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O & M
INTRODUCTION

1.0 PURPOSE: (192.605)

This Operators O&M Plan Manual ensures the Operator's compliance with the requirements of 49 CFR Part 192. The Operator emphasizes public safety in the operation of its gas pipeline facilities in compliance with federal and state governing regulations.

1.1 SCOPE

A. Legislation
B. Regulation
C. Requirements
D. Definitions

1.2 ENABLING LEGISLATION:

The Natural Gas Pipeline Safety Act of 1968 authorizes the requirements for the Operation and Maintenance Plan.

1.3 GOVERNING REGULATIONS:

The Operation and Maintenance Plan is a requirement of, and is based on, 49 CFR Parts 191 and 192 (Minimum Pipeline Safety Standard) which is administered by the Office of Pipeline Safety (OPS), Pipeline and Hazardous Materials Safety Administration (PHMSA), in the U. S. Department of Transportation (DOT); and the applicable State Pipeline Safety Regulatory Authority. For information purposes, the Transportation Safety Institute, a function of PHMSA has published Parts 191 and 192 in a booklet entitled Minimum Pipeline Safety Regulations.

1.4 PIPELINE SAFETY IMPROVEMENT ACT OF 2002

On December 17, 2002 the President of the United States signed into law new legislation affecting the way natural gas systems are to be operated in the future including the qualifications of those individuals performing operations and maintenance tasks affecting the integrity of the country's natural gas facilities.

O & M
DEFINITIONS AND TERMS

2.0 PURPOSE

This section defines the important terms used in the operations and maintenance of jurisdictional natural gas facilities. The ultimate objective is to use one standard term for each subject.

2.1 DEFINITIONS AND TERMS

Abandon – Permanently removed from service.

Abnormal Operating Condition (AOC) – A condition identified by the Operator that may indicate a deviation from normal operations and that may indicate an operating condition that could exceed design limits or result in hazard(s) to persons, property, or the environment.

Actual Operating Pressure (AOP) – The highest pressure at which a pipeline or pipeline segment actually operates during normal operation over a period of one year.

Aeration – A method used to extract natural gas from the soil by converting the energy in compressed air into a useful vacuum.

Anode – An electrically conductive material that discharges current into the ground to provide cathodic protection.

Anodeless Riser – A riser that does not require cathodic protection.

Automatic Shutoff – A device that will automatically stop the flow of gas when the downstream pressure exceeds a predetermined amount and will remain closed until manually reset.

Bare Pipe – Pipe that has no external coating.

Backweld – The process of depositing weld material to bridge the gap created when pipe and/or fittings of different wall thickness are butt-welded together. This occurs on the inside of the pipe and/or fitting.

Bedding – The material placed between the bottom of the trench and the pipe to provide protection (padding) where rocky areas or debris could cause damage to the pipe.

Bend – A means a change in direction in the pipe accomplished by mechanical means by deforming pipe.

Bleed – A small flow of gas that must be passed through some devices in order that they may operate.

Bond – A cable or other metallic connection between two or more structures in order to safely exchange current between them.

Bore – An excavation method involving tunneling or drilling by one of multiple means.

Bowing – A means for securing a change in direction of piping by utilizing the natural flexibility of pipe.

Branch Connection – A pipeline segment, which is connected to a header (see lateral).

Branch Service – A lateral service line connected to another service line crossing one property line to service an additional customer.

British thermal unit (BTU) – The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit at sea level. There are approximately 1,000 BTU's in one cubic foot of natural gas.

Business District – Principal business area(s) in the community, where large numbers of people regularly congregate, and/or engage in business activities such as purchasing, sales, manufacturing of commodities, or service.

Bypass – Piping which permits gas that, normally flows through a facility to flow around the facility when the facility is out of service, temporarily diverting gas from one portion of a pipeline to another portion for the purpose of tie-in, repair, etc.

Cadweld – A method of welding by the Thermit process.

Capacity – The maximum flow that may be put through a device without causing its outlet pressure to drop below a predetermined limit.

Capping / Plugging – A device or a method of closing the end of piping to prevent flow.

Carrier Pipe – Pipe installed within a casing or sleeve that carries gas.

Casing – A section of steel pipe installed around a steel carrier pipeline, or pipeline segment for its protection, to facilitate its installation or carry superimposed loads. For plastic carrier pipeline, refer to "sleeve" in these definitions.

Cast Iron – An alloy of iron and carbon and small amount of other elements with a carbon content in excess of two percent. It is non-weldable and non-ductile.

Cathodic Protection (CP) – The process of protecting a segment of pipe from the affects of corrosion / Corrosion Control. This may involve appropriate protective coating and maintaining an electrical potential on a segment of piping so that electric current tends to flow onto the piping rather than to leave it.

Cathodic Protection Electrical Survey – A series of closely spaced pipe to soil readings over the pipeline i.e. Close Interval Survey (CIS), isolated section survey, and other that when analyzed to identify locations where current is leaving the pipeline.

Cathodic Protection Test Station – The physical equipment through which an accessible permanent electrical connection is made to underground pipelines, mains and services to make possible electrical measurements for cathodic protection.

Class Location – A geographical area 220 yards on either side of the pipeline by 1 mile long along the centerline of a pipeline where the pipeline is continuous through the 1 mile. The concept here is not one of blocks of land each fixed to a particular point on the ground, but rather that of a "window" which can be moved along the pipeline as an aid in analyzing building and therefore population density and the related safety liability or a "Sliding Mile". The four class locations are: 1, 2, 3 or 4.

The operator must have records that document the current class location of each pipeline segment and that demonstrates how each current class location was determined in accordance with the requirements of 49 CFR Part 192.5

Coating – A protective layer or coating of durable material placed on the surface of pipe or other metal to prevent corrosion.

Cold Expanded – Seamless or welded pipe which is formed and then hydraulically expanded in the pipe while cold so that the circumference is permanently increased by at least 0.5 percent.

Combustible Gas Indicator (CGI) – An electronic leak detection device that measures percent gas in air.

Commission – State Pipeline Safety Regulator.

Compressor Station – A property and the facilities used to increase pressure.

Confined Spaces – Substructures with a restricted opening.

Control Piping – Small sized piping, which transmits pressure or flow to, or from regulators or the devises which control regulators.

Control Regulator – A small regulator used to maintain constant pressure at inlet to instruments or controls such as relays, actuators, etc.

Corrosion – The deterioration of a material, usually a metal, by a reaction with its environment. Corrosion may be Atmospheric, External, or Internal corrosion.

Corrosion – Active – Continuing corrosion which unless controlled could result in an unsafe condition.

Corrosion Control Monitoring – Evaluation of pipeline and pipeline facilities in areas of active corrosion. Active corrosion means continuing corrosion which, unless controlled could result in a condition that is detrimental to public safety including leakage or failure.

Covered Task – An activity, identified by the Operator that meets the following four part test:
1. **Is performed on a pipeline facility;**
2. **Is an operations or maintenance task;**
3. **Is performed as a requirement of 49 CFR Part 192; and**
4. **Affects the operation or integrity of the pipeline**

Cubic foot, standard (scf) – The quantity of dry gas at a temperature of sixty degrees Fahrenheit and a pressure of 14.73 pounds per square inch that occupies one cubic foot.

Customer Meter – A device for measuring the transfer of gas from the operator to the customer.

Customer, Commercial – Classification of service to customers who are engaged primarily in the sale of goods and services, including institutions and government agencies.

Customer, Industrial – Classification of service to customers who engage primarily in a process that creates or changes raw or unfinished materials into another form or product. This includes electrical generation.
Customer, Residential – Classification of service to customers that consist of direct domestic usage in a residential dwelling for residential usage.

Design Factor – A factor defined by the class location and other determinants, i.e., road crossing, railroads, etc., which determines the allowable stress level in the calculation of pipe design pressure.

Design Pressure – The pressure rating of a component or a segment of the piping system, as determined by the design procedures applicable to the material and/or pipe.

Distribution Line – A pipeline other than a transmission line or gathering line used to distribute gas to the customers which, operates at a hoop stress of less than 20% SMYS.

District Regulator Station – The physical equipment that controls the pressure of gas supplied to mains. Piping, valves and vaults are included.

DOT – The U.S. Department of Transportation.

Droop – The amount a regulator allows pressure to deviate below setpoint as flow increases.

Ductile Iron – An alloy of iron and carbon. It is non-weldable but relatively ductile.

Easement – An agreement with a property owner specifying certain use of the property by another party without transfer of ownership.

Equivalent Length – A length of piping of a given size that will provide an equal amount of some function such as surface or flow resistance as the length of piping or a fitting being considered.

Evacuation – For Emergency Response reporting purposes only, Evacuation means denying entry into or the organized clearing of a building or buildings involving:

(a) One hundred or more individuals from any number of buildings;
(b) All of the individuals present from five or more buildings;

(c) All of the individuals present from five or more businesses within a single building such as a strip mall; or

(d) A nonresidential building known or discovered to be occupied by individuals who are confined, are of impaired mobility, or would be difficult to evacuate because of their age or physical or mental condition or capabilities, such as a hospital, prison, school, daycare facility, retirement facility, or assisted living facility

Excess Flow Valve – An automatic shut-off device installed on a service line.

Extension Fitting – A short length of pipe on which a pressure control fitting has been installed and the pipe drilled out. It may be used to extend existing piping or to install laterals on piping that is in service.

External Stress – The stress resulting from outside forces exerted on a pipeline or restraining the movement of the pipeline. Stresses include changes in temperature and the bowing of the pipe.

Feeder Line – A segment of piping used to supply other segments that are normally of smaller size. A feeder may be a large main or a high pressure main.

Filter – A device installed in the natural gas stream that contains one or more elements designed to remove particles entrained in a gas stream.

Fitting – A component of the piping system other than pipe, valve, regulator or similar item. Used to cap or connect piping or to change the direction or size of the piping.

Flame Ionization (FI) Unit – A leakage detection device that detects the presence of hydrocarbons registering in parts per million (ppm).

Flow – The condition or pressure at which a regulator allows gas to feed. The volume of gas that is passing through a pipeline facility.

Gas – Natural gas, flammable gas, or gas which is toxic or corrosive. Other gases may include petroleum gas, nitrogen, oxygen, and others.

Gathering Line – A pipeline that transports gas from a current production facility to a transmission line or main.

Header – A pipe on which one or more lateral or branch connections are provided. Also may be used to allow the connection of more than one parallel meters or regulators.

High Pressure Distribution System – The distribution system, which operates at a pressure significantly higher pressure than that provided to the customer.

High Consequence Areas – A high consequence area is an area defined as a class 3 or a class 4 location, plus additional criteria as defined under rule base on pipe classification, type, size, MAOP, etc.

Holiday – A hole or break in the pipe coating that exposes the metal surface.

Hoop Stress – The stress on a pipe caused by gas pressure at a line around the pipe's circumference at any arbitrary point along its length.

Houseline – The customer's gas piping after the outlet of the Operator's meter and the customer's gas appliances. By definition, houseline piping is not maintained by the Operator.

Hydrostatic Test – A strength test utilizing water as the test medium.

Impressed Current – Cathodic protection current caused to flow from the anode by means of an external power source such as a rectifier.

Incident – An uncontrolled release of gas from a pipeline that results in an undesired consequence as defined by the DOT and/or State Pipeline Safety authorities.

Independent Laboratory – A laboratory that is not owned or operated by the Operator and that has no affiliation with the Operator through ownership, familial relationship, or contractual or other relationship that results in the laboratory being controlled by or under common control with the Operator.

Industrial Customer – Consumers who engage primarily in a process that creates or changes raw or unfinished materials into another form or product.

Instrument Piping – Small size piping that transmits pressure or flow to instruments.

Insulation – A nonconductive material applied to piping to prevent or deter electric current or heat from entering or leaving the insulating piping.

Insulator – A fitting containing a material that does not conduct electricity, and is used to prevent the passage of current beyond a certain point without disturbing the mechanical continuity.

Intended Operating Pressure (IOP) – The pressure as established by the designing engineer, at which a segment of the piping system is intended to operate to utilize the remainder of the system with the greatest efficiency. IOP is primarily determined by operating conditions and long range planning rather than physical equipment.

Lateral – A pipeline segment that is connected to a header or a mainline.

Listed Specification – This is a specification listed in the D.O.T., Appendix B, and adopted by reference.

Leak Investigation – An investigation to determine the gas leakage is the cause of an odor complaint, or failure during a leak test.

Leak Survey – The annual, 20%, or special survey conducted by the Operator to determine leakage using leakage detection equipment.

Leak Test – A test given to determine that a pipeline will not leak when subject to the pressure for which it is designed. It may be a pressure stand-up test or a soap bubble test.

Line Section – A continuous run of pipeline between pipeline appurtenances such and compressor stations, block valves, pressure reducing stations, etc.

Lock-up – The condition of the regulator at which no gas flows.

Low Pressure Distribution System – The distribution system that operates at a system pressure at the same, or nearly the same, pressure as that delivered to the customer.

Main – A distribution pipeline that serves as a common source of supply for more than one service line.

Malleable Iron – Annealed cast iron. It is non-weldable but moderately ductile.

Maximum Actual Operating Pressure – The maximum pressure that occurs during normal operations over a period of one year.

Maximum Allowable Operating Pressure (MAOP) – This is the maximum design pressure at which the pipeline facility may operate. MAOP is generally established through a qualification pressure test of the facility. The MAOP of a pipeline facility is equal to the lowest MAOP of any segment or component of the pipeline facility.

Meter Manifold – One service regulator handling more the one customer meter other than a regulator station.

Metering Station – A facility used to measure large volumes of gas to industrial or resale customers, or to measure gas for accounting purposes, including all valves, regulators and other appurtenances, as well as the meters installed in the facility.

Meter Set Assembly (MSA) – The piping, including any valves or regulators, which is necessary to enable a meter to service a customer. It consists of the piping from the service shutoff to the house line.

Miter Weld Bend – A means for securing a change in direction of piping by cutting an angle and welding.

Municipality – City, county, or any other political subdivision of the state.

Odorant – A substance (mercaptan) added to or previously existing in natural gas to make it readily detectable through the sense of smell.

Odorization – The process of adding concentrations of odorant to a gas stream so that the odor is detectable at $1/5^{th}$ of its Lower Explosive Limit (LEL).

Office of Pipeline Safety – California Public Utilities Commission personnel are assigned to perform PHMSA's day-to-day activities under an agreement made with PHMSA under 49 U.S.C. Section 60106. That agreement can be found at: https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/about-phmsa/working-phmsa/state-programs/70561/2019-appendix-f-state-pipeline-program-certification-agreement-status_1.pdf

Operator – A person or company who engages in the transportation and distribution of gas.

Orifice – An installed restriction in piping to limit flow or to produce a pressure differential.

Outage – An unplanned and unscheduled discontinuation of service:

(a) Concurrently to 250 or more residential customer accounts or to 10 or more commercial customer accounts; or

(b) To a nonresidential building known or discovered to be occupied by individuals who are confined, are of impaired mobility, or would be difficult to evacuate or relocate because of age or physical or mental condition or capabilities, such as a hospital, prison, school, daycare facility, retirement facility, or assisted living facility.

Over-Pressure Protection – A secondary device to prevent the pressure in a segment of the piping system from exceeding its MAOP if a primary device for this purpose fails. It may be a regulator, pressure relieving device or pressure limiting device.

Padding – The sandy type material (Bedding) placed between the pipe and the bottom of the trench to provide protection where rocky areas or debris could cause damage to the pipe.

Petroleum gas – Propane, propylene, butane, or mixtures of gases.

Pipe – Any pipe or tubing used in the transportation of gas including pipe type holders. A rigid conduit with a wall thickness and outside diameter corresponding to iron pipe sizes.

Pipeline – All parts of those physical facilities through which gas moves in transportation, including pipe, valves and other appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders and fabricated assemblies.

Pipeline Facility – All new and existing pipelines, rights-of-way, and any equipment, facilities or building used in the transportation of gas or in the treatment of gas during the course of transportation.

Pipeline Environment – Includes soils resistivity, soil moisture, soil contaminants and other know conditions could affect the probability of active corrosion.

PHMSA – Pipeline and Hazardous Materials Safety Administration of the US Department of Transportation (Formally OPS).

Pipe to Soil – The potential reading taken between the pipe and a copper sulfate electrode in contact with the electrolyte.

Polyethylene (PE) – Plastic pipe material.

Polyvinyl Chloride 2116 (PVC) – Plastic pipe material.

Pressure Control Fitting – A fitting installed on the pipeline to stop or redirect the gas flow.
Pressure Indicating Device – A device utilized for indicating pressure, such as gauges and pressure recorders.

Pressure Limiting Device – A device that limits the maximum pressure imposed on downstream piping to a present value.

Pressure Test – A test performed to verify the strength of a pipeline and/or to determine if leakage is present.

Pressure Reducing Station – Terminology used for regulator station assemblies such as district regulator station, property line regulator and farm tap.

Pressure Relieving Device – A device that will vent gas to the atmosphere or a lower pressure when operating pressure exceeds design limits.

Purge – The process of expelling air or gas from the pipe or container and replacing it with air or gas.

Rectifier – The means of changing alternating (AC) current to direct (DC) current for the purpose of cathodic protection.

Regulator – A device that automatically controls the pressure to the piping system downstream of the device to a preset value.

Regulator, Control – A small regulator used to maintain constant pressure at the inlet to instruments or controls

Regulator, Monitor – A regulator used in series with a working regulator or service regulator, set to control downstream pressure at a slightly higher value than the working regulator, so as to provide overpressure protection should the working or service regulator fail in the open position.

Regulator, Pilot – A regulator used to provide a small flow of gas to control a larger regulator.

Regulator, Series – Two – or three – stage regulation: pressure regulation accomplished by placing two or three regulators in series, each regulator providing a reduction in pressure independent of the other.

Regulator, Service or Customer – A device on a service line that controls the pressure of gas delivered from a higher pressure to pressure delivered to the customer. A service regulator may serve one customer or multiple customers through a manifold. (Residential and small commercial customers).

Regulator Station – The facility that controls the pressure of gas supplied to downstream pipelines. (District regulator station, city gate farm tap, etc)

Regulator, Working – A regulator in an MSA or regulating station which is controlling downstream pressure to the IOP and which is in series with a monitor regulator providing protection.

Remedial Action – A remedy or an action plan to remedy or correct deficiency.

Right-of-Way – A legal right of passage across or right to use another's property.

Riser – Piping used to connect an underground service line to an aboveground MSA. (Also see anodeless riser).

Safety Related Condition – A condition that represents a potential threat to system integrity.

Secondary Stress – Stress produced by loads other than internal pressure.

Service Line – A distribution line that transports gas from a common source of supply to a customer, to two adjacent or adjoining customers or to multiple customers served thru a meter manifold. The service line ends at the outlet of the customer meter or connection to a customer's piping, whichever is farther downstream or the connection to a customer's piping if there is no customer meter (residential and small commercial customers).

Shading – The material placed between the pipe and the first layer of backfill material to provide protection from rocks or debris that could cause damage to the pipe.

Shall – Mandatory requirement.

Should – Recommended practice.

Sleeve, Plastic Carrier – A steel or plastic pipe installed around a plastic carrier pipe to provide protection, facilitate its installation, or carry external loads.

Sleeve, Steel Carrier – A short section (3 feet or less) of plastic pipe to protect a steel carrier pipe as it passes through concrete or other material.

Span (pipeline) – Any unsupported length of pipeline.

Specified Minimum Yield Strength (SMYS) – The minimum yield strength for steel pipe manufactured to a known specification; it is the minimum yield strength as determined by the provisions of 192.107(b) for steel pipe of unknown specifications.

Standard Service – A distribution line on private property that supplies a customer on that property. If more than one customer meter or connection is supplied on that property, that standard service will extend this service to the most remote meter or connection.

Static Line – Control piping for the purpose of sensing the pressure controlled by a regulator.

Steel – An alloy of iron and carbon and a small amount of other elements with carbon content of two percent or less. It is weldable and ductile.

Strainer – A device for separating and collecting solid particles in a gas stream.

Strength Test – A test given to piping to determine that it will not fail or leak when subjected to pressure for which it is designed.

Stress – A force tending to deform piping expressed in terms of psig.

Stress Relief – Elimination of secondary stress by intentional creation of a stress greater than yield strength or the application of heat.

Tap – A connection to piping through which gas may be obtained.

Test Medium – The material that is used to put a pipeline system under pressure as part of a required test operation following construction or repair. The medium may include liquid, air, natural gas, or a compatible inert gas.

Therm – A unit of heating value equivalent to 100,000 BTU's.

Tie-in – The joining of two previously completed pipeline segments of piping or the joining of a new pipeline segment to the existing pipeline.
Transition Piece – A short length of pipe used to join two pieces of pipe with differing wall thicknesses by welding. Its wall thickness is between the thicknesses of the pipes to be joined. A transition piece may also be used to join steel and plastic.

Transmission Line – A pipeline, other than a gathering line that:

1 MAOP that produces a hoop stress equal to or greater than 20% of SMYS
2. Transports gas from a gathering line, storage facility, or another transmission line to a distribution center, storage facility or large volume customer that is not downstream from a distribution center.
3. Transports gas within a storage field.

A large volume customer may receive similar volumes of gas as a distribution center, and including factories, power plants and industrial customers.

Transportation of Gas – The actual gathering, transmission or distribution of gas by pipeline or the storage of gas in or affecting interstate or foreign commerce.

TSI – The Transportation Safety Institute.

Unknown Failure – For Investigation of Failures reporting purposes only, an occurrence in which a portion of a pipeline system fails, and:

(a) The cause cannot be attributed to any observable corrosion, third-party damage, natural or other outside force, construction or material defect, equipment malfunction, or incorrect operations; or
(b) The Operator and the California Public Utilities Commission disagree as to the cause.

Valve – A mechanical device for stopping or manually controlling flow in pipe.

Vault – An underground enclosure used to make buried piping facilities readily accessible.

Vent Line – Pipe used to conduct the discharge of vented gas from a regulator, casing, vault or other location to a suitable location.

Weak Link – A device or method used when pulling polyethylene pipe, typically through methods such as horizontal directional drilling, to ensure that damage will not occur to the pipeline by exceeding the maximum tensile stresses allowed. Also known as a break link.

Wedding Band – An axially split, short length of cylindrically formed plate welding onto a pipeline to cover a defective weld or other defect on a pipeline.

Welding – A process for joining two pieces of metal by fusing them together with or without filler metal.

Work Day – Excluding Saturday, Sunday and federal holidays.

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Bore – An excavation method involving tunneling or drilling by one of multiple means.

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Equivalent Length – A length of piping of a given size that will provide an equal amount of some function such as surface or flow resistance as the length of piping or a fitting being considered.

Evacuation – For Emergency Response reporting purposes only, Evacuation means denying entry into or the organized clearing of a building or buildings involving:

(a) One hundred or more individuals from any number of buildings;
(b) All of the individuals present from five or more buildings;

(c) All of the individuals present from five or more businesses within a single building such as a strip mall; or

(d) A nonresidential building known or discovered to be occupied by individuals who are confined, are of impaired mobility, or would be difficult to evacuate because of their age or physical or mental condition or capabilities, such as a hospital, prison, school, daycare facility, retirement facility, or assisted living facility

Excess Flow Valve – An automatic shut-off device installed on a service line.

Extension Fitting – A short length of pipe on which a pressure control fitting has been installed and the pipe drilled out. It may be used to extend existing piping or to install laterals on piping that is in service.

External Stress – The stress resulting from outside forces exerted on a pipeline or restraining the movement of the pipeline. Stresses include changes in temperature and the bowing of the pipe.

Feeder Line – A segment of piping used to supply other segments that are normally of smaller size. A feeder may be a large main or a high pressure main.

Filter – A device installed in the natural gas stream that contains one or more elements designed to remove particles entrained in a gas stream.

Fitting – A component of the piping system other than pipe, valve, regulator or similar item. Used to cap or connect piping or to change the direction or size of the piping.

Flame Ionization (FI) Unit – A leakage detection device that detects the presence of hydrocarbons registering in parts per million (ppm).

Flow – The condition or pressure at which a regulator allows gas to feed. The volume of gas that is passing through a pipeline facility.

Gas – Natural gas, flammable gas, or gas which is toxic or corrosive. Other gases may include petroleum gas, nitrogen, oxygen, and others.

Gathering Line – A pipeline that transports gas from a current production facility to a transmission line or main.

Header – A pipe on which one or more lateral or branch connections are provided. Also may be used to allow the connection of more than one parallel meters or regulators.

High Pressure Distribution System – The distribution system, which operates at a pressure significantly higher pressure than that provided to the customer.

High Consequence Areas – A high consequence area is an area defined as a class 3 or a class 4 location, plus additional criteria as defined under rule base on pipe classification, type, size, MAOP, etc.

Holiday – A hole or break in the pipe coating that exposes the metal surface.

Hoop Stress – The stress on a pipe caused by gas pressure at a line around the pipe's circumference at any arbitrary point along its length.

Houseline – The customer's gas piping after the outlet of the Operator's meter and the customer's gas appliances. By definition, houseline piping is not maintained by the Operator.

Hydrostatic Test – A strength test utilizing water as the test medium.

Impressed Current – Cathodic protection current caused to flow from the anode by means of an external power source such as a rectifier.

Incident – An uncontrolled release of gas from a pipeline that results in an undesired consequence as defined by the DOT and/or State Pipeline Safety authorities.

Independent Laboratory – A laboratory that is not owned or operated by the Operator and that has no affiliation with the Operator through ownership, familial relationship, or contractual or other relationship that results in the laboratory being controlled by or under common control with the Operator.

Industrial Customer – Consumers who engage primarily in a process that creates or changes raw or unfinished materials into another form or product.

Instrument Piping – Small size piping that transmits pressure or flow to instruments.

Insulation – A nonconductive material applied to piping to prevent or deter electric current or heat from entering or leaving the insulating piping.

Insulator – A fitting containing a material that does not conduct electricity, and is used to prevent the passage of current beyond a certain point without disturbing the mechanical continuity.

Intended Operating Pressure (IOP) – The pressure as established by the designing engineer, at which a segment of the piping system is intended to operate to utilize the remainder of the system with the greatest efficiency. IOP is primarily determined by operating conditions and long range planning rather than physical equipment.

Lateral – A pipeline segment that is connected to a header or a mainline.

Listed Specification – This is a specification listed in the D.O.T., Appendix B, and adopted by reference.

Leak Investigation – An investigation to determine the gas leakage is the cause of an odor complaint, or failure during a leak test.

Leak Survey – The annual, 20%, or special survey conducted by the Operator to determine leakage using leakage detection equipment.

Leak Test – A test given to determine that a pipeline will not leak when subject to the pressure for which it is designed. It may be a pressure stand-up test or a soap bubble test.

Line Section – A continuous run of pipeline between pipeline appurtenances such and compressor stations, block valves, pressure reducing stations, etc.

Lock-up – The condition of the regulator at which no gas flows.

Low Pressure Distribution System – The distribution system that operates at a system pressure at the same, or nearly the same, pressure as that delivered to the customer.

Main – A distribution pipeline that serves as a common source of supply for more than one service line.

Malleable Iron – Annealed cast iron. It is non-weldable but moderately ductile.

Maximum Actual Operating Pressure – The maximum pressure that occurs during normal operations over a period of one year.

Maximum Allowable Operating Pressure (MAOP) – This is the maximum design pressure at which the pipeline facility may operate. MAOP is generally established through a qualification pressure test of the facility. The MAOP of a pipeline facility is equal to the lowest MAOP of any segment or component of the pipeline facility.

Meter Manifold – One service regulator handling more the one customer meter other than a regulator station.

Metering Station – A facility used to measure large volumes of gas to industrial or resale customers, or to measure gas for accounting purposes, including all valves, regulators and other appurtenances, as well as the meters installed in the facility.

Meter Set Assembly (MSA) – The piping, including any valves or regulators, which is necessary to enable a meter to service a customer. It consists of the piping from the service shutoff to the house line.

Miter Weld Bend – A means for securing a change in direction of piping by cutting an angle and welding.

Municipality – City, county, or any other political subdivision of the state.

Odorant – A substance (mercaptan) added to or previously existing in natural gas to make it readily detectable through the sense of smell.

Odorization – The process of adding concentrations of odorant to a gas stream so that the odor is detectable at 1/5th of its Lower Explosive Limit (LEL).

Office of Pipeline Safety – California Public Utilities Commission personnel are assigned to perform PHMSA's day-to-day activities under an agreement made with PHMSA under 49 U.S.C. Section 60106. That agreement can be found at: https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/about-phmsa/working-phmsa/state-programs/70561/2019-appendix-f-state-pipeline-program-certification-agreement-status_1.pdf

Operator – A person or company who engages in the transportation and distribution of gas.

Orifice – An installed restriction in piping to limit flow or to produce a pressure differential.

Outage – An unplanned and unscheduled discontinuation of service:

(a) Concurrently to 250 or more residential customer accounts or to 10 or more commercial customer accounts; or
(b) To a nonresidential building known or discovered to be occupied by individuals who are confined, are of impaired mobility, or would be difficult to evacuate or relocate because of age or physical or mental condition or capabilities, such as a hospital, prison, school, daycare facility, retirement facility, or assisted living facility.

Over-Pressure Protection – A secondary device to prevent the pressure in a segment of the piping system from exceeding its MAOP if a primary device for this purpose fails. It may be a regulator, pressure relieving device or pressure limiting device.

Padding – The sandy type material (Bedding) placed between the pipe and the bottom of the trench to provide protection where rocky areas or debris could cause damage to the pipe.

Petroleum gas – Propane, propylene, butane, or mixtures of gases.

Pipe – Any pipe or tubing used in the transportation of gas including pipe type holders. A rigid conduit with a wall thickness and outside diameter corresponding to iron pipe sizes.

Pipeline – All parts of those physical facilities through which gas moves in transportation, including pipe, valves and other appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders and fabricated assemblies.

Pipeline Facility – All new and existing pipelines, rights-of-way, and any equipment, facilities or building used in the transportation of gas or in the treatment of gas during the course of transportation.

Pipeline Environment – Includes soils resistivity, soil moisture, soil contaminants and other know conditions could affect the probability of active corrosion.

PHMSA – Pipeline and Hazardous Materials Safety Administration of the US Department of Transportation (Formally OPS).

Pipe to Soil – The potential reading taken between the pipe and a copper sulfate electrode in contact with the electrolyte.

Polyethylene (PE) – Plastic pipe material.

Polyvinyl Chloride 2116 (PVC) – Plastic pipe material.

Pressure Control Fitting – A fitting installed on the pipeline to stop or redirect the gas flow.
Pressure Indicating Device – A device utilized for indicating pressure, such as gauges and pressure recorders.

Pressure Limiting Device – A device that limits the maximum pressure imposed on downstream piping to a present value.

Pressure Test – A test performed to verify the strength of a pipeline and/or to determine if leakage is present.

Pressure Reducing Station – Terminology used for regulator station assemblies such as district regulator station, property line regulator and farm tap.

Pressure Relieving Device – A device that will vent gas to the atmosphere or a lower pressure when operating pressure exceeds design limits.

Purge – The process of expelling air or gas from the pipe or container and replacing it with air or gas.

Rectifier – The means of changing alternating (AC) current to direct (DC) current for the purpose of cathodic protection.

Regulator – A device that automatically controls the pressure to the piping system downstream of the device to a preset value.

Regulator, Control – A small regulator used to maintain constant pressure at the inlet to instruments or controls

Regulator, Monitor – A regulator used in series with a working regulator or service regulator, set to control downstream pressure at a slightly higher value than the working regulator, so as to provide overpressure protection should the working or service regulator fail in the open position.

Regulator, Pilot – A regulator used to provide a small flow of gas to control a larger regulator.

Regulator, Series – Two – or three – stage regulation: pressure regulation accomplished by placing two or three regulators in series, each regulator providing a reduction in pressure independent of the other.

Regulator, Service or Customer – A device on a service line that controls the pressure of gas delivered from a higher pressure to pressure delivered to the customer. A service regulator may serve one customer or multiple customers through a manifold. (Residential and small commercial customers).

Regulator Station – The facility that controls the pressure of gas supplied to downstream pipelines. (District regulator station, city gate farm tap, etc)

Regulator, Working – A regulator in an MSA or regulating station which is controlling downstream pressure to the IOP and which is in series with a monitor regulator providing protection.

Remedial Action – A remedy or an action plan to remedy or correct deficiency.

Right-of-Way – A legal right of passage across or right to use another's property.

Riser – Piping used to connect an underground service line to an aboveground MSA. (Also see anodeless riser).

Safety Related Condition – A condition that represents a potential threat to system integrity.

Secondary Stress – Stress produced by loads other than internal pressure.

Service Line – A distribution line that transports gas from a common source of supply to a customer, to two adjacent or adjoining customers or to multiple customers served thru a meter manifold. The service line ends at the outlet of the customer meter or connection to a customer's piping, whichever is farther downstream or the connection to a customer's piping if there is no customer meter (residential and small commercial customers).

Shading – The material placed between the pipe and the first layer of backfill material to provide protection from rocks or debris that could cause damage to the pipe.

Shall – Mandatory requirement.

Should – Recommended practice.

Sleeve, Plastic Carrier – A steel or plastic pipe installed around a plastic carrier pipe to provide protection, facilitate its installation, or carry external loads.

Sleeve, Steel Carrier – A short section (3 feet or less) of plastic pipe to protect a steel carrier pipe as it passes through concrete or other material.

Span (pipeline) – Any unsupported length of pipeline.

Specified Minimum Yield Strength (SMYS) – The minimum yield strength for steel pipe manufactured to a known specification; it is the minimum yield strength as determined by the provisions of 192.107(b) for steel pipe of unknown specifications.

Standard Service – A distribution line on private property that supplies a customer on that property. If more than one customer meter or connection is supplied on that property, that standard service will extend this service to the most remote meter or connection.

Static Line – Control piping for the purpose of sensing the pressure controlled by a regulator.

Steel – An alloy of iron and carbon and a small amount of other elements with carbon content of two percent or less. It is weldable and ductile.

Strainer – A device for separating and collecting solid particles in a gas stream.

Strength Test – A test given to piping to determine that it will not fail or leak when subjected to pressure for which it is designed.

Stress – A force tending to deform piping expressed in terms of psig.

Stress Relief – Elimination of secondary stress by intentional creation of a stress greater than yield strength or the application of heat.

Tap – A connection to piping through which gas may be obtained.

Test Medium – The material that is used to put a pipeline system under pressure as part of a required test operation following construction or repair. The medium may include liquid, air, natural gas, or a compatible inert gas.

Therm – A unit of heating value equivalent to 100,000 BTU's.

Tie-in – The joining of two previously completed pipeline segments of piping or the joining of a new pipeline segment to the existing pipeline.

Transition Piece – A short length of pipe used to join two pieces of pipe with differing wall thicknesses by welding. Its wall thickness is between the thicknesses of the pipes to be joined. A transition piece may also be used to join steel and plastic.

Transmission Line – A pipeline, other than a gathering line that:

1 MAOP that produces a hoop stress equal to or greater than 20% of SMYS
2. Transports gas from a gathering line, storage facility, or another transmission line to a distribution center, storage facility or large volume customer that is not downstream from a distribution center.
3. Transports gas within a storage field.

A large volume customer may receive similar volumes of gas as a distribution center, and including factories, power plants and industrial customers.

Transportation of Gas – The actual gathering, transmission or distribution of gas by pipeline or the storage of gas in or affecting interstate or foreign commerce.

TSI – The Transportation Safety Institute.

Unknown Failure – For Investigation of Failures reporting purposes only, an occurrence in which a portion of a pipeline system fails, and:

(a) The cause cannot be attributed to any observable corrosion, third-party damage, natural or other outside force, construction or material defect, equipment malfunction, or incorrect operations; or
(b) The Operator and the California Public Utilities Commission disagree as to the cause.

Valve – A mechanical device for stopping or manually controlling flow in pipe.

Vault – An underground enclosure used to make buried piping facilities readily accessible.

Vent Line – Pipe used to conduct the discharge of vented gas from a regulator, casing, vault or other location to a suitable location.

Weak Link – A device or method used when pulling polyethylene pipe, typically through methods such as horizontal directional drilling, to ensure that damage will not occur to the pipeline by exceeding the maximum tensile stresses allowed. Also known as a break link.

Wedding Band – An axially split, short length of cylindrically formed plate welding onto a pipeline to cover a defective weld or other defect on a pipeline.

Welding – A process for joining two pieces of metal by fusing them together with or without filler metal.

Work Day – Excluding Saturday, Sunday and federal holidays.

PROCEDURES
SAFETY / GENERAL

1.0 PURPOSE

The following Safety Section is for the purpose of identifying specific hazards and to establish procedures to eliminate incidents. The approved operating instructions shall be followed. These requirements shall apply to all individuals engaged in gas operations, including those individuals doing work on rights-of-way and on pipeline facilities or customer property.

1.1 SCOPE

A. B-2 Personal Safety
B. B-3 Protection of General Public
C. B-4 Confined Space Entry
D. B-5 Traffic Safety
E. B-6 Prevention of Accidental Ignition
F. B-7 Lock-out Tag-out
G. B-8 Trench Safety
H. B-9 Pipeline Security / Continuing Surveillance
I. B-10 Start-up & Shut-down
J. B-11 Abnormal Operating Conditions (AOC's)
K. B-12 System Integrity
L. B-13 Public Awareness & Damage Prevention

1.2 GENERAL

A. All work shall be arranged and conducted with a primary view to the safety of the employee, and all other individuals as may be affected by the work, including people property and the environment and the public welfare in general.

B. Each employee shall be familiar with the general safety and regulatory compliance rules.

C. The following Safety Section is not meant to cover all potential situations and details. More specific information on safety, and specific procedures related to a work assignment may be found in other sections of this manual, specific project work plan and should be discussed with all appropriate individuals prior to the start of work.

D. All employees are to be continually watchful and alert to ensure adherence to the safety plan:

- Plan ahead: Visualize the project and think of everything that might be dangerous.
- Prepare your Space: Eliminate potential risk factors such as clutter and debris.
- Dress for success: Appropriate work attire, including PPE, for the job will help to eliminate risks.
- Read labels.
- Use the appropriate tools.
- Properly clean, maintain and store your tools.
- Be smart.
- Know what you are doing or don’t do it.
- Don’t try to do everything at once and don’t rush.

PROCEDURES
PERSONAL SAFETY

2.0 PURPOSE

Each employee is responsible for their own safety as well as the safety of their co-workers, the general public, property, and the environment. Appropriate personal protective equipment (PPE) shall be worn by all individuals engaged in work with and on the pipeline facilities.

2.1 SCOPE

A Personal Safety Equipment
B. Personal Injury

2.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Ear Protection

Operator / OSHA - approved ear protection shall be worn while performing or working in the area of any operation that exposes the ears to sparks and flying weld metal or any high-noise-level environment (at or above 90 decibels) that could damage hearing. Work activities that generally require hearing protection may include:

1. Purging operations, compressor or pump stations.
2. Using jackhammers, air spades, tampers or other heavy equipment.

B. Eye Protection

OSHA approved shatter resistant goggles, safety glasses, face shields or other devices furnished for eye protection shall be kept clean and properly adjusted. Such devices shall be worn when an employee is engaged in or is in the vicinity of work involving:

1. Posted as job site requirement.
2. Drilling or chipping stone, brick, concrete, paint, pipe coating or metal.
3. Grinding, buffing or wire brushing.
4. Dust or flying particles.
5. Welding or cutting.
6. The use of hot or dangerous substances.
7. Injurious light or heat rays.

8. Any other job where there is a danger of eye injury.

C. Eye Protection / Arc Welding

Anyone in the vicinity where arc welding is being performed shall be made aware of the dangers of watching an electric arc. Persons standing nearby shall be warned before an arc is struck. If possible, use curtains or protective shields made of fireproof materials. Welders shall wear approved arc welding hoods with #10 to #12 shade lens. **All individuals involved in arc welding operations should have and wear appropriate eye protection**.

D. Foot Protection

Appropriate protective footwear shall be worn at all time during the performance of work where there is exposure to foot hazards. This includes a sturdy leather upper and impact resistant toe or slipover foot shield where appropriate for such tasks as operating tampers, clay spades, pavement breakers and rock drills and other power operated equipment.

E. Gloves

1. Leather work gloves shall be worn whenever there is a possibility of hand injury.
2. Appropriate protective gloves shall be worn where exposure to potentially damaging chemicals or other products are present.

F. Hard Hats

1. OSHA approved hard hats shall be worn when there is a possibility of head injury and in designated/posted areas.
2. Hard hats shall not be altered or modified in any manner.

G. Respirators

Respirators shall be used by the employees where adverse atmospheric conditions due to dusts, vapors, fumes, mists, etc., are encountered.

1. The appropriate respirator and filter cartridge as applicable shall be utilized for varying conditions.

2. Respirators shall be regularly inspected, cleaned and maintained in accordance with Manufacturer's Operation Manual.
3. Employee fit tests shall be conducted annually if required to use.

H. Safety / Traffic Vests

1. OSHA approved, bright color, traffic safety vests shall be worn by all employees when working at a job site on or adjacent to any roadway.
2. Where work area protection, i.e., warning signs, barricades, cones, etc., are required.
3. Where posted.

I. Fire Safety

Steps shall be taken to eliminate potential sources of ignition from the work area prior to the start of any work. (See section B-6 Prevention of Accidental Ignition)

Appropriate, survivable fire protection is best accomplished by dressing in layers consisting of fire retardant and fire resistant clothing. The recommended layering is as follows:
1. All / 100% cotton undershirt and underpants.
2. Fire retardant shirt (retardant chemical added to material).

Note: In all cases, every effort should be made to avoid working directly in a gaseous atmosphere until the situation / gas flow has been controlled.

Fire extinguisher shall be ABC rated dry chemical.

Procedure for using portable extinguisher:
1. Pull the pin
2. Aim low
3. Squeeze
4. sweep side to side and upward

2.3 PERSONAL INJURY

PROCEDURES
PERSONAL SAFETY

Steps shall be taken to ensure that at least one individual / company employee trained in first aid and CPR shall be present on all job sites. Whenever and wherever a personal injury, company employee or other, occurs, each individual should:

1. Take necessary actions to preserve human life.
2. Administer First Aid.
3. Notify Emergency Agencies / (911 or other job specific entity)
   - Give location of Emergency;
   - Give type of Emergency; and
   - Assist Emergency Personnel.
4. Notify immediate supervisor, safety administrator and / or other appropriate project management.
5. Complete appropriate Injury Reports.

PROCEDURES
PROTECTION OF GENERAL PUBLIC

3.0 PURPOSE

The following section provides a high-level summary for response to emergency situations, such as reports of gas odor, fire, explosion, no gas, natural disaster, etc. For all detailed requirements for emergency response, refer to the **Emergency Response Plan**, a separate document which is incorporated by reference into this Operating & Maintenance Plan.

3.1 SCOPE

VMUS may receive reports of emergencies or potential emergencies that affect or could affect the normal, safe distribution of natural gas. Any report of a leak or complaint of natural gas odor shall be treated as an emergency.

VMUS will record certain data for reporting to appropriate management and regulatory authorities.

Emergencies may include, but are not limited to:

1. Carbon Monoxide Reports
2. Fire/Explosion
3. Line Breaks
4. Natural Gas Leaks
5. No Gas/Low Gas Pressure
6. Gas System Outage
7. Civil Disorder or Natural Disaster

Upon arrival at the site of an emergency condition, the VMUS first responder MUST assess the situation then determine actions to be taken. The assessment and actions taken shall, in order:

1. Protect people
2. Protect public/private property
3. Address actions to be taken to secure and protect pipeline facilities
4. Protect the environment by minimizing and/or stopping the uncontrolled release of gas, and finally,
5. Maintain system continuity.

As soon as practical after arriving on the scene, the VMUS employee or contractor shall report to the dispatcher the field situation and request fire and/or police or other assistance as necessary. If, upon investigation, the employee determines that the situation can be made safe without assistance, he shall do so.

If the emergency involves fire, property damage, injury and/or death to a human being, the dispatcher shall insure that the fire and police departments are notified. Immediately thereafter, the manager the designee shall be notified. The manager or the designee shall instruct the dispatcher to implement appropriate sections of the Emergency Plan. The manager or designee shall be responsible for notifying telephonically and in some cases written follow up notification to the applicable personnel, the State Regulatory Authority and the Department of Transportation, Office of Pipeline Safety in Washington, D.C.
If the emergency involves a natural gas leak requiring evacuation, the manager or designee will be notified. During a major emergency, the manager shall be responsible for notifying the appropriate management personnel.

If the emergency involves significant loss of service to customers, the appropriate management personnel shall be notified immediately.

Following control of the emergency situation, investigations shall be conducted to determine the mode and extent of system failure, if appropriate. It is important that no action be taken which might disturb or obliterate evidence that is important to gaining proper conclusions and establishing the liability of VMUS or others.

As soon as possible after the emergency situation is confirmed, reporting requirements are to be implemented, including appropriate notification by management of regulatory authorities at the local, state and federal levels. Initial telephonic or electronic reporting may need to be followed with written reports, as determined by management.

PROCEDURES
CONFINED SPACE ENTRY

4.0 PURPOSE

Certain work locations may present potential hazards due to the confined nature of the location. In such locations where there exists the potential for oxygen deficiency, potential hazardous chemicals or fumes, or the presence of a gaseous condition, the following safety procedures shall be adhered to.

4.1 SCOPE

A. Entering Confined Spaces
B. Rescue Harness

4.2 GENERAL

In general, employees should not, under normal circumstances, enter or work in confined spaces unless necessary for the completion of the work assignment. Should such job specific work assignment require confined space entry, each individual shall be properly trained and qualified before starting work and follow the following guidelines:

1. When working in locations where oxygen deficiency or gaseous conditions can exist, the atmosphere shall be tested.
2. When flammable or hazardous gases are present, adequate ventilation shall be provided, and sources of ignition shall be eliminated. Every effort shall be made to control the gas flow and eliminate the gaseous atmosphere before proceeding.
3. Before the start of work, secure the area and post appropriate safety and warning signs.
4. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, fire suit and fire extinguisher, etc., shall be readily available where adverse atmospheric conditions exist or could be expected to exist.
5. A written record of the pre-entry and post-entry test results must be made and kept at the jobsite for the duration of the work activity. Records shall be kept for a min. 1 year.

4.3 ENTERING CONFINED SPACES

Confined spaces include, throat-type vaults; vaults where all covers have not been removed, and tunneled and bored excavations in which other substructures restrict the opening.

A. Do not enter confined spaces unless necessary for the completion of the work assignment.

B. Before entering a confined space, a qualified individual shall check for the presence of explosive gas or oxygen deficiency.
   1. Natural Gas: 20% LEL or higher represents a hazard
   2. Oxygen: Less than 19.5% is not sufficient

C. No employee shall enter any vault or substructure with a restricted opening, or any other vault, manhole structure, or excavation that is surrounded by confining surfaces that will permit the accumulation of gas, without another employee above ground.

D. If pre-entry testing detects the combustible gas at or above 20% LEL, oxygen less than 19.5% or any other hazardous condition the space must be purged by mechanical ventilation and then re-tested. If upon re-testing, with the ventilator operating, any hazardous condition remains, do not enter the confined space until the hazardous condition is corrected, or person entering and the standby person are wearing all PPE including a rescue harness for the hazardous condition. If the condition has been corrected by mechanical ventilation, entry is allowed while mechanical ventilator is continuously operating.

E. Before entering, clear floor, steps, and ladder of any slippery substance, debris, or moisture to avoid slipping.

F. Confined spaces shall be ventilated before and during any of the following procedures:
   1. Painting.
   2. Cleaning with any solvent other than water.
   3. When it is necessary to open any piping, or other device, which might result in the release of gas.

      NOTE: All fittings and pipe to be separated or removed shall be grounded.

   4. When pre-entry test detects gas at or above 20% LEL, or gas is likely to accumulate at or above the lower explosive limit during work activity.
   5. When welding, flame cutting or doing any job that requires fire.
   6. When doing any work where ventilation would reduce the hazards of the job.

7. When using any chemical product that could result in an unsafe level of harmful gas or vapor.

PROCEDURES
TRAFFIC SAFETY

5.0 PURPOSE

The purpose of this section is to identify procedures for safely working in locations, streets, highways, and others where vehicular traffic may be present.

5.1 SCOPE

A. Use of Barricades
B. Flagging
C. Securing Excavation

5.2 TRAFFIC SAFETY

A. Barricading of job site and traffic control shall be done in accordance with local requirements.

1. Because the great majority of our underground structures are on public streets and highways, safe control of the flow of traffic is essential. Effective barricading is the primary means of both protecting the crew members while working in the street and protecting the public from hazards incurred by our excavations. The crew leader will be responsible for placing of barricades, signs, flagperson, etc., in compliance with the governing body to:

(a) Maintain as free a flow of traffic as practical.
(b) Protect the crew from traffic.
(c) Protect motorists and pedestrians.
(d) Protect excavations which are left open and unattended during darkness.

B. Excavations left open overnight or on weekends shall be sufficiently secured by one or more of the following methods:

(a) Barricades with lights or barrier tape.
(b) Steel plates.
(c) Planks.
(d) Plywood.
(e) Fence.

C. When necessary to work in streets or highways, equipment should be parked so as to give protection to the crew from the traffic. Discretion must be used at all times when parking on a highway.

D. When it is necessary to park trucks along a ditch, they should be headed in the direction of traffic if possible. Equipment should be parked to keep streets, alleys, driveways sidewalks, fireplugs and especially stop signs clear. Stop signs should never be blocked or obstructed from the view of traffic. Park in such a way as to be least obstructive to traffic, pedestrians and Operator personnel, or install temporary traffic control as needed.

1. While parked on streets or in alleys, vehicles should have signs or cones placed fore and aft.

D. A number of hand signaling devices, such as STOP/SLOW paddles, lights and red flags are used in controlling traffic through work zones. The sign paddle bearing the clear messages STOP or SLOW provides motorists with more positive guidance than flags and should be the primary hand signaling device. Flag use should be limited to emergency situations and at spot locations which can best be controlled by a single flagger.

E. Sign paddles should be at least 18" wide with letters at least 6" high. A rigid handle should be provided. This combination sign may be fabricated from sheet metal or other light semi rigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW shall be orange with black letters and border. When used at night the STOP face shall be reflectorized red with white reflectorized letters and border, and the SLOW face shall be reflectorized orange and black letters and border.

F. Flags used for signaling purposes shall be a minimum, of 24" x 24" in size, made of a good grade of red material securely fastened to a staff approximately 3' in length. The free edge should be weighted to ensure that the flag will hang vertically, even in heavy winds.

G. The following methods of signaling with sign paddles should be used:

1. To STOP traffic. The flagger shall face traffic and extend the STOP sign paddle in a stationary position with the arm extended horizontally away from the body. The free arm is raised with the palm toward approaching

traffic.

2. When it is safe for traffic to proceed, the flagger shall face traffic with the SLOW sign paddle held in a stationary position with the arm extended horizontally away from the body. The flagger motions traffic ahead with the free hand.

3. When it is desired to alert or slow traffic, the flagger shall face traffic with the SLOW sign paddle held in a stationary position with the arm extended horizontally away from the body.

H. The following methods of signaling with a flag should be used:

1. To stop traffic, the flagger shall face traffic and extend the flag horizontally across the traffic lane in a stationary position so that the full area of the flag is visible hanging below the staff. For greater emphasis, the free arm may be raised with the palm toward approaching traffic.

2. Where it is desired to alert or slow traffic, by means of flagging, the flagger shall face traffic and slowly wave the flag in a sweeping motion of the extended arm from the shoulder level to straight down without raising the arm above a horizontal position.

I. When required, flagperson(s) shall obtain and maintain any and all necessary regulatory qualifications.

PROCEDURES
PREVENTION OF ACCIDENTAL IGNITION

6.0 PURPOSE (192.751)

All possible precautions shall be exercised to prevent the accidental escape and ignition of gas. Whenever possible, potential sources of ignition should be eliminated prior to the commencement of work.

6.1 SCOPE

A. Escaping Gas Hazards and Prevention of Ignition
B. Leak Repair Procedures
C. Static Electricity
D. Smoking
E. Combustible Atmosphere
F. Preventing Air from Entering Open Mains

6.2 ESCAPING GAS HAZARDS AND PREVENTION OF IGNITION

Escaping gas may follow a ditch or excavation for an appreciable distance if air currents are favorable, or if gas is blowing directly up at the ditch or excavation. The public must be kept a safe distance at all times even if the area must be roped off in order to do so. The following procedures are observed where sources of ignition may be involved:

A. Post warning signs as appropriate, provide a fire extinguisher and remove all potential sources of ignition from the area when the presence of gas or the proposed venting of gas into the air may create a hazard of fire or explosion.

B. Do not turn on electrical circuits, including flashlights not approved for a gaseous atmosphere, in an area where gas is present. Electrical tools, cords, and generators used with plastic fusion may also be considered possible sources of ignition.

C. Do not weld or gas cut pipe or other facilities containing a combustible mixture of gas in air. This does not prohibit the "Fire Controlled" tie-in method. This method allows the welding operation to go on while gas is present at slightly higher than atmospheric pressure.

D. Precautions against possible ignition from static electricity in gaseous atmosphere are taken when work with plastic pipe is performed, i.e., purging operations, leak repairs or with broken or damaged lines.

E. Use only lighting equipment approved for use in a gaseous atmosphere, including flashlights, in or adjacent to an area of possible ignition.

F. Do not use open flames of any kind for the purpose of detecting and/or localizing gas leakage or suspected gas leakage in mains or services under any circumstances. Use combustible gas indicators and/or soap bubble testing to detect and/or localize leakage.

G. The practice of "flashing" bell holes before entering them for the purpose of welding, etc. When flashing, do not flash bell holes containing plastic piping under pressure. Use a combustible gas indicator to detect gas leakage.

6.2 LEAK REPAIR PROCEDURES

A. Location of Vehicle

Park Utility vehicles a safe distance from the leak. If wind is present, always park upwind from the leak.

B. Warning the Public

"No Smoking" signs, barricades and caution tape shall be posted (220 linear feet around the site). When on or near a public roadway, personnel shall be stationed on both sides of the restricted area to stop vehicles and to warn the public. They shall use red flags during the day and electric trouble lights at night.

C. If the leak is major and is near a residence or business establishment occupants shall be contacted immediately and warned to extinguish all fires.

D. Prepare for an Emergency

Evaluate the situation. Be prepared for the worst before starting to repair even minor leaks. Check location of available valves and work out any necessary shutdown and rerouting procedures.

E. Have Tools and Supplies Ready

Have the right tools and materials on the job before the leak is uncovered. Be sure the clamps, bolts, nuts, wrenches and other items are ready and in a handy and safe place. Be sure all threads are clean, oiled and in good condition.

F. Take Steps to Prevent Fire

Extinguish or move to safe distance all possible sources of ignition. Matches, cigarette lighters, friction lighter, etc., shall be left in the truck.

G. Reduce Pressure

When making repairs on high-pressure lines, gas pressure may be reduced as authorized by your supervisor.

H. Prevent Sparks

When using hand tools, be extremely careful to prevent striking sparks.

I. Protect the Eyes

Wear approved eye protection when excavating around the pipe, as well as when actually repairing the leak.

J. Excavating

Make the excavation large enough for ample working room around the pipe. Do not disturb the dirt covering the actual leak until the very last. This will minimize the amount of digging to be done while the leak is blowing.

K. Stay Clear of Gas

Always stay clear of a blowing stream of gas. Stand behind or to one side of the stream.

L. Signaling

Have prearranged signals to direct work in repairing a break or leak. The noise from a high-pressure leak makes hearing extremely difficult. Use approved ear protection when working on a high-pressure leak.

M. Number of Employees

The severity of the leak or line break will determine the number of employees required to safely control escaping gas. **No person shall enter a gaseous atmosphere in a confined space without another person outside of the confined space.**

N. Fire Extinguishers

A minimum of one 20-pound, dry chemical fire extinguisher, ABC, shall be kept in readiness while repairing a line break, making a tap on a hot line, during welding processes, or where any possible escape of natural gas and source of ignition might occur. Before work begins, the employee in charge shall designate one qualified individual to be responsible for the fire extinguisher.

Procedure for using portable extinguisher:

1. Pull the pin
2. Aim low
3. Squeeze
4. sweep side to side and upward

If gas is ignited decide as to whether to extinguish the fire or let it burn based on public safety

O. Methods of Gas Flow Control

1. The following methods may be used to control gas flow:

   (a) In-line valves.

   (b) Pressure control (line stopper) fitting.

   (c) Pipe squeezing.

   (d) Repair clamps.

   (e) Expansion plug.

2. When determining what type of flow control to use in an emergency, good judgment shall be exercised to avoid entering a gaseous atmosphere whenever practical. Emphasis shall be placed on customer and employee safety when determining flow control. No person shall enter a gaseous atmosphere in a confined space without proper safety equipment including breathing apparatus, and another person outside of the confined space.

6.3 STATIC ELECTRICITY

Polyethylene plastic pipe does not readily conduct electricity however a static electric charge can buildup on inside and outside surfaces, and stay on the pipe surface until some grounding device such as a tool or a person comes close enough for the static electricity to discharge to the grounding device.

Discharging one part of the pipe surface will not affect other charged areas because static electricity does not flow readily from one area to another. Polyethylene pipe cannot be discharged by attaching normal grounding wires to the pipe.

A static electricity discharge to a person, a tool, or a grounded object close to the pipe surface can cause an electric shock or a spark that can ignite a flammable gas or combustible dust atmosphere causing fire or explosion.

Precautions against possible ignition from static electricity in a gaseous atmosphere shall be taken prior to performing the work.

A. Plastic Pipe: A wetting agent on the surface of the pipe provides a conductive path to rapidly diffuse static electricity.
   1. The rags or burlap must remain wet with soapy solution during the entire operation.
   2. All pipe in the work area shall be wetted with a soapy water solution* from soil to soil the full length of the excavation.
   3. Make sure that contact with the soil is made at the ends.
   4. For purging operations of 5' or less, the above method can be utilized for dissipating static electricity. For purging of sections over 5' in length, **refer to CS H-5, Purging**.

When performing any maintenance, splices, repairs, taps, etc. on any existing plastic gas lines, control of static electricity is a major concern. The following is the procedure to be used in static electricity control:

1. Expose pipe by excavating below pipe to working area desired.
2. Clean off exposed plastic pipe then thoroughly rinse off with approved soapy water solution.
3. Wrap pipe at each end of the bank with cotton rags or burlap sacks soaked in a conductive anti-static liquid or a diluted soap and water solution.
4. If using squeezers, wrap wet rags around the pipe on each side of the squeezer. The rags should extend approximately 12 inches beyond the squeezer.
5. Be certain rags touch the ground with 4-6 inches slack. Pour soapy water solution over rags, being sure to saturate them and pool soapy water solution on the ground where rags contact the ground.
6. Install jumper cables on tracer wire to be cut and spliced.
7. Install jumper cables on all metallic tools being used.

***Note: A soapy solution can be made by mixing 8-12 ounces of leak test soap with one (1) gallon of water.**

B. Steel or other Metallic Pipe: The use of ground cables and ground rods or plates shall be utilized as a precaution against static spark.

1. Before any pipe or tools are installed or removed place ground straps, insulated wire, or other approved device on each tool, pipe, or pipeline facility that is separated or may be separated. Ensure that each surface is clean and that cables make adequate connection.
2. Ground rods or plates shall be securely placed in the ground as to provide an adequate path for the static electricity and as not to be disturbed during the performance of the work.
3. Ground cables shall remain in place throughout the entire work performance.
4. Use of brass tools will reduce the chance of creating an accidental spark.

6.4 SMOKING

Smoking shall be carefully restricted to safe distances (220 feet or greater) from work areas. Under the following circumstances, no employee shall smoke nor allow anyone else to smoke in the restricted area.

1. When any job is in progress that will allow gas to escape.
2. When doing work in a vault where gas is under pressure.
3. When flammables, such as gasoline, diesel fuel or acetone might be present.

4. When "No Smoking" signs are posted, cigarettes, matches and lighters shall be left at a safe distance.

Barricades, caution tape, and no smoking signs shall be utilized to define restricted area during the work performance.

6.5 COMBUSTIBLE ATMOSPHERE

Before entering areas where gas can accumulate, such as vaults and excavations that have been plated overnight test for the presence of combustible gases will be made with a combustible gas indicator (CGI).

Electric tools or fusion equipment may not be explosion-proof and may ignite a flammable gas atmosphere. **DO NOT operate electrical devices that are not explosion proof in a flammable gas atmosphere**.

6.6 PREVENTING AIR FROM ENTERING OPEN MAINS

Whenever possible, a main line shall not be open at two places at the same time, such as a blow-down or a cut in the line. This may permit a draft of air to enter the line at one opening and escape at the other, which allows the possible formation of an explosive mixture. This can be caused by wind pressure or by difference in elevation of the two openings, permitting air to enter the lower of the two openings. This must be guarded against, particularly when working large size mains. No main, service or other gas piping shall be cut apart without being properly grounded and purged by approved method.

One method of reducing the risk of air from entering a mainline is to cover the opening with a canvas tarp of other fire resistant material while preparing to make repairs.

PROCEDURES
LOCKOUT - TAGOUT

7.0 PURPOSE

Lockout-Tagout procedures are essential for the safety of Operator personnel and the general public. Lockout-Tagout procedures shall be adhered to whenever the unintended use of any tool and piece of equipment may cause harm to others.

7.1 SCOPE

A. Devices
B. Procedures

7.2 LOCKOUT - TAGOUT DEVICES

A. Lockout devices such as warning tags, padlocks and keys shall be:

1. Individually identified and assigned to authorized individuals.
2. Marked in such a way (e.g., number, name, color, etc.,) to identify the user.
3. Separately keyed to preclude unauthorized removal.
4. Standardized by size, shape, color, etc.

B. Tagout devices shall only be used when the energy isolating device cannot, because of design, be locked out.

C. Tagout devices, like lockout devices, may be removed from the energy isolating device only by the person who attached it.

D. Tagout devices must be placed on the energy isolating device at the same point where a lock would be placed. (If such an attachment point is not available, the tag must be placed in a position that is immediately obvious to anyone attempting to operate the energy isolating device.)

E. When a single lock or tag is used for a crew of employees performing service or maintenance on a single machine or piece of equipment, one employee must be assigned the responsibility of placing and removing the lock or tag. (The assigned employee must coordinate the shutdown and start-up procedures.)

7.2 LOCKOUT-TAGOUT PROCEDURES

A. The purpose of this procedure is to establish requirements for the lockout or tagout of energy isolation devices (valves, switches, etc.). These requirements are intended to ensure that any machine, equipment, pipeline or other facilities on which work is being performed has been effectively isolated from all potentially hazardous release of energy thus preventing an unexpected activation or re-energization of the machine, equipment, pipeline or other facility that could result in an employee injury.

B. This procedure covers the following activities involving energized or pressurized equipment:

1. Installation
2. Setup (Pre-operation Preparation)
3. Inspection
4. Modification
5. Maintenance/Service

C. This procedure does not apply to the following activities:

1. Work on cord or plug connected to electrical equipment when the cord is unplugged and under the exclusive control of the employee performing the work.
2. Hot tap operations on pressurized pipelines for which specific, written operator procedures are currently established and adhered to.

D. Examples of Lockout/Tagout Usage

1. Pipeline repairs involving isolation of the pipe from pressurized systems when valves, stoppers or squeezers are not in the immediate vicinity of the work location.
2. Maintenance on regulating or measurement stations isolated or on bypass.

E. When encountering situations similar to the above mentioned examples, the Lockout/Tagout Procedure will be implemented as follows:

1. Locate and identify all valves, switches, etc. that will be used as isolation

points.

2. Inform all employees involved of the isolation plan.
3. One person shall be responsible for the placement and removal of <u>all</u> locks or tags used on the particular work activity. The responsible person will maintain sole possession of the key(s) while work is in progress. In the case of usage of tags instead of locks, all employees will be notified and confirm the one person who can remove tags.
4. The responsible party will ensure all personnel are safely positioned and work is satisfactorily completed before removing locks/tags and beginning re-energization.

PROCEDURES
TRENCH SAFETY

8.0 PURPOSE

Excavations performed by Operator personnel or others present potential hazards. The following Best Excavation Practices shall be adhered to whenever excavation is to take place on or around the gas system:

8.1 SCOPE

A. Trench Inspection By Competent Person
B. Excavation Exit & Entry
C. Foreign Trench
D. Unattended Excavations
E. Water In Trench / De-Watering
F. Placement Of Spoils
G. Adjacent Structures
H. Shoring & Sloping
I. Foreign Lines
J. Pavement Cutting

8.2 GENERAL

A. The operator/contractor shall be responsible to mark planned excavation area and call the appropriate **One-Call System**. Appropriate time shall be allowed for applicable locates to take place before any excavation begins.

B. The company/contractor shall remove all foreign water entering the trench. Refer to City's Best Management Practices.

C. All excavations shall be clearly marked with barricades / cones / caution tape to protect the general public and keep unauthorized individuals from entering work site.

8.3 TRENCH INSPECTION

An OSHA approved competent person (i.e., Supervisor, Crew Leader or other appropriately trained employee assigned by the Operator) shall personally inspect any trench or excavation for cave-in potential, hazardous atmosphere and condition of shoring (when used) prior to anyone entering. Daily inspections shall be made on excavations or trenches left open overnight. Periodic inspections are required on excavations or trenches exposed to wet conditions from running water, ground water or rain. Employees may not enter a trench or excavation if during the inspection, it is found to be unsafe.

8.4 ENTRY-EXIT

A ladder, stairway or sloped ramp shall be used for entering and exiting all trenches 4 ft. or more in depth. Travel distance to the way of exit shall not exceed 25 ft. Ladders shall be in good condition and shall extend 3 rungs above the top of the trench. A ramp used for entering or exiting the trench must be sloped so as to allow an employee to walk upright when using it.

8.5 FOREIGN TRENCH

Entry into a non-complying foreign (excavation dug by others) trench or excavation is prohibited until the excavation has been properly sloped or a protective system (shoring, trench box) has been provided.

8.6 UNATTENDED EXCAVATIONS

Excavations and trenches that are unattended or remotely located from the actual work site shall be covered or barricaded to protect the public.

8.7 WATER IN TRENCHES

Employees shall not work in trenches or excavations in which there is an accumulation of water unless adequate precautions have been taken to protect against hazards posed by the water. Diversion ditches, dikes or other suitable means shall be taken to prevent water from entering a trench or excavation and to provide adequate drainage next to the excavation. The
Competent Person shall periodically monitor water removal equipment to ensure proper operation. Refer to City's Best Management Practices.

8.8 PLACEMENT OF SPOILS

Spoils shall be placed a minimum of 2' from the edge of the trench or excavation or effectively retained so that employees in the excavation will not be exposed to falling or rolling objects. When hand excavating, a safe distance between employees in the excavation shall be maintained to avoid injuring a fellow employee with shovel, digging bars, appropriate hand excavation tools, etc.

8.9 ADJACENT STRUCTURES

When the stability of adjoining buildings, walls or other structures is endangered by an excavation, shoring, bracing, underpinning or other effective means shall be used to protect against a collapse.

8.10 SHORING AND SLOPING

Soil classification is an important part of the proper sloping or shoring technique used. Three soil types are recognized in addition to stable rock. They are listed below in decreasing order of stability:

A. Type "A" (most stable) soil means cohesive soils with an unconfined compressive strength of 1.5 tsf (ton per square foot) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam and in some cases, silty clay loam and sandy clay loam, as well as cemented soil such as caliche and hardpan. However, no soil is Type A if it is:

1. Fissured.
2. Subject to vibration.
3. Previously disturbed or is part of a sloped, layered system where layers dip into the excavation or a slope of four horizontal to one vertical or greater.
4. Subject to other factors that would require it to be classified as a less stable material.
5. Trench slope may be from ½:1 or ¾:1 or benched to same slope.

B. Type "B" (less stable) soil means cohesive soil with an unconfined compressive strength greater than 0.5 tsf, but less than 1.5 tsf, or:

1. Granular noncohesive soils including angular grave, silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
2. Previously disturbed soils, except those that would otherwise be classified as Type C soil.
3. Soil that meets the unconfined compressive strength or cementation required for Type A, but is fissured or subject to vibration.
4. Dry rock that is not stable.
5. Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical

(4H:1V), but only if the material would otherwise be classified as Type B.

6. Trench slope 1:1 or benched to same slope.

C. "Type C" (least stable) means cohesive soil with an unconfined compressive strength of 0.5 tsf or less, or:

1. Granular soils including gravel, sand, loamy sand.
2. Submerged soil or soil from which water is freely seeping.
3. Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.
4. Trench slope may be from 1½:1 or benched to same slope.

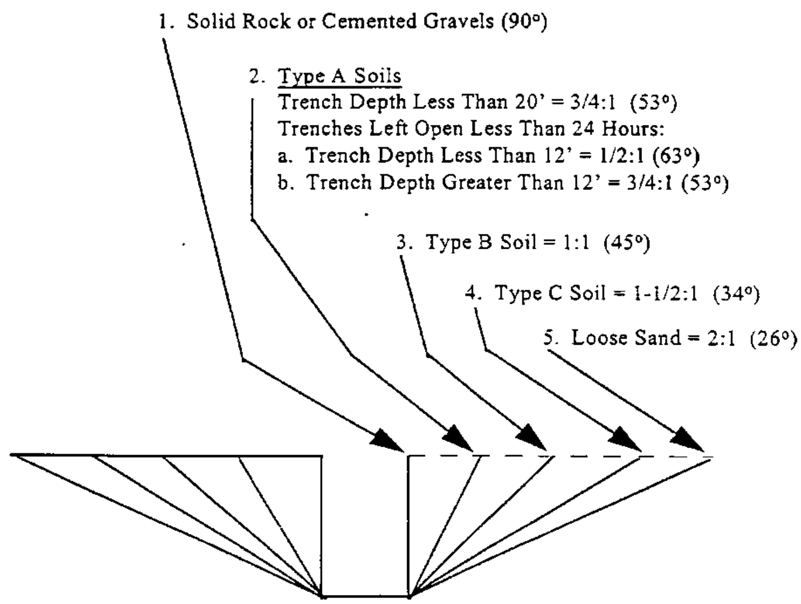
D. At least one visual and one manual test must be conducted by the "competent person" to determine the appropriate soil classification during excavation

E. Shoring and Sloping Requirements - General

1. Banks more than 5' high shall be shored, sloped back to stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins.
2. Trenches located in stable rock do not require shoring or sloping.
3. Sides of trenches in unstable or soft material, 5' or more in depth, shall be shored, sheeted, braced, sloped, benched, or otherwise supported by means of sufficient strength to protect the employee working within them.
4. Trenches less than 5' in depth shall also be effectively protected when examination of ground indicates that there may be unstable ground.
5. Materials used for sheeting, bracing, shoring and underpinning shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

FIGURE 1

ANGLE OF REPOSE FOR SLOPING EXCAVATIONS



Note **Sloping or benching for excavations greater than 20' must be designed by the Engineer**.

Sloping requirements are to be determined by qualified "competent person".

Contractor-installed shoring or sloping must comply with minimum Operator /OSHA requirements. Soil classification is an important part of the proper sloping or shoring technique used.

8.11 FOREIGN LINES (UNDERGROUND)

A. Before any excavation is started, all available means shall be used to detect foreign lines such as telephone, water, underground electric power lines, etc. Appropriate and applicable one-call systems shall be notified allowing for appropriate advance notification of any excavation.

B. The location of existing underground utility lines shall be plainly marked and the excavator informed so he can take steps to avoid them. Pneumatic tools or any other tools having a metal handle shall not be used to uncover cables or conduits carrying high voltage.

Note: Color codes are used to indicate existing facilities:

Red	**Electric**
Orange	**Telephone and Cable TV**
Yellow	**Gas**
Green	**Sewer**
Blue	**Water**
White	**Proposed Excavation**

C. When using booms or excavating equipment under or near overhead power lines, where there is a possibility of touching the line, the following boom clearance shall be maintained:

1. For lines 50KV or less, ten feet (10').
2. For lines over 50 KV, ten feet (10') plus 0.4 inches for each 1 KV over 50 KV.

D. The electric utility shall be contacted for instructions when the voltage is unknown.

E. Exposing foreign lines shall be done manually rather than with machine. Digging tools with non-metallic handles shall be used. Follow local requirements for the distance that hand excavation is required around a facility.

8.12 PAVEMENT CUTTING

A. All work done in connection with pavement cutting and excavation shall be done with the standard specifications of the state, city, county or other authority involved.

B. When engaged in pavement cutting or core drilling excavations, foot guards, goggles or safety glasses, and ear protection shall be worn.

C. Edges of cuts shall be left square and as free from jagged edges as possible in order to prevent hazardous working conditions.

D The practice of undermining pavement and then breaking it down is prohibited.

PROCEDURES
PIPELINE SECURITY / CONTINUING SURVEILLANCE

9.0 PURPOSE

All gas utility personnel share in the responsibility to protect the Operators system security and safety. As well as the potential for accidental interruption of service and public safety, the potential for intentional acts of sabotage exists.

9.1 SCOPE

A. Pipeline Security
B. Continuing Surveillance

9.2 PIPELINE SECURITY

A. Threats to pipeline safety may be facilities damaged due to force including but not limited to:
- Vandalism and/or sabotage.
- Rock fall or slide.
- Snow slide.
- Soil Liquefaction.
- Lateral spread.
- Earthquake.

B. The operator's specific plans for system safety shall include:
- Identifying sensitive pipeline facilities.
- Develop plans to keep these facilities safe from vandalism or intended acts of sabotage.

B. **Particular attention should be given to Critical infrastructure with:**
- Potential as a terrorist target.
- Potential to be used as a weapon.
- Potential for mass casualties.
- Potential effects to drinking water supplies.
- Military/defense installations.

C. All Operator personnel shall be trained and the general public informed about public awareness and their role in:
- Being on the lookout during regular activities for any suspicious activity on or around gas pipeline facilities.
- Double check, and verify that gas facilities that require locking devices are

properly locked. Also check for evidence of tampering.
- Be especially aware of any unusual findings, evidence of tampering or valves in the wrong position during maintenance activities.

E. Attention shall be given to cyber threats as well as physical ones.

F. Immediately report suspicious activities to the gas supervisor or appropriate authorities.

G. Should such events occur a leakage survey should be conducted to ensure pipeline safety.

Refer to Emergency Response Plan Section B.7, Civil Disorder / Natural Disaster Guidelines for additional information.

9.3 CONTINUING SURVEILLANCE (192.613)

Each utility employee shall have the responsibility to report any observed changing conditions that may affect the safe operation of the gas system as may be observed during the normal performance of their daily activities. These include but are not limited to:
- Leakage conditions.
- Exposed lines or suspected ground movement, including subsidence or flooding.
- Corrosion.
- Material or equipment failures.
- Encroachment into/over the pipeline system
- Tampering with pipeline facilities
- Any changes that may affect class locations, such as new construction, changes in usage of existing buildings or outside areas.
- Any construction, excavation, or blasting activities that may adversely affect the system.

Such conditions shall be reported to the appropriate management personnel as soon as practical. All observations of this nature shall be documented and turned into the appropriate utility management individual for appropriate remedial action.

VMUS management is to review field documentation and historical system information to determine the need to prepare plans of corrective action in the event that significant detrimental changes have been discovered in the pipeline system. Among the information to be reviewed in addition to reviewing the listed field conditions observed above are:

- Corrosion history and significant changes in cathodic protection requirements in the area
- Coating condition
- Repair history in the area and the cause of the need for repair (such as third-party damage)
- Leakage history in the area
- Failures or releases in the area
- Proximity of other pipelines and their impact on the gas pipeline system
- The characteristics and vintage of the pipe observed in the field
- The operating pressure
- Right-of-way conditions in the area
- Depth of cover
- Encroachment
- Historical Flooding or Subsidence in the area
- Historical Blasting information and any potential blasting activity
- Nearby construction and development, including road crossings
- Abnormal operating conditions (AOCs) or Potential AOCs in the area.

If a segment of pipeline is determined to be in unsatisfactory condition but no immediate hazard exists, management shall initiate a program to recondition or phase out the segment involved. If the segment cannot be reconditioned or phased out, reduce the MAOP in accordance with 192.619 (a) and (b).

PROCEDURES
SYSTEM START-UP & SHUT-DOWN

10.0 PURPOSE (192.605)

The purpose of this section is to establish that whenever the need arises, planned or un-planned, to shutdown a segment of the pipeline system, it is necessary to establish a specific plan for the safe shutdown and start up.

Potential Causes
- Emergency Situation
- Planned Maintenance, Repair, or Replacement
- New Facilities Extension

10.1 SCOPE

A. Emergency Shutdown
B. Planned Shutdown
C. Start-up

10.2 EMERGENCY SHUTDOWN

A. Incident or Uncontrolled Escape of Gas
1. Implement Emergency Response Plan (ERP) to protect the general public.
    a. Secure the area involved.
    b. Assess the situation and implement ERP as necessary.
    c. Identify pipeline segment(s) involved.
    d. Determine if pipeline shutdown or pressure reduction is appropriate.
    e. Identify points to install gauges and to monitor pressure.
    f. Establish emergency command center.
2. Take action to shut down gas flow or reduce pressure.
3. Control the flow of gas by:
    - Squeeze off
    - Isolation Valves
    - Line fittings
    - Reduce pressure at pressure reducing station
4. Be observant of potential abnormal operating conditions.
5. Complete safe repair or replacement of affected facilities.
6. Document your actions; complete all appropriate Operator forms.

10.3 PLANNED SHUTDOWN

A. Prepare written plan of action.
   1. Monitor upstream and downstream pressures.
   2. Isolate gas supply or reduce pressure:
      - Valve(s)
      - Line stop fitting(s)
      - Squeeze
      - By-pass
      - Pressure reducing station(s)
   3. Isolate / Turn off all affected customer meters. (Use Gas Outage Control Form)
   4. Be observant of potential abnormal operating conditions.
   5. Complete safe repair or replacement of affected facilities.

B. Complete appropriate documentation.

10.4 START_UP

A. Plan for the safe reintroduction of gas into the system.
   - Verify pressure reducing station flow and lockup pressures
   - Monitor pressure to avoid over pressuring the downstream system

B. Be observant of abnormal operating conditions **Refer to Section B-11.**
   - System pressure deviation – high or low
   - Unanticipated system flow rate
   - Unplanned or uncontrolled release of natural gas
   - Activation of a pressure relief or other over pressure protection device
   - Component failure or malfunction

C. Purge the system of air and foreign material **Refer to Section H-5.**

D. Plan for safe customer relight(s) **Refer to Section F-4.**

PROCEDURES
ABNORMAL OPERATING CONDITIONS (AOC)

11.0 PURPOSE

The purpose of this section is to identify a comprehensive list of Abnormal Operating Conditions (AOC's). This list will never be all inclusive.

11.1 SCOPE

A. AOC's
B. Recognize and React Appropriately

11.2 ABNORMAL OPERATING CONDITIONS (AOC)

An Abnormal Operating Conditions (AOC) is a condition identified by the Operator that **may** indicate a malfunction of a component or a deviation from normal operations that **may**:

a. Indicate a condition exceeding design limits; or
b. Result in a hazard to persons, property or the environment

Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response. For transmission lines, the manual must also include procedures for handling abnormal operations. This manual must be reviewed and updated by the operator at intervals not exceeding 15 months, but at least one each calendar year. This manual must be prepared before operations of a pipeline system commence. Appropriate parts of the manual must be kept at locations where operations and maintenance activities are conducted **(192.605).**

There are a number of different types of conditions that may occur on a pipeline:
1. Normal Operations
2. Emergencies
3. Abnormal Operating Conditions
4. Potential Abnormal Operating Conditions
5. Safety Related Conditions

Normal operations are the goal of VMUS at all times. However, VMUS realizes there are instances that vary from normal operations.

Emergencies are changes to the pipeline system that generally are identified by others (that is, people outside of VMUS's operating personnel). These always require immediate response because of the possible severity of impact due to the condition, as well as the emergency being identified by a person not qualified by training or experience in the recognition of different pipeline conditions.

Abnormal Operating Conditions are generally identified by VMUS personnel. They have not yet progressed to the point of becoming an emergency but have the potential to become emergencies if not addressed directly and immediately. Once an Abnormal Operating Condition has been identified, it should receive continuous action to correct the condition until the natural gas system is returned to normal operations. Abnormal Operating Conditions include but are not limited to the following:

- System pressure deviation – high or low
- Unanticipated system flow rate
- Unplanned or uncontrolled release of gas
- Activation of a pressure relief or other over pressure protection device
- Insufficient cover or exposed pipe
- Damaged, defective, or deteriorated pipe, pipe coating, or component
- Component failure or malfunction
- Odorant levels – too high or too low
- CP readings – too high or too low
- Key valves – obstructed, in the wrong position or inoperable
- Unauthorized excavation or blasting near gas facilities
- Construction defect
- Unsafe meter set

Potential Abnormal Operating Conditions are conditions which have been identified, evaluated and determined that they may become an Abnormal Operating Condition if not corrected. These may include nearby excavations where pipe damage may be a concern, etc. A Potential Abnormal Operating Condition must be tracked until it is resolved. The time frame for resolution should be no more than 120 days, unless there is a code or O&M requirement for a shorter time frame, the Potential Abnormal Operating Condition has been identified as part of a specific project tracking program or if it is a Potential Abnormal Operating Condition due to corrosion.

Certain Potential Abnormal Operating Conditions are identified as being immediately reported to VMUS management for reporting as a Safety Related Condition. Safety Related Condition reporting is addressed in a separate section of the O&M Plan (Section No. B12.4).

11.3 RECOGNIZE AND REACT AND RESOLVE

Each individual, employee or contractor, that performs a covered task on the Operator's system shall demonstrate his/her knowledge, skill, and ability to recognize and react appropriately to any abnormal operating condition that may arise during the performance of that task.

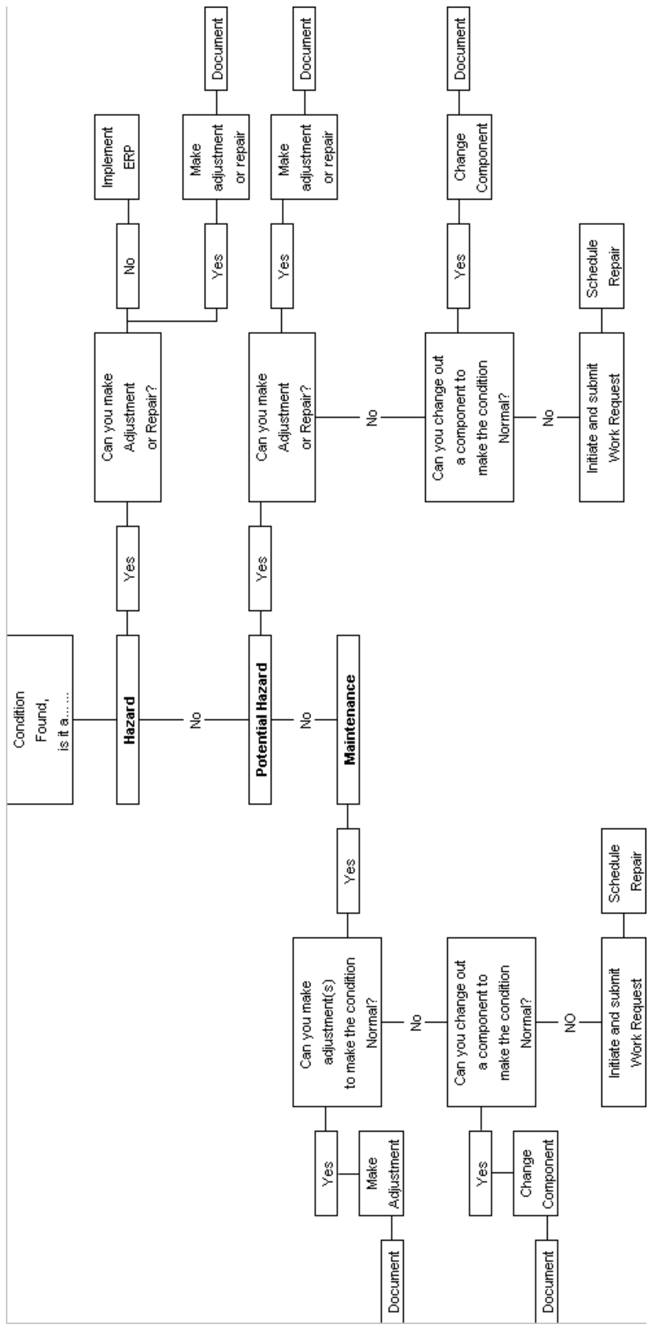
AOCs will be identified as either a hazard, poses an immediate threat to public safety, or potentially hazardous, a condition that if not corrected may become a hazard. The following matrixes, #1 for employees, and #2 for contractors, shall be followed when encountering an AOC.

Hazardous AOCs require immediate and continuous action to correct.

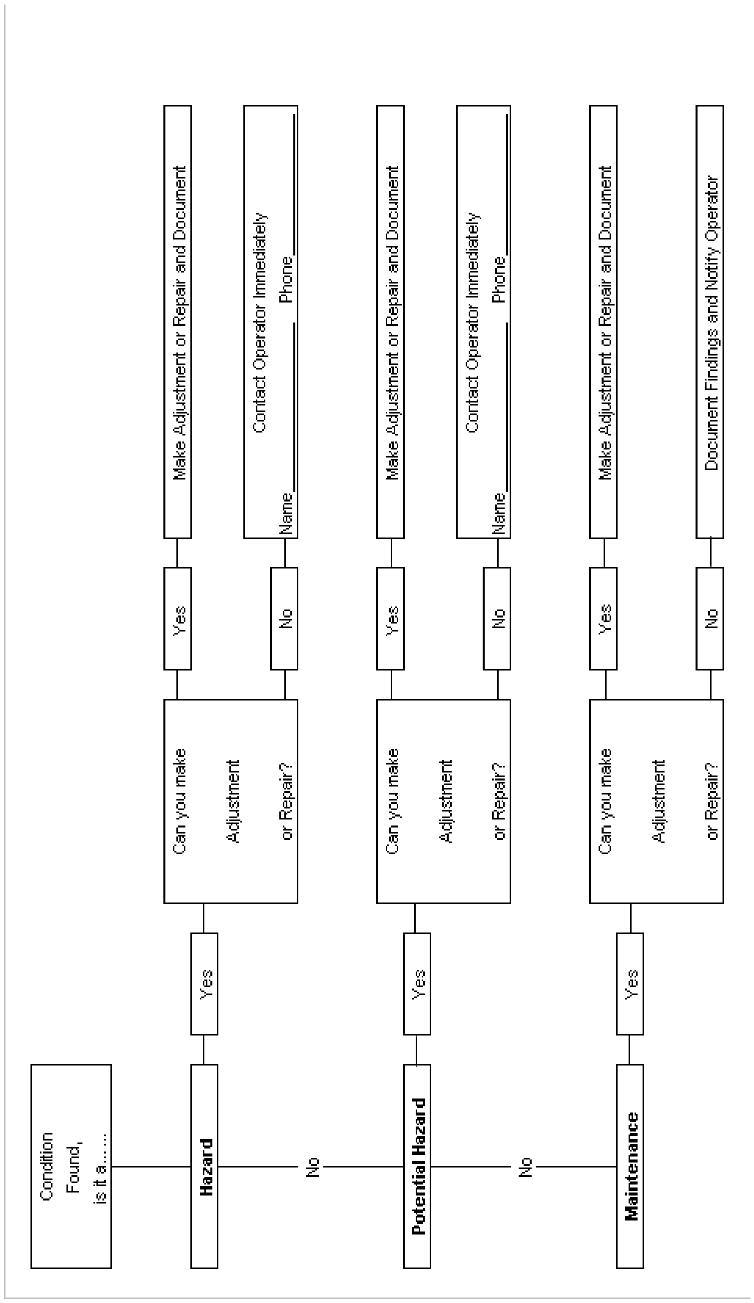
Potentially Hazardous AOCs shall be tracked utilizing appropriate operator forms. The potentially hazardous condition shall be corrected within 120 days. If it can not be corrected within that time the operator shall develop a written plan of action to correct the condition.

PROCEDURES
ABNORMAL OPERATING CONDITIONS (AOC)

OPERATOR
ABNORMAL OPERATING CONDITIONS MATRIX #1



CONTRACTOR
ABNORMAL OPERATING CONDITIONS MATRIX #2



PROCEDURES
SYSTEM INTEGRITY

12.0 PURPOSE

The U.S. Legislature enacted legislation during 2006 that directly impacts the pipeline industry. The Distribution Integrity Management Program (DIMP) currently contains the following elements that may be found in the DIMP plan:

1. Knowledge
2. Identify threats
3. Evaluate and rank risk
4. Identify and implement measures to address risks
5. Measure performance, monitor results and evaluate effectiveness
6. Periodic evaluation and improvement
7. Report results

This section identifies current elements of the Operator's **Distribution System** procedures in a way to address pipeline integrity and future requirements.

12.1 SCOPE

A. Class Location Study
B. Patrolling
C. Safety Related Conditions
D. Failure Investigation
E. Operator Qualifications
F. System Design
G. Records, Reports And Maps
H. Annual System Review
I. Annual Report
J. Mechanical Fitting Failure Report
K. Quality Assurance
L. OPID national registry

12.2 CLASS LOCATION STUDY: (192.609 & 192.611)

The Operator shall at least once each calendar year conduct a **Class Location Study** to evaluate the effects of population growth and new construction within the area of its pipeline facilities to determine the need if any for changes in Class Location. Whenever an increase in population density indicates a change in class location, the operator shall perform a study to determine if the current MAOP remains valid or should be changed.

The Operator shall have records that document the current class location of each pipeline segment. These records must demonstrate the method used by the operator to determine each class location.

This Class Location Study shall include, but not be limited to the following:

1. Sliding Mile - 220 yards on either side of the pipeline by 1 mile long along the centerline of a pipeline where the pipeline is continuous through the 1 mile. The concept here is not one of blocks of land each fixed to a particular point on the ground, but rather that of a "window" which can be moved along the pipeline as an aid in analyzing building and therefore population density and the related safety liability or a “Sliding Mile”.
2. Evaluate the effects of new construction and development.
3. Evaluate the effect of changes in population growth.
4. Define and document all class locations in accordance with the findings of the study.
5. The design, construction, and testing procedures followed in the original construction, and a comparison of these procedures with those required for the present class location.
6. The physical condition of the segment to the extent it can be ascertained from available records.
7. The operating and maintenance history of the segment.
8. The maximum allowable operating pressure and the corresponding operating hoop stress, taking pressure gradient into account, for the segment of pipeline involved.
9. The actual area affected by the population density increase, and physical barriers or other factors which may limit further expansion of the more densely populated area.

The four class locations are:

Class 1: Class location unit contains fewer than 10 buildings intended for human habitation.

Class 2: Class location unit contains more than 10 but fewer than 46 buildings intended for human habitation.

Class 3: Class location unit contains more than 46 buildings intended for human habitation. A class 3 location also exists where, the pipeline lies within 100 yards, 300 linear feet, of a building occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12 month period.

Examples of class 3 locations include but shall not be limited to:
- Businesses
- Schools and churches
- Meeting halls and convention facilities
- A small, well defined, outside area, such as a park
- A school bus stop located within 100 yards of the pipeline where 20 or more children wait for the bus
- A prison or other facility that may be difficult to evacuate

Class 4: Class location unit contains a prevalence (50% or greater) of buildings of four or more stories above ground. For this definition, each dwelling unit in a multiple dwelling complex is counted separately. When a cluster of buildings requires a class 2 or 3 location, the class location ends 220 yards from the nearest building in the cluster.

12.3 PATROLLING: (192.705 & 192.721)

The Operator's employees shall identify and observe its system facilities in locations where anticipated physical movement or external loadings could cause failure. These locations include, but shall not be limited to the following:
1. River crossings both suspended and buried
2. Known fault lines
3. Railroad and highway crossings
4. Locations of known shallow depth
5. Any area where it may reasonably be expected that outside forces may have influenced the potential for movement.

Facilities shall be observed for:

1. Exposed Pipe
2. Damage or Failure
3. Hazardous conditions
4. Safety Related Conditions
5. Increased potential for damage
6. Vandalism
7. Signs of unknown excavations

All such areas shall be checked immediately following one of, but not limited to, the following events:

1. Earthquake (Refer to Emergency Plan section A-6)
2. Major flooding
3. Land and/or snow slide
4. Tsunami

(192.705 Transmission)
At required frequencies, observe conditions on and adjacent to its transmission facilities for leaks, construction activities and other factor affecting the safety and operation.

1. Class locations 1 & 2: At highways and railroad crossings, interval not greater than 7 ½ months but at least twice each calendar year. At all other locations, at intervals not greater than 15 months but at least once each calendar year.
2. Class location 3: At highways and railroad crossings, interval not greater than 4 ½ months but at least four times each calendar year. At all other locations, at intervals not greater than 7 1/2 months but at leas twice each calendar year.
3. Class location 4: At all known locations, interval not greater than 4 ½ months but at least four times each calendar year.

(192.721 Distribution)

1. In business districts, intervals not exceeding 4 ½ months but at least four times each year.
2. Outside business districts, intervals not exceeding 7 ½ months but at least twice each year.

12.4 SAFETY RELATED CONDITION: (191.23 & 191.25)

All operations and maintenance personnel will report the existence of any unusual conditions found on Company facilities to the appropriate management personnel. Management personnel will review the unusual conditions reported to determine if the condition is a DOT (Department of Transportation) reportable *Safety Related Condition*.

Operators are required to take corrective action and report certain safety related conditions.

A. Training of Employees: All Operations and Maintenance employees and contractors shall receive instruction in identifying and reacting appropriately when safety related conditions are discovered.

B. All potential Safety Related Conditions will be reported to VMUS Management for evaluation and determination of a Safety Related Condition.

C. Recognizing and Reacting to Safety Related Conditions:

Examples of unusual conditions that are potential Safety Related Conditions:

1. Impaired Structural Integrity or Serviceability of a Pipeline. Employees are on the watch for the following: Any shifting or abnormal loading by environmental causes such as earthquake, landslide, flood, or similar natural causes which may impair the serviceability of any part of the system. When any such event occurs, the Operator inspects the entire system at the earliest possible moment to determine if the system has sustained any damage.
2. System Malfunction or Operator Error. Any system malfunction or operator error which causes the operating pressure to rise above the sum of the MAOP plus the allowable build-up pressure for operation of pressure limiting or control devices.
3. Situations which could lead to an imminent hazardous and cause, directly or indirectly, a reduction of 20% or more in the operating pressure, or in system shutdown. These situations include material defects or physical damage to the pipeline system.

Examples of unusual conditions that are NOT Safety Related Condition:

1. Should the Operator rectify the potential safety related conditions in accordance with its established repair procedures within five (5) days of discovery of the safety related condition, no report is required.
2. Other conditions not reportable:
   - Should the condition be determined to not actually exist.
   - Exists on a customer owned service line.
     Should it become an incident prior to the deadline for filing the safety related condition report.
   - Should it exist on a pipeline that is more than 220 yards from a building intended for human occupancy or an outdoor place intended for public

assembly, except that a report is still required if the condition is within the right-of-way of an active railroad or paved road, street, or highway.

D. Instructions for Reporting Safety Related Conditions

When a potential safety-related condition has been noted, the responsible Supervisor must use the following determination requirements and reporting deadlines:

1. The local responsible Supervisor (with assistance from Utility management as necessary) must determine whether a safety-related condition exists and meets the reporting criteria. This determination must be made within 5 working days of initial discovery of the potential condition. This person is listed on the form as the "Person Determining Condition" and will be the person contacted for further information.

2. Once the responsible Supervisor determines that a safety-related condition exists and meets the reporting criteria, the written report must be physically received by the PHMSA within 5 working days.

NOTE: The maximum time between the date of discovery of the condition and the date of reporting is 10 working days. Often the date of discovery and the date of determination are the same day, which means a total of only 5 days are allowed between the date of discovery and the date the written report must be physically received by the PHMSA.

3. Should the Operator not rectify the safety related condition within five (5) working days of discovery then:
   - Safety related conditions are reported to the U. S. Department of Transportation by means of a Safety Related Condition Report.
   - The safety-related condition report must be filed (received by OPS within 5 working days) after the day a representative of the City of Victorville first determines that the condition exists, but not later than 10 working days after the day a representative of the City of Victorville discovers the condition. In determining the number of days, exclude Saturdays, Sundays or Federal holidays.

4. The Safety Related Condition Report must be headed "Safety Related Condition Report"

- The report MUST provide the following information:
  - Operator's name, principal address and Operator ID (OPID) Number - 32119
  - The date of the report
  - Name, job title and business telephone number of the person who is submitting the report.
  - Name, job title, and business telephone number of the person who determined (verified) that the condition exists. This can be the same person that is filing the report.
  - The dates when the condition was discovered and when its actual existence was verified.
  - Location of the condition with reference to a specific geographical area (give state, county and town or city, nearest street address, survey station number, milepost, fixed landmark, etc.)
  - Description of the condition including how it was discovered, what significant effects it may have on safety, and what is carried in the pipeline;
  - What corrective action has been or will be taken (including pressure reduction of 20% or more or shutdown) before the report was submitted, together with a plan and a schedule showing when the future corrective action will be initiated and concluded.

5. Reports must be signed by the Utilities Director or designee to ensure Safety Related Condition reports are properly filled out.

Reports may be transmitted by email to InformationResourcesManager@dot.gov or by sending the notification by mail to:

ATTN: Information Resources Manager
DOT/PHMSA/OPS
East Building, 2nd Floor, E22-321
1200 New Jersey Ave. SE
Washington, DC 20590

A copy of any safety related condition report must also be submitted to the California Public Utilities Commission by email to usrb@cpuc.ca.gov.

Following is a sample of a Safety Related Condition Report form

SAFETY RELATED CONDITION REPORT

City of Victorville
Municipal Utility Services
PO Box 5001
Victorville, CA 92393-5001
Operator ID (OPID) Number - 32119

Date of Report:
Person submitting report: Job title: Telephone number:
Person determining condition: Job title: Telephone number:
Date condition discovered:
Date condition was first determined to exist:
Condition location: (including state; town; city or county; nearest street address, if applicable; milepost; landmark; or name of pipeline)
Description: (Describe the condition, that caused a report to be submitted, any significant effects on safety, commodity carried in the pipeline)
Description of corrective action: (Corrective action taken before the report was submitted and any planned future corrective action including the anticipated schedule for the action to be taken.)

Submitted By (signature):

Submitted By (printed name):

Title:

12.5 FAILURE INVESTIGATION: (192.617)

Each accident or failure involving the operator's system which, results in an emergency situation, shall be investigated to determine the cause of the failure and to minimize the possibility of a recurrence. The following may be included:

1 Question witnesses.
2 Check condition of facilities including meters and regulators.
3 Test odorant level.
4 Evaluate damage patterns.
5 Evaluate potential of weather conditions or other outside forces having contributed to the situation.
6 Maintain adequate samples of failed or damaged facilities to perform further materials tests.
7 Solicit outside assistance with investigation when appropriate.
8 Review records of previous work and operator or contractor personnel's performance as may have contributed to the accident or failure.

The operator shall report accidents or failures that result in an emergency situation in accordance with applicable State and Federal requirements.

12.6 OPERATOR QUALIFICATIONS (192.801- 192.805)

The Operator is responsible to ensure that all Operator personnel and contract personnel are qualified to perform Covered Tasks involving the operation and maintenance of the Operator's natural gas system and are able to recognize and react appropriately to any abnormal operating conditions which may arise during the performance of the Covered Task. Each individual must demonstrate the knowledge, skill, and ability to perform a covered task.

Accepting qualifications obtained under the programs of other operators for covered tasks is generally not allowed under the requirements of 49 CFR Part 192.805(b).

Exception
VMUS may accept qualifications obtained under the OQ (Operator Qualification) program of other operators and contractors with which the VMUS has a written Mutual Assistance Agreement, and the following conditions have been met:

- The OQ program of the other operator complies with all provisions of CFR 49 Part 192.801-809
- The standards used by the other operator for qualification are acceptable to the Company
- A documented audit has been conducted of the other operator's program

NOTE: **During an emergency, VMUS reserves the right to utilize any personnel needed to protect lives and property. This may involve utilizing the employees from a mutual aid organization who have been trained and qualified under their program and not the VMUS program.**

(Written Operator Qualification Program under separate binder)

12.7 SYSTEM DESIGN: (192.53, 192.103 & 192.143)

All materials, pipe, and components shall be designed in accordance with the requirements established under Subparts B, C & D of this Part.

12.8 RECORDS, REPORTS AND MAPS: (192.603)

The operator shall maintain documentation as required by rule and make this documentation available to all personnel as may be necessary for the safe operations and maintenance of its system. It is the position of the State and Federal regulators that **"If it is not documented then it is not considered completed"**. These may include but are not limited to the following:

A. Maps depicting size, type and location of mains, services and other pipeline facilities.
B. Pressure test records shall be maintained for the useful life of the pipeline facilities.
C. Records and reports of all annual maintenance requirements as prescribed by rule.

Refer to Section E-1

12.9 ANNUAL SYSTEM REVIEW: (192.605)

The Operator shall institute a program for the annual review of its system including this manual (at an interval not exceeding 15 months but at least once each calendar year). The following, but not limited to, may include:

A. System inspection of records and site inspections to ensure critical and urgent O&M requirements have been met. The following records shall be included:
   1. Leak survey records
   2. Corrosion control records
   3. Maintenance records
   4. Failure reports
   5. Line locations & damage reports
   6. Patrolling records
   7. Operator Qualification
   8. DIMP plan – update every 3 years or after any major changes to the distribution system (including leak management program).

B. Review meeting with operations personnel to discuss system compliance conditions, pertinent changes to Parts 191 and 192 and state regulations:
   1 Continuing surveillance findings
   2 Class Location Study including population growth, system changes and other information that may affect current class location determinations **(192.609 & 192.611).**
   3 Safety Related Conditions
   4 Design records
   5 All other pertinent information that may affect the natural gas system operations.

12.10 ANNUAL REPORT: (191.11, 191.13 & 191.17)

On or before March 15th of each calendar year, the operator shall complete and file form PHMSA 7100.1-1 electronically with the DOT at http://portal.phmsa.dov.gov/pipeline.

If considered a burden to file electronically, written reports may be filed by mail at:

Information Resources Manager
Office of Pipeline Safety
Pipeline & Hazardous Material Safety Administration
East Building, 2nd Floor, PHP-20
1200 New Jersey Avenue, SE
Washington D. C. 20590

File a copy with the appropriate state regulator(s) as may be applicable. The applicable State Pipeline Safety office may require that this report be sent to them earlier than March 15th.

12.11 MECHANICAL FITTING FAILURE REPORT (191.12)

On or before March 15th of each calendar year, the operator must submit a mechanical fitting failure report PHMSA F-7100.1-2 for each mechanical fitting failure that occurs within the previous calendar year. Alternatively, the operator may elect to submit its reports throughout the year.

Mechanical fitting failures that result only in non-hazardous leaks do not need to be reported on the PHMSA F-7100.1-2 report.

At a minimum, the following information should be collected when a mechanical fitting failure results in a reportable failure to be included in PHMSA F-7100.1-2 report:

- Date of the fitting failure
- The mechanical fitting involved
  - Stab
  - Nut Follower
  - Bolted
  - Other Compression Type
- The type of mechanical fitting
  - Inline Tee
  - Tapping Tee
  - Transition Fitting
  - Coupling
  - Riser
  - Adapter
  - Valve
  - Sleeve
  - End Cap
  - Other
- Leak Location
  - Above Ground/Below Ground
  - Inside/Outside
  - Main-to-Main/Main-to-Service/Service-to-Service/Meter Set
- Materials being joined

    - First Pipe Size
    - First Pipe Material
    - Second Pipe Size
    - Second Pipe Material
- Apparent Cause of Leak
    - Corrosion
    - Natural Forces
        - Was there thermal expansion or contraction?
    - Excavation Damage
        - Time the excavation damage occurred
            - At the time of discovery
            - Previous to the leak discovery
    - Other Outside Force Damage
    - Material or Welds/Fusions
        - Due to Material Defect or Design Defect?
    - Equipment
    - Incorrect Operation
    - Other
        - Explain
- How did the leak occur?
    - Leaked through the seal
    - Leaked through the body
    - Pulled out

12.12 QUALITY ASSURANCE

A. The Operator conducts periodic review and inspection of work performed by its personnel to determine the effectiveness and adequacy of its procedures. If deficiencies are found in its procedures, the Operator will modify them as necessary. **192.605 (b) (8)**

B. All records and reports produced in the field shall be signed by the qualified individual performing the work as well as to be reviewed by the appropriate supervisor prior to filing.

1. Documentation shall be checked for completeness
2. Proper procedures
3. Safety compliance

4. Any abnormal operating conditions

C. Quality Control Inspections are conducted once each calendar year not to exceed fifteen (15) months for each employee and contract employee performing work on the Operator's system.

D. The Operator contracts with one or more suitable, qualified consultants to provide training for its employees and for those of consultants and contractors as may be needed.

1. The operator has developed a Training Matrix for identifying and scheduling necessary training.
2. The requirements for refresher training for existing employees may be satisfied by demonstration of continued competence by the employee.

Note: Operator Qualification Program under separate cover.

12.13 <u>NATIONAL REGISTRY OF OPERATOR IDENTIFICATION NUMBER</u>

A. The operator must notify PHMSA electronically through the National Registry of Pipeline, Underground Natural Gas Storage Facility and LNG Operators at http://opsweb.phmsa.dot.gov of certain events. Notification must be within 60 days of any of the following events:

1. Construction or any planned rehabilitation, replacement, modification, upgrade, uprating, or update of a facility, other than a section of line pipe, that costs $10 million or more. If 60 days notice is not feasible because of an emergency, the operator must notify PHMSA as soon as practical.
2. Construction of 10 or more miles of a new or replacement pipeline.
3. Construction of a new LNG plant or LNG facility.
4. Construction of a new underground natural gas storage facility.
5. Reversal of product flow direction when the reversal is expected to last more than 30 days.
6. A pipeline converted for service under 192.14 of this chapter, or a change in commodity as reported on the annual report as required by 191.17.

B. The operator must notify PHMSA of any of the following events no later than 60 days after the event occurs:

1. A change in the primary entity responsible for managing or administering a safety program required by this part covering pipeline facilities operated under multiple OPIDs.

2. A change in the name of the operator.
3. A change in the entity responsible for an existing pipeline, pipeline segment, pipeline facility, underground natural gas storage facility or LNG facility.
4. The acquisition of 50 or more miles of a pipeline or pipeline system subject to Part 192.
5. The acquisition of an existing LNG plant or or LNG facility subject to Part 193.
6. The acquisition of an existing underground natural gas storage facility subject to Part 192.

C. The operator must use the OPID issued by PHMSA for all reporting requirements covered under this subchapter and for submissions to the National Pipeline Mapping System.

PROCEDURES
PUBLIC AWARENESS and DAMAGE PREVENTION

13.0 PURPOSE

The purpose of this section is to define the Operator's program directed at raising the affected public's awareness of the presence of the gas pipeline facilities in their community and to understand the steps that should be taken to prevent and to respond to potential pipeline emergencies.

The program goal is to eliminate damages and the uncontrolled release of gas from its system which may adversely affect the safety of the general public.

13.1 SCOPE

Public awareness is an essential ingredient in the overall pipeline integrity and safety. This program is intended to enhance the part that the public plays in the prevention of and response to potential pipeline emergencies. Included are the following program guidelines:

A. Public Awareness
B. Damage Prevention

Refer to separate Public Awareness and Damage Prevention programs for greater detail.

13.2 PUBLIC AWARENESS: (192.616)

The City of Victorville's Director of Electric Utilities, Brenda Hampton, is accountable for the development, monitoring, implementation, and documentation of the program for public awareness, however each gas utility employee and contract employee share in the responsibility to maintain a safe system. **(Reference API Recommended Practice 1162)**

Key stakeholders include:

- Landowners adjacent, within 330 linear feet, of the operator's rural pipeline route.
- Residents and businesses within the local distribution system service area (Customers and non-customers).
- Places of congregation within service area or adjacent to the rural pipeline route (Both structures and outside gathering areas).
- Emergency response officials who may respond to an emergency affecting the Operator's system.
- Local public officials.
- Excavators known to perform excavation within the Operator's service area or advertising locally to do so, i.e. phone book or other local publications.

A. The Operator has established the following methods for educating the public about the utility and about recognizing gas pipeline emergencies and reporting them to the Operator. These may include but are not limited to the following:

- Media advertisement i.e. newspaper(s), TV, radio and other information pieces shall occur at a minimum of twice annually.
- Utility bill stuffers or bill messages shall contain public awareness message at a minimum of twice annually.
- Participation annually at the local events that may be well attended by local residents, business operators, and public officials.
- Direct mail to affected landowners, excavators, and others as may be necessary.
- Conduct annual public liaison sessions with emergency response agencies / first responders annually.

B. The Operator's Community Education programs will include but not be limited to the following messages:

- An odor, similar to that of "rotten eggs", is added to both natural gas and propane gas so that the smell is easily recognizable.
- Natural gas is a very safe form of energy but must be handled with care and respect. The safe and efficient operation of the natural gas system is a public concern.
- Incidents are rare but may occur including leaks, ruptures, and ignition.
- Potential hazards may include construction or excavation near the gas facilities, land movement due to earthquakes, flooding, or landslides, and other events that may cause damage to the gas facilities.
- Other indications of a leak or rupture may include the sound of escaping gas, dust or other occurrences located near the gas facilities.
- Potential hazards should not be disregarded. The public should report to the utility any potential hazards they may see.
- Anyone who notices suspicious activity around our system should immediately notify the utility.
- Inform the public that the utilities and their contractors are highly trained and qualified to recognize and react to any abnormal operating conditions that may occur.
- Any excavating requires that the excavator call 811 before digging.

C. At the time of customer sign up or transfer, customers should be notified of the above information plus:

- The utility owns, operates and maintains the gas facilities up to and including the service regulator and gas meter at or near the structure.
- Only the utility's employees or contractors authorized and qualified by the utility may work on the gas facilities.
- The customer is responsible for all plumbing, piping and appliances, including maintenance of the pipe from the meter to the individual appliances, and any buried pipe after the meter. If the buried pipe is not maintained, it may be subject to the potential hazards of leakage and corrosion. Buried pipe should be periodically inspected for leaks and corrosion if the piping is metallic and repaired if an unsafe condition is found.
- When excavating near buried gas piping, the piping should be located in advance, and the excavation done by hand.
- Only qualified service persons should be utilized for making installations, repairs and/or alterations on the gas appliances or piping after the meter.
- Pipeline warning signs are there for the public's safety and should not be damaged or removed.
- The customer may have an Excess Flow Valve installed at the time of installation or replacement of the gas service line.

D. The utility has established its Emergency Response Plan:

- The utility regularly reviews and exercises this plan.
- Upon conclusion each incident, the actions of the individuals involved including those of outside responders and other that may have been involved are reviewed / debriefed.
- Any material failures, training needs, or necessary changes to the plan that are identified during this process are documented and addressed to the attention of the Director of Utilities.
- Appropriate changes to the plan or procedures will be initiated by the Director of Utilities.

E. Records of each of the above events shall be maintained in a central file location for review annually. These records (except Section C) shall be maintained for a minimum of five years or until the operator performs a regularly scheduled analysis of the effectiveness of the program. A copy of the current customer notification (Section C) and evidence of notification for the past three years must be made available to the regulatory agencies. **192.16 (d)**

F. The Operator's Public Awareness Program shall be reviewed at a minimum of once annually at the time of the annual O&M Plan review.

G. From time to time, but not to exceed four years, the Operator will conduct an audit of this program. Included will be:

- Documentation of actual messages and frequency
- A random survey of key stakeholders
- Measurement of program effectiveness:
  - Reaching intended audience
  - Effectiveness of message, is the consumer aware
  - Reduction in actual incidents
  - Interview utility personnel
- Recommendations for change or enhancements

13.3 <u>DAMAGE PREVENTION: (192.614)</u>

The Operator has established a damage prevention program which is closely related to the Public Awareness Program and is designed to eliminate damages to the Operator's gas system caused by third parties.

A. The primary method is to participate in the local One Call System.

- The Operator shall maintain active participation in the local area **One Call System**.
- Appropriately respond and document all calls for line locations within allotted time established by the state's one call law.
- The Operator shall follow all rules and guidelines set down by state and local statutory requirements

B. Customer Notification at time of sign-up including the following:

- Excess Flow Valve
- "Notice to Customers" public awareness notice
- "General Natural Gas Service Information" notice
- One-Call System information
- Pipeline markers and warning signs

C. Identify and Inform Excavators and Contractors:

- Annually direct mail to each notification of state law, line location services and

one call center phone number.
- Previous Dig Alert tickets shall be utilized in identifying the individuals, companies and entities.
- List of persons who normally engage in excavation activities (excavators) in proximity to the operator's pipeline.

D. The Operator shall place warning signs wherever it is deemed necessary to reduce the possibility of damage to the Operator's facilities. Such locations include:
- Aboveground facilities in Class 1 & 2 Locations.
- Railroad and public roadway crossings in Class 1 & 2 locations.
- Inform the public of the importance of these signs and that the pipeline warning signs are there for the public's safety and should not be damaged or removed.

E. The Operator shall place caution tape above all newly installed and replacement gas mains and services. Refer to **Section E-8.**

F. Operator Continuing Surveillance Program **Section B-9.3.**

G. At the time of the annual O&M Plan review, the Operator shall evaluate the effectiveness of this program and make changes/enhancements as may be necessary.

H. Also Refer to **Section B-12**, **System Integrity**, for additional actions complementing this program.

PROCEDURES
PLASTIC PIPE / GENERAL

1.0 PURPOSE (192.271-192.287)

It is the purpose of this section to provide minimum requirements and information on the equipment, materials and methods utilized in the fabrication of plastic gas pipe and tubing.

1.1 SCOPE

This section deals only with polyethylene plastic pipe. This section covers the following:

A. C-1 Static Discharge / Pinholing
B. C-2 Plastic Pipe Handling And Care
C. C-3 Butt Fusion
D. C-4 Electrofusion
E. C-7 Plastic Pipe Risers
F. C-8 Controlling Gas Flow / Plastic Pipe
G. C-9 Plastic Pipe Repair
H. C-10 Plastic Pipe Mechanical Fittings

1.2 GENERAL

Polyethylene plastic pipe is currently the most commonly used plastic pipe throughout the gas industry. PVC, ABS, and some other pipe materials exist in gas operating systems however these materials are no longer recommended for use in new or replacement systems.
Individuals performing plastic pipe joining including fusion, mechanical, or other means shall be qualified in the procedure to be utilized.

1.3 JOINING (192.271 – 192.287)

A. Individuals performing polyethylene pipe joining must be qualified in the procedure being utilized. Individuals must be re-qualified once each calendar year not to exceed 15 months or after a pipe joint has been found unacceptable by testing (**192.285**).

B. Pipe and fitting surfaces must be clean and properly prepared.

C. Heating tool surfaces must be clean, undamaged and at the correct surface temperature.

D. Plastic pipe shall be joined utilizing one of the following procedures specified in **Section C** of this manual.

E. Individuals performing inspections of polyethylene pipe joining must be qualified by appropriate training or experience in evaluating the pipe joining (**192.287**).

F. Operator must maintain equipment used in joining plastic pipe in accordance with the manufacturer's recommended practices or with written procedures that have been proven by test and experience to produce acceptable joints (**192.756**).

1.4 MARKING

A. Each joint in a plastic pipe system shall be marked to identify the qualified individual performing the procedure, using their designated unique identifier.

B. Care shall be exercised in marking the pipe joint as not to damage the pipe. The following are acceptable marking instruments:
- Sanford Sharpies
- Sanford "Gold Coat" slim tip metallic marker
- Sanford "Silver Coat" slim tip metallic marker
- Sanford china marker

1.5 MAIN TEMPERATURE

DOT regulated gas applications in the United States; main pressure must be reduced for elevated temperature when the main temperature exceeds 100°F (38°C).

1.6 STATIC DISCHARE / PINHOLING

The buildup and discharge of static electricity inside and on the outside of plastic pipe is of significant concern and may lead to future pipeline integrity.

A. Pinholing may be the result of static discharge such as during purging, or

B. May be due to a material defect.

C. Caution and continuing surveillance of the plastic distribution system for signs of possible pinholing and resulting leakage shall be maintained by the operator.

PROCEDURES
PLASTIC PIPE HANDLING AND CARE

2.0 PURPOSE

Care not to damage the pipe should be taken in the handling and storage of PE pipe. PE pipe shall be covered to avoid exposure to ultraviolet rays.

2.1 SCOPE

A. Handling and Loading
B. Storage
C. Exposure to Ultraviolet Light
D. Liquid Hydrocarbon Permeation
E. Fusion in Cold Weather

2.2 HANDLING AND LOADING

A. Four inch (4") and larger pipe shall be loaded and unloaded by the use of a mechanical lifting device. Pipe straps should be utilized to protect against damage to the pipe.

B. The pipe shall not be turned loose to roll down the skids. It shall also be properly supported to prevent dragging ends of the pipe on the ground.

C. All associated components shall be handled with care as to prevent damage.

2.3 STORAGE

A. Pipe and tubing should be stacked in straight rows and contained by upright stakes or racks so it will remain straight.

B. Pipe should not be stacked so high as to cause the bottom rows to become out-of-round due to excessive loading.

C. Pipe should be stored on wooden strips not less than 3.5" wide to prevent it from being damaged or becoming out of round.

D. Pipe should be stored so as to eliminate debris and other undesirable elements from entering the pipe.

E. Care should be taken when loading and unloading pipe to avoid cuts and punctures that occur when pushed or pulled over sharp projections.

F. Pipe should not be dropped or struck by objects.

G. Polyethylene pipe may be laid on the ground without pads or similar support where the terrain will not damage the pipe.

H. All piping and tubing shall be carefully inspected for cuts, gouges and deep scratches upon delivery. Harmful imperfections shall be noted for proper disposition. Small imperfections may be cut out and destroyed while major damage or imperfections shall not be accepted and/or returned to the supplier.

I. All associated components shall be carefully inspected for any damage or missing parts upon delivery and stored in a manner to protect it from ultraviolet light and damage.

2.4 EXPOSURE TO ULTRAVIOLET LIGHT

A. Plastic pipe shall not be subjected to unprotected outdoor exposure to ultraviolet light for longer than 2 years.

B. This applies to all pipe kept in storage and to all temporary piping installations.

2.5 LIQUID HYDROCARBON PERMEATION

A. When present, liquid hydrocarbons may permeate (solvate) polyethylene pipe. Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe, or where soil surrounding the pipe is contaminated with liquid hydrocarbons, or where liquid hydrocarbon condensates can form in gas pipelines. All types of liquid hydrocarbons (aromatic, paraffinic, etc.) have a similar effect, and the relative effect on different polyethylene pipe resins is essentially the same. Heat fusion joining to liquid hydrocarbon permeated pipes may result in a low strength joint.

CAUTION — once polyethylene pipe has been permeated with liquid hydrocarbons, heat fusion or electrofusion joining is NOT recommended because liquid hydrocarbons will leach out during heating and contaminate the joint. Liquid hydrocarbon permeated polyethylene pipe should be joined using suitable mechanical connection methods.

B. Liquid hydrocarbon contamination is indicated by a rough, sandpaper-like, bubbly, or pockmarked surface when a fusion heating iron is removed from the pipe surface, and may be indicated by discoloration or by a hydrocarbon fuel odor.

2.6 FUSION IN COLD WEATHER

A. In cold weather, polyethylene becomes more sensitive to impact and less flexible. Use additional care in handling. When temperatures are very cold, avoid sharp impact such as dropping the pipe from moderate heights. Cold pipes will be harder to bend or uncoil. In inclement weather and especially in windy conditions, the fusion operation should be shielded to avoid precipitation or blowing snow and excessive heat loss from wind chill.

B. Remove all frost, ice, or snow from the OD and ID surfaces of areas to be fused. Surfaces must be clean and dry before fusing.

C. Polyethylene pipe and fittings will contract slightly in the cold. Most butt and saddle fusion equipment will accommodate the slightly reduced diameter of cold pipe. In socket fusion, it will be more difficult to fit a cold socket fitting on the heating tool socket face. One way to compensate is to warm socket fittings in the cab of the service truck before using them.

D. In some cases, socket fusion cold ring clamps may fit loosely on cold pipe. Using two cold ring clamps, set the first cold ring clamp to proper distance with the depth gauge. Shim around the pipe behind the clamp with tape, and place a second, backup cold ring clamp over the tape. The backup cold ring clamp prevents slippage, and the inner cold ring clamp allows the pipe to expand to normal dimensions when heated.

E. When fusing in cold weather, the time required to obtain the proper melt may increase.
   - *Maintain the specified heating tool surface temperature.* ***Do not increase heating tool surface temperature.***
   - *Do not apply pressure during zero pressure butt or saddle fusion heating steps.*
   - *Do not increase butt or saddle fusion joining pressure.*

F. In butt fusion, melt bead size determines heating time; so the procedure automatically compensates when cold pipe requires longer time to form the proper melt bead size.

G. For saddle fusion, establish the necessary cold weather heating time by making trial melt patterns in the field on non-pressurized, excess pipe that is at field temperature. Use the standard heating time plus additional heating time in 3-second increments until the proper melt pattern is established on the pipe. A clean wood board or heat shield ("flyswatter") should be used between the saddle fitting and the heater to avoid heating the fitting when making trial melt patterns. Use only the cold weather heating time required to obtain the proper melt. Avoid excessive heating time. Do not make saddle fusion trial melt patterns on pressurized pipe.

H. In cold weather socket fusion, it takes more time to push a cold socket fitting onto the male socket heater face so trials to develop a heating time for the fitting are not needed. For the pipe, establish the necessary heating time by making trial patterns on excess pipe that is at field temperature. Use the recommended heating time plus additional heating time in three-second increments until the proper melt pattern is established.

PROCEDURES
BUTT FUSION

3.0 PURPOSE

This section identifies the procedures for performing butt fusion of polyethylene pipe and the handling and care of the equipment utilized to perform butt fusions.

3.1 GENERAL

A. Butt fusion is used to make end-to-end joints between "butt" or plain end pipes and fittings that have the same outside diameter and like wall thickness.

B. Fusion tools and equipment must be correct for the job, and in proper working order.

C. Individuals performing polyethylene pipe joining must be qualified in the procedure being utilized.

D. Individuals inspecting joints made in plastic pipe must be qualified by training and/or experience in evaluating the acceptability of plastic pipe joints made under the appropriate joining procedure.

E. Pipe and fitting surfaces must be clean and properly prepared.

F. When removing shavings from the fusion machine or pipe, use a clean cotton cloth or paper towel to ensure the faced pipe ends do not become contaminated. Ensure the cloth does not come in contact with the lubricated guide rods.

G. Heating tool surfaces must be clean, undamaged and at the correct surface temperature. Heat may not be applied with a torch or other open flame.

H. The approximate melt bead width for the heating cycle and cooling times may vary due to ambient temperature, wind velocity, humidity, etc. Visual inspection will determine a properly made fusion.

I. After approximately 30 seconds, set cam locks, if so equipped, and allow for full cooling time per pipe manufacturer's procedure (minimum 30 to 90 seconds per inch of pipe diameter). For the remainder of the cooling time, the pressure may be maintained by using the cam locks. *Do not try to shorten cooling time by applying water, wet cloths or other means.*

J. Any connections to dissimilar material shall be made with approved electrofusion fittings, mechanical fitting or other approved coupling.

3.2 POLYETHYLENE BUTT FUSION PROCEDURE

A. Equipment

Use only approved fusion equipment listed below for heat fusing PE pipe

Approved Fusion Equipment		
Manufacturer	Model No.	Application
McElroy Manufacturing	2LC	½" CTS through 2" IPS Butt Fusion
	No. 14	1" IPS through 4" IPS Butt Fusion
	No. 28	2" IPS through 8" IPS Semi-Automatic Butt Fusion

A copy of the Operator's Manuals for each of these machines is included in the Appendix to the O&M Plan.

B. Before You Start:

1. Inspect pipe lengths and fittings for unacceptable cuts, gouges, deep scratches or other deleterious defects. Damaged products shall not be used (cuts, gouges, or scrapes deeper than 10% of the pipe wall thickness). See Section E-2 H.
2. Toe-in or necking down is normal at pipe ends, but may need to be removed for socket fusion, or butt fusion to fittings.
3. Remove surface damage at pipe ends that could compromise the joining surfaces or interfere with fusion tools or equipment.
4. Be sure all required tools and equipment are on site, in proper working order and fueled.
5. The pipe and fitting surfaces where tools and equipment are fitted must be clean and dry. Use CLEAN, dry, non-synthetic (cotton) cloths or paper towels to remove dirt, snow, water and other contamination.
6. Shield heated fusion equipment and surfaces from inclement weather and winds. A temporary shelter over fusion equipment and the fusion operation may be required.
7. Relieve tension in the line before making connections.

When joining coiled pipe, making an s-curve between pipe coils can relieve tension. In some cases, it may be necessary to allow pipe to equalize to the temperature of its surroundings. Allow pulled-in pipes to relax for several hours to recover from tensile stresses.

8. Pipes must be correctly aligned before making connections.
9. Cuts of pipe sizes 2" or smaller may be made using a ratchet single blade style cutter, or a guillotine style cutter. Guillotine style cutters should be used on sizes greater than 2" in diameter.
10. All points on both heating tool surfaces where the heating tool surfaces will contact the pipe or fitting ends must be within the prescribed minimum and maximum temperatures and the maximum temperature difference between any two points on the heating tool fusion surfaces must not exceed 20°F (11°C) for equipment for pipe smaller than 18-in. (450 mm) diameter, or 35°F (19°C) for larger equipment. Heating tool surfaces must be clean.

C. Procedure #01 – 2LC and NO. 14 butt fusion machine

1. **Assemble Required Materials:**

   - Cutting Tool
   - Fusion Machine with correct clamping inserts installed
   - Appropriate Heater Plate Temperature Confirmation Equipment
     - Tempilstiks
     - IR Thermometer
     - Pyrometer
   - Clean cotton cloth or paper towels
   - 120 grit emery cloth if tempilstiks are used
   - Timepiece

2. **Clean and Secure Pipe Ends:**

   Clean the inside and outside of the component (pipe or fitting) ends by wiping with a clean, dry, lint-free cloth or paper towel. Remove all foreign matter.

   The pipe ends should be undamaged and cut squarely.

   Align the components with the machine, place them in the clamps and then close the clamps.

   Do not force pipes into alignment against open fusion machine clamps.

(When working with coiled pipe, if possible “S” the pipes on each side of the machine to compensate for coil curvature and make it easier to join.)

Component ends should protrude past the clamps enough so that facing will be complete – approximately 1”.

Bring the ends together and check high-low alignment. Adjust alignment as necessary by tightening the high side down.

3. **Face**:

Place the facing tool between the component ends, and face them to establish smooth, clean, parallel mating surfaces.

Complete facing produces continuous circumferential shavings from both ends.

Face until there is a minimal distance between the fixed and moveable clamps. Some machines have facing stops. If stops are present, face down to the stops.

Remove the facing tool, and clear all shavings and pipe chips from the component ends. ***Do not touch the component ends with your hands after facing.*** Care must be exercised when removing the shavings to prevent contamination of the faced ends. **<u>Do not touch ends of pipe with bare hands, or dirty, oily rag, or gloves.</u>**

4. **Align**:

Bring the component ends together, check alignment and check for slippage against fusion pressure. Look for complete contact all around both ends with no detectable gaps, and outside diameters in high-low alignment.

If necessary, adjust the high side by tightening the high side clamp. Do not loosen the low side clamp because components may slip during fusion.

Re-face if high-low alignment is adjusted.

Caution: Over tightening the clamps may distort the pipe.

5. **Melt**:

Verify that the heating tool is maintaining the correct temperature.

Medium Density PE Min. 400 degrees F – Max. 450 degrees F.
(High Density PE min. 475 degrees F- max. 500 degrees F.)

When checking heater plate surfaces for proper temperature use only approved tempilstiks, approved infrared (IR) thermometer, or approved pyrometer on the face of the heater plate. Do not use tempilstiks on the plate area where the pipe will make contact.

> Use 120 grit emery cloth to remove hardened material from the end of tempilstiks

Clean surface area with a clean cotton cloth or wooden implement if surface area is dirty. **(NEVER use metal tools)** Do not use any synthetic material, which might melt when placed on the hot heater plate.

Place the heating tool between the component ends and move the ends against the heating tool. The initial contact should be under moderate pressure to ensure full contact.

Hold contact pressure *very briefly* then release pressure without breaking contact. Pressure must be reduced to contact pressure at the first indication of melt around the pipe ends. Hold the ends against the heating tool ***without force***. Beads of melted polyethylene will form against the heating tool at the component ends. When the proper melt bead size is formed, quickly separate the ends, and remove the heating tool.

During heating, the melt bead will expand out flush to the heating tool surface or may curl slightly away from the surface. If the melt bead curls significantly away from the heating tool surface, unacceptable pressure during heating may be indicated.

Heater plate temperature shall be checked prior to each fusion to confirm that the proper temperature is obtained.

Table 1 Minimum Melt Bead Size

Pipe Size	*Minimum Melt Bead Size*
Less than 2”	1/32”
2” through 3”	1/16”
4” through 8”	3/16”

6. **Remove heater plate:**

   After achieving proper melt bead:

   Retract the movable alignment clamp to pull the pipe away from the heater plate.

   Bump the heater plate away from the stationary pipe end and carefully remove the heater plate.

   If softened material adheres to the heater plate, discontinue the process and restart from step 1.

7. **Join:**

   Immediately after heating tool removal, *QUICKLY* inspect the melted ends, which should be flat, smooth, and completely melted. If the melt surfaces are acceptable, immediately and in a continuous motion, bring the ends together and apply the correct joining force. Do not slam.

   Apply enough joining force to roll both melt beads over to the pipe surface. A concave melt surface is unacceptable; it indicates pressure during heating. Do not continue. Allow the component ends to cool and start over at Step 1.

   The correct joining force will form a double bead that is rolled over to the surface on both ends.

8. **Hold:**

   Hold joining force against the ends until the joint is cool.

   After approximately 30 seconds, set cam locks, if so equipped, and allow for full cooling time per pipe manufacturer's procedure.

The joint is cool enough for *GENTLE* handling when the double bead is cool to the touch Cool for about 30-90 seconds per inch of pipe diameter. *Do not try to shorten cooling time by applying water, wet cloths or other means.*

Avoid pulling, installation, pressure testing and rough handling for at least an additional 30 minutes.

Heavier wall thickness pipes require longer cooling times.

9. **Inspect:**

Visually Inspect on both sides, the double bead should be well aligned, rolled over to the surface, uniformly rounded and consistent in size all around the joint, and be non-porous.

The double bead width should be 2 to 2-1/2 times its height above the surface, and the v-groove depth between the beads should not be more than half the bead height.

If the joint doesn't meet these requirements, cut it out and restart from Step 1.

When butt fusing to molded fittings, the fitting side bead may have an irregular appearance. This is acceptable provided the pipe side bead is correct.

It is not necessary for the internal bead to roll over to the inside surface of the pipe.

D. **Procedure #02 – No. 28 Semi-Automatic Fusion Machine**

In addition to the procedures used in the McElroy Operator's Manual for the specified equipment, the following procedures will also be used during the fusion procedure.

1. **Assemble Required Materials**

- Cutting Tool

- Fusion Machine with correct clamping inserts installed
- Appropriate Heater Plate Temperature Confirmation Equipment
  - Tempilstiks
  - IR Thermometer
  - Pyrometer
- Clean cotton cloth or paper towels
- 120 grit emery cloth if tempilstiks are used
- Timepiece

2. **Check and Adjust Hydraulic Pressures**

Check hydraulic fluid level daily. If hydraulic oil is not visible in the sight gauge, oil must be added.

Check and adjust hydraulic pressures per the manufacturer's manual and monograph. Interfacial Fusion Pressure is 75 PSI.

NOTE: Pressure gauges on this machine do not require calibration beyond a daily inspection to assure that the gauge reads zero when the unit is not running.

Determine Drag Pressure

Drag pressure is the minimum pressure required to move the carriage and the connected pipe. Drag pressure should be determined using the procedure in the Operator's Manual. Record this pressure for future reference.

Set the Fusion Pressure

Fusion pressure is the Interfacial Fusion Pressure PLUS the Drag Pressure.

Heating Pressure

Heating Pressure must be set to 0 PSI.

After facing the pipe, put the selector valve to the center position (heating) and move the carriage so that the pipe ends are approximately 2" apart.

Shift the carriage control valve to the left.

Gradually increase the pressure by turning the valve clockwise.

Quickly reduce the heater pressure by turning the valve counterclockwise until the carriage is barely moving. This pressure at this point will be recorded. This is the actual pressure.

3. **Clean and Secure Pipe Ends**

Set up pipe supports and adjust height so the pipe is in line with the jaws.

Clean the inside and outside of the component (pipe or fitting) ends by wiping with a clean, dry, lint-free cloth or paper towel. Remove all foreign matter.

The pipe ends should be undamaged and cut squarely.

Align the components with the machine, place them in the clamps and then close the clamps.
Do not force pipes into alignment against open fusion machine clamps.

(When working with coiled pipe, if possible “S” the pipes on each side of the machine to compensate for coil curvature and make it easier to join.)

Component ends should protrude past the clamps enough so that facing will be complete – approximately 1”.

Bring the ends together and check high-low alignment. Adjust alignment as necessary by tightening the high side down.

4. **Face**

Position pipe into the machine by swinging the facer into place.

Facing pressure should be set as low as possible while still facing the pipe. It may be necessary to adjust the carriage pressure.

Complete facing produces continuous circumferential shavings from both ends. Continue facing until the rest buttons on the jaws bottom out on the facer rest buttons.

Remove the facing tool and clear all shavings and pipe chips from the component ends. Do not touch the component ends with your hands after facing. Care must be exercised when removing the shavings to prevent contamination of the faced ends. **Do not touch ends of pipe with bare hands, or dirty, oily rag, or gloves.**

IMPORTANT: When facing heavy wall pipe, it may be necessary to increase system pressure to 1,000 psig.

IMPORTANT: When drag pressure exceeds 300 PSI it is necessary to move the carriage to the left, bringing the pipe ends into contact with the facer, before opening the facer valve.

5. **Align**

Bring the component ends together, check alignment and check for slippage against fusion pressure. Look for complete contact all around both ends with no detectable gaps, and outside diameters in high-low alignment.

If necessary, adjust the high side by tightening the high side clamp. Do not loosen the low side clamp because components may slip during fusion.

Re-face if high/low alignment is adjusted.

Caution: Over tightening the clamps may distort the pipe.

6. **Procedure**

Follow the McElroy instructions, included with the machine, for operating the fusion machine.

7. **Melt**

Verify that the heating tool is maintaining the correct temperature.

Medium Density PE / Min. 400 degrees F – Max. 450 degrees F.
(High Density PE / Min. 475 degrees F – Max. 500 degrees F.)

When checking heater plate surfaces for proper temperature use only approved tempilstiks, approved infrared (IR) thermometer, or approved pyrometer on the face of the heater plate. Do not use tempilstiks on the plate area where the pipe will make contact.

Use 120 grit emery cloth to removed hardened material from the end of tempilstiks

Clean surface area with a clean cotton cloth or wooden implement if surface area is dirty. **(NEVER use metal tools)** Do not use any synthetic material, which might melt when placed on the hot heater plate.

Move the carriage to the right to open a space large enough to insert the heater plate. Place the heating tool between the component ends and move the ends against the heating tool. Move the selector valve handle down to the fusing position and insert the heater plate. Move the carriage to the left, bringing the heater plate into contact with both pipe ends.

Move the selector valve to the center position then the carriage control valve to neutral.

During heating, the melt bead will expand out flush to the heating tool surface or may curl slightly away from the surface. If the melt bead curls significantly away from the heating tool surface, unacceptable pressure during heating may be indicated.

Heater plate temperature shall be checked prior to each fusion to confirm that the proper temperature is obtained.

Table 1 Minimum Melt Bead Size

Pipe Size	Minimum Melt Bead Size
Less than 2”	1/32”
2” through 3”	1/16”
4” through 8”	3/16”

8. **Remove heater plate** after achieving proper melt bead

After following the specified heating procedure, do the following:

(a) Verify carriage control valve is in neutral.
(b) Shift the selector valve down to fusion position.
(c) Move the carriage to the right just enough to remove the heater.
(d) Quickly remove the heater.

If softened material adheres to the heater plate, discontinue the process and restart from Step 2.

A concave melt surface is unacceptable; it indicates pressure during heating. Do not continue. Allow the component ends to cool and start over at Step 2.

9. **Join**

Immediately after heating tool removal, QUICKLY inspect the melted ends, which should be flat, smooth, and completely melted. If the melt surfaces are acceptable, bring the pipe ends together under the recommended pressure by quickly moving the carriage to the left, bringing the pipe ends together under the recommended pressure.

The correct joining force will form a double bead that is rolled over to the surface on both ends.

10. **Hold**

Hold joining force against the ends until the joint is cool.

After the joint has cooled for the manufacturer's recommended time, shift the carriage control valve to the neutral position.

The joint is cool enough for GENTLE handling when the double bead is cool to the touch Cool for about 30-90 seconds per inch of pipe diameter. Do not try to shorten cooling time by applying water, wet cloths or other means.

Avoid pulling, installation, pressure testing and rough handling for at least an additional 30 minutes.

Heavier wall thickness pipes require longer cooling times.

11. **Inspect**

Loosen all clamp knobs and move the carriage to the right far enough to open the jaw nearest the facer.

Open the moveable jaws

Open the fixed jaws.

Raise the pipe using the pipe lifts.

Visually Inspect on both sides, the double bead should be well aligned, rolled over to the surface, uniformly rounded and consistent in size all around the joint, and be non-porous.

The double bead width should be 2 to 2-1/2 times its height above the surface, and the v-groove depth between the beads should not be more than half the bead height.

If the joint doesn't meet these requirements, cut it out and restart from Step 2.

When butt fusing to molded fittings, the fitting side bead may have an irregular appearance. This is acceptable provided the pipe side bead is correct.

It is not necessary for the internal bead to roll over to the inside surface of the pipe.

3.3 BUTT FUSION TROUBLESHOOTING GUIDANCE

Observed Condition	**Possible Cause**
Excessive double bead width	overheating; Excessive joining force
Double bead v-groove too deep	excessive joining force: Insufficient heating; Pressure during heating
Flat top on bead	Excessive joining force; Overheating
Non-uniform bead size around pipe	Misalignment; Defective heating tool; Worn equipment; incomplete facing
One bead larger than the other	Misalignment; Component slipped in clamp; Worn equipment; Defective heating tool; Incomplete facing; Dissimilar material – see note above

Beads too small	Insufficient heating; Insufficient joining force
Bead not rolled over to surface	*Shallow v-groove* – Insufficient heating & insufficient joining force; *Deep v-groove* – Insufficient heating & excessive joining force
Beads too large	Excessive heating time
Squared outer bead edge	Pressure during heating
Rough, sandpaper-like, bubbly or Pockmarked melt bead surface	Hydrocarbon contamination

3.4 EQUIPMENT CARE AND MAINTENANCE

CLEANLINESS

1. The fusion machines should be cleaned with a dry, clean rag after each use to ensure proper function. Use of a dirty machine can result in contamination of the fusion and can also inhibit smooth movement of the clamp along the guide rods due to soiled lubrication.
2. Clamping and fitting inserts should be cleaned with a wire brush to keep the grooves from accumulating dirt and debris. This will ensure a more stable grip between the clamp and the pipe.

ALIGNMENT AND LUBRICATION

1. Lubrication must be applied to the guide rods whenever the moveable clamp does not slide easily along the rods. 10W-40 oil should be applied by removing the side screws on the moveable clamp and inserting oil into the chamber.
2. Check hydraulic oil level, voltage level, and hydraulic pressures on the McElroy No. 28 prior to use.
3. Verify that the guide rods are not misaligned or damaged. This is indicated by smooth, easy movement of the moveable clamp along the rods. Check that the bushings are not worn. If there is any damage or misalignment to the machine, the machine should be repaired.
4. Periodically check all bolts for tightness.

HYDRAULIC FLUID (for Semi-Automatic Units)

1. If hydraulic fluid is not visible in the sight gauge, fluid must be added between top and bottom of the sight gauge. Use only hydraulic fluids recommended by McElroy Manufacturing, as provided in the Operator’s Manual.
2. Never allow dirt, water, or other foreign matter to enter the tank.
3. Use only clean oil from an unopened container.
4. The hydraulic filter should be replaced when the indicator gauge reads between 20 psi

(138 kPa) and 25 psi (172 kPa) (yellow range).

5. Fluid should also be changed as extreme weather conditions dictate.

FACER

1. Keep facing tools free of dirt and other debris by wiping with a clean rag. Keep guides on larger facers clean and oiled for smooth, easy movement along the guide rods of the fusion machines.
2. Inspect blades for sharpness. Dull blades will make even, complete facing difficult. If chips, as opposed to long continuous strands, are present during facing, a new facing tool must be used. Blades cannot be resharpened; they must be replaced.

HEATER PLATE

1. Prior to each fusion, check the heater plate for signs of wear, scratches or other deterioration. The Teflon plates must be replaced if any signs of deterioration are present. The Teflon plates cannot be repaired.
2. Prior to each fusion, check the heater plate for temperature using approved tempilstiks, approved infrared (IR) thermometer or approved pyrometer on the face of the plate. Do not use tempilstiks on the plate area where the pipe will make contact.
3. If heater plate is not operating within the specified heat range, adjustments may be made by turning the thermostat screw located on the heater plate. **Always** unplug the heater plate before attempting to adjust the thermostat. The heater plate must be checked after adjustment to ensure the proper heat range has been attained.
4. Clean the heater plate with a clean, soft cloth or wooden implement if the surface of the heater plate is dirty (NEVER use metal tools to clean the heater plate). Do no use any synthetic material, which might melt when placed on the hot heater plate.

PROCEDURES
ELECTROFUSION

4.0 PURPOSE

This section covers the methods used when joining PE plastic pipe by means of electrofusion.

4.1 GENERAL

The electrofusion method is an acceptable means for joining two dissimilar PE pipes.

4.2 ELECTROFUSION JOINING PROCEDURES

This procedure describes how to join polyethylene pipe using electrofusion couplings.

A. Equipment Required

1. Approved electrofusion power supply and controls
2. Approved Electrofusion couplings specified for use with the approved fusion power supply and control device or repair patch
3. Pipe peeling tool or scraping tool
4. Alignment clamp (if needed)
5. Clean cotton rag or paper towels
6. Marking pencil
7. Extension Cord - 50 feet long, 12-gauge minimum.
   (Cords over 100 feet not recommended)
8. Isopropyl alcohol

B. Procedure #03 for Couplings

NOTE: Cleanliness is a must! Coupling should remain in bag until Step 4. Pipe ends shall be kept clean, dry and free from any contaminates.

A pipe surface that is properly prepared for electrofusion has the oxidized outer layer or "skin" of the pipe removed to expose clean, virgin material. This "skin" should be removed using an approved scraping tool. Never use wood rasps, metal files, sandpaper, emery cloth or any other tools that could leave grit or a grit-like residue on the being prepared for electrofusion.

Keep in mind that the purpose of peeling material from the pipe wall is to remove material. Simply roughing the fusion area will not allow an acceptable bond to be made.

1 Prepare the pipe ends. The pipe ends shall be clean, undamaged and squarely cut.
2 Using the coupling's centerline as a guide, mark one-half of the coupling length on each pipe end, using a marking pencil.
3 Check the pipe surface to be peeled for any embedded debris that may damage the peeling tool and that the pipe to be peeled is clean and free of any dirt or mud that could re-contaminate peeled surfaces.
4 Using an approved pipe peeler, remove the oxidation layer from the surface area of the pipe to be fused, up to the previously made marks. A continuous ribbon should be removed when peeler is used. (Do not peel over the marks. Chamfer the end of the pipe if the coupling fits tight.)
Remove any chips in the fusion area and the interior of the pipe with a clean cotton cloth or paper towel.

NOTE: After peeling, if the pipe outside diameter is still too large to accept the coupling, the pipe may be peeled again to reduce the wall thickness. At no point should the pipe be peeled to reduce the wall thickness more than 10%.

If the installation method requires the coupling to be pushed completely over one pipe end, peel the pipe end for the entire length of the coupling to prevent contamination of the coupling by sliding over un-peeled pipe.

If the coupling has internal stops, they can be removed to allow the coupling to slide completely onto the prepared end of the pipe.

5 Remove the coupling from the package. Clean the exterior of the pipe and the interior of the coupling liberally using isopropyl alcohol and a clean cotton rag or paper towel. Make sure the pipe and the interior of the coupling are dry before proceeding.
6 Slide the coupling onto one pipe end. The pipe ends can be chamfered if the coupling fit is too tight.
7 Insert the second pipe into the coupling, centering the coupling on the pipe ends, using the marks made in Step 2. Butt the pipe ends together. Make sure

the pipe ends are aligned. The space between the butted ends shall not exceed 1/4".

8 If the coupling was fully slid onto one pipe slide the coupling back, center the coupling by sliding it back onto the second pipe, making sure it is properly centered and the pipes are butted together.

CAUTION: To avoid contaminating fusion areas do not touch inside of couplings. If pipe surface becomes contaminated, clean by wiping with a clean paper towel or cotton rag and denatured alcohol.

NOTE: It may be necessary to use a rubber mallet and wooden blocks to move the coupling on the pipe.

9 If needed, an alignment clamp can be used to restrain the pipe on either side of the coupling.

NOTE: Electrofusion couplings require the pipe to be sufficiently supported or restrained to restrict movement during the fusion and cooling process and to eliminate or alleviate sources of stress or strain until the fusion and the cooling cycles are complete. If sufficient support is not provided, an alignment clamp may be used to restrain the pipe during the electrofusion process.

10 With the control unit disconnected from 120 VAC power source, connect the fusion leads to the fitting. Be sure connections are clean and tight.

11 Follow instructions on the manufacturer's fusion controls and activate the fusion process.

NOTE: If the fusion process was interrupted, the coupling can be re-fused only in the event of an input power interruption (fusion leads were detached during fusion, the generator stops running, a processor malfunction occurs, other situations result in processor input power interruption or the STOP button was pushed).

The fitting should remain in position and the fusion leads disconnected from the coupling. If an alignment clamp was used, it should not be removed. The fitting should be allowed to cool to ambient temperature. After cooling to ambient temperature, the fusion leads should be reconnected and the fitting re-fused for the entire fusion time.

If the initial fusion was terminated for any reason other than power input reasons, the fitting should be cut out and replaced.

12 Allow the appropriate cooling time as required by the manufacturer. The fusion leads may be removed during the cooling process. Avoid pulling, installation, pressure testing or rough handling until the manufacturer's recommended cooling time has been reached. If alignment clamp is used, it shall not be removed until the coupling has sufficiently cooled.

CAUTION: Do not use artificial methods to speed cooling of the electrofusion. Do not apply wet rags, pour water or increase airflow across the coupling to shorten the cooling time. Allow the coupling to cool naturally.

Friatec Electrofusion Fittings Size in inches	Total Elapsed Cooling Times in minutes			
	Couplings, Elbows & Transition Fittings			Repair Patches
	Before Handling	Before Pressuring to ≤ 80 psig	Before Pressuring to ≥ 80 psig	Before Handling
1/2 - 1 CTS 3/4 - 1 IPS	5	8	10	--
1-1/4 – 2 IPS	7	15	25	15
3 – 4 IPS	10	30	40	20
6 IPS	20	60	75	30
8 IPS	20	60	75	50

13 A visual inspection during and after the fusion process shall be conducted to identify problems such as smoking or melted plastic running out of the coupling. If such problems occur, cut out the coupling and start over.

14 When coupling has cooled per manufacturer's specifications, pressure test or soap test connections as required in Section H-3 of this manual.

C. Procedure #04 for Repair Patches

NOTE: Cleanliness is a must! Repair patch should remain in bag until Step 5. Pipe ends shall be kept clean, dry and free from any contaminates.

A pipe surface that is properly prepared for electrofusion has the oxidized outer layer or "skin" of the pipe removed to expose clean, virgin material. This "skin" should be removed using an approved scraping tool. Never use wood rasps, metal files, sandpaper, emery cloth or any other tools that could leave grit or a grit-like residue on the being prepared for electrofusion.

Keep in mind that the purpose of peeling material from the pipe wall is to remove material. Simply roughing the fusion area will not allow an acceptable bond to be made.

1 Verify the pipe O.D.
2 Measure and mark the pipe surface covered by the repair patch.
3 Scrape off the oxidized layer on the pipe using either a hand scraper or another suitable scraper tool.

NOTE: Do not remove more than 10% of the pipe wall thickness.

4 If needed, re-round oval pipe with the re-rounding clamp.
5 Clean pipe surface and inside of fitting liberally with Isopropyl Alcohol using a clean cotton rag or paper towel.
Make sure surfaces are completely dry before assembly.
6 Install fitting on pipe and firmly tighten all four bolts (under saddle versions only), working diagonally, without using excessive force until the repair patch is flush with the pipe. Care should always be taken to not contaminate the fusion zone area. Re-mark pipe surface at fitting placement area.
7 Assembly of pipe and fitting must be in as clean, supported and stress free a condition as possible.
8 Connect the repair patch to the fusion processor and start the fusion. These size ranges of fittings are fused in one cycle.

NOTE: After the end of the fusion process, record the end of fusion time (time of day), total fusion time (in seconds), installers initials, cooling time (in minutes) and date on pipe using an approved marker.

Wait for indicated cooling time. Cooling times are listed in the table above. [Cooling times before handling and pressurizing are also located on fusion the processor or barcode on fitting (only Cooling Time before handling)].

NOTE: On 8" and larger VSC-TL Repair Patches (Top-Loading version only), the IPEX Pneumatic Top-Loading Tool is required. See separate operating instructions for the use of this tool.

PROCEDURES

5.0 HELD FOR FUTURE

PROCEDURES

6.0 HELD FOR FUTURE

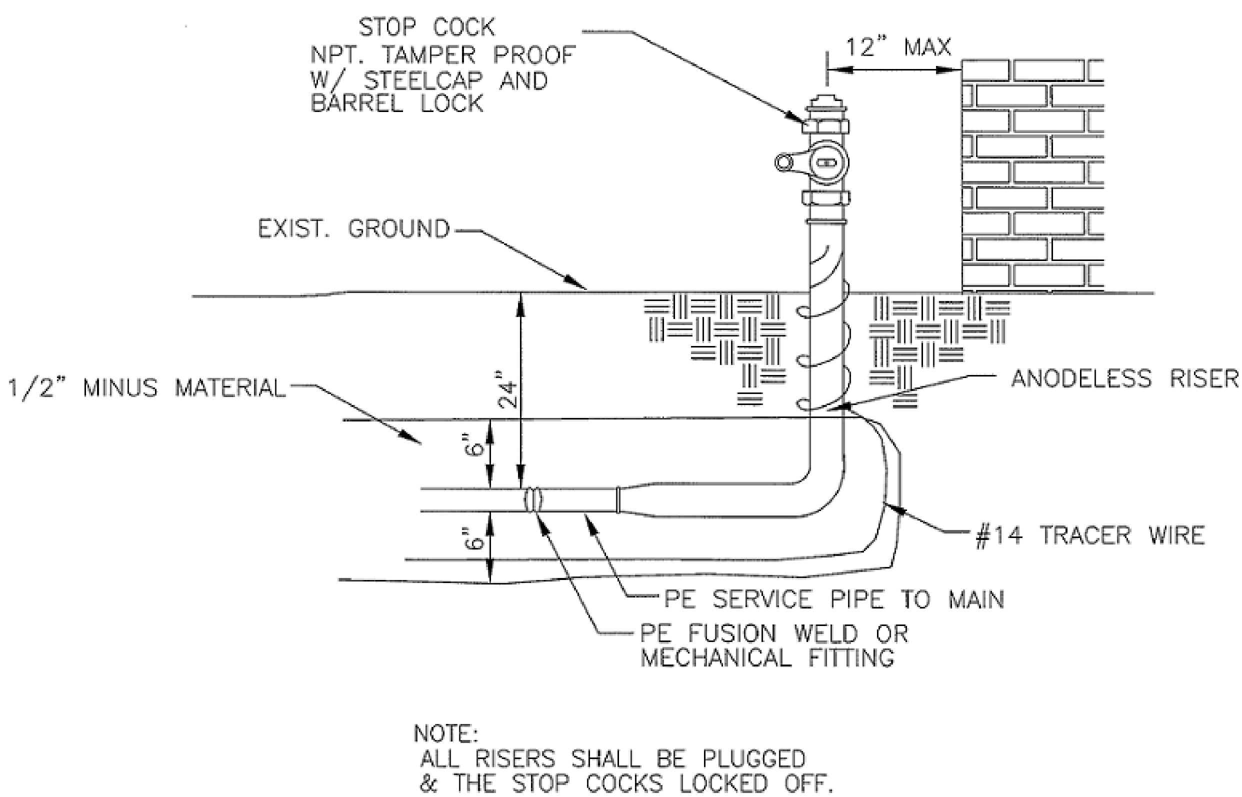
PROCEDURES
PLASTIC PIPE RISERS

7.0 PURPOSE

This section identifies the acceptable risers for use in the operator's system and the acceptable installation procedures.

7.1 GENERAL

A. Anodeless risers are preferred and should be used whenever and wherever practical.
B. Prefabricated steel risers may be used only when necessary.



7.2 INSTALLATION OF ANODELESS RISER

The anodeless riser connects polyethylene (PE) service piping to a meter set assembly (MSA) and does not require cathodic protection.

A. The installation of the riser with respect to finished grade should be made by locating the red stripe on the manufacturer's label at finished grade.

B. Risers should be installed a maximum of 12" from the building or structure to which they serve.

C. Commercial meter set assemblies (MSA) shall include installation of a by-pass valve below the service cock/valve.

   A threaded tee with short nipples and stopcocks may be installed on a factory riser that doesn't have a bypass. The riser must be pressure tested with the new bypass tee, short nipples and stop cocks already installed to the 90 psig system test pressure.

D. The locator/tracer wire should be installed with each service riser, terminating between the top of sleeving, if required, and below the stopcock. Wrap several times (minimum 3 wraps) around the riser, secure with electrical tape and insulate the end of the wire with a wire nut.

E. The locator wire shall not be electrically connected to the riser.

F. Anodeless risers shall not be altered.

G. Anodeless risers shall not be subjected to welding, brazing, cad welding, or any source of extreme heat.

H. Sleeves, when required, are to be installed so that the top of the sleeve is approximately 6 inches below bottom of stopcock.

7.3 PREFABRICATED RISERS

A. Prefabricated risers shall be bent to 90 degrees without causing a wrinkle in the bend or using a weld 90. Miter welds are not allowed.

B. Prefabricated risers shall have an approved factory coating or the riser shall be field wrapped.

C. Care shall be taken to protect the factory coating from damage.

D. Prefabricated risers installations shall include cathodic protection by placement of an approved anode or connection to the impressed current system.

E. Connection of the riser to the plastic service shall be by means of an approved fusion procedure, use of an approved transition fitting or use of an approved mechanical fitting.

PROCEDURES
CONTROLLING GAS FLOW / PLASTIC PIPE

8.0 PURPOSE

This section identifies the safe procedures implemented within the Operator's system for controlling the flow of gas.

8.1 GENERAL

The primary method to control the flow of gas through polyethylene pipe and tubing is by squeezing utilizing the approved squeeze tool.
Refer to Section B-6 Static Electricity

8.2 METHODS FOR CONTROLLING GAS FLOW THROUGH PE PIPE

A. Squeezing
The proper size and approved squeezer (Mustang or Footage brand) shall be selected for the particular pipe size to be squeezed.

NOTE: During squeezing operations, the squeezing tool shall be grounded. Use jumper cable or locator wire attaching the ground rod to the squeezing tool.

1. Select the proper squeeze tool with the retractable lower jaw in the correct position for the particular pipe or tubing size to be squeezed (ASTM F 1563).
2. Tool shall be visually centered on the pipe.
3. Tool shall have a mechanical stop.
4. Mustang hydraulic squeezer model DBML-80 – Refer to operator manual for squeezing operation.
5. Properly ground the tool before proceeding.
6 Place the squeeze tool over the particular pipe or tubing where the squeeze is to be made, centering the pipe or tubing in the squeeze tool.
7. Tighten the squeeze tool slowly, creating a cold flow condition, until shutoff of the gas flow is achieved.
   A. Above 32^0 F: **maximum 1 inch per minute of pipe diameter**
   B. Below 32^0 F: **maximum ½ inch per minute of pipe diameter**
8. For large diameter pipe, 3" and above, pause for 1 minute when squeeze is halfway (1/2) and again when three quarters (3/4) complete then do the same when releasing the squeeze.
9. The reestablishment of gas service is accomplished by releasing the squeeze tool slowly (**Same maximum rates as above**).

10. **PE pipe shall not be squeezed more than one time in the same area.** Leave a minimum of 3 pipe diameter or 12 inches, whichever is greater, between squeeze points.
11. Mark the squeeze area to identify the previous squeeze if uncovered again in the future.
12. Soap test the squeeze area to ensure no damage resulting in leakage occurred during the squeeze procedure. (Pinhole leaks may appear)
13. A squeeze must not exceed 8 hours. If a squeeze exceeds 8 hours it must be cut out.
14. When squeezing PE pipe, the squeeze area must be at least 3 pipe diameters or 12 inches, whichever is greater, away from any butt fusion, socket fusion, electrofusion, sidewall fusion or mechanical fitting.

13. If the pipe is damaged or leakage is present, replace the affected section of pipe.
14. If under emergency conditions a squeezer not approved for the specific application is used**, squeeze shall be cut out and pipe replaced after the emergency is concluded.**

NOTE: If 100% shut-off is not achieved, it may be necessary to install a second squeeze tool at a safe location away from the first squeeze.

B. PE Valves

Valves are designed to be used to control gas flow. Prior to operating any valve:

1. Check system maps and records to ensure what will result due to the valve operation.
2. Obtain management approval if possible.
3. Determine proper operating procedure for valve.

C. PVC Pipe

1. PVC and other plastic pipes may include the installation and/or use of pressure control fittings.
2. Caution shall be exercised when squeezing PVC plastic pipe to avoid further cracking of the pipe.

    i. PE squeeze tools may be used if specific PVC tool is unavailable.
    ii. In cold weather conditions, wrap cotton rags soaked in hot water around the PVC pipe for a period of 5 minutes or more. This may soften the PVC enough to avoid cracking when squeezed.

8.3 GAS BYPASS

A. Prior to shutting down mains or services, verify if bypass is needed.
   1. Refer to system maps and records.
   2. Verify pressure by use of gauges.

B. When bypass is required, it may be necessary to contact the Engineering Department to determine size and number of bypasses needed.
   1. Two bypassing methods are approved for use:
      a. Tap Tees
      b. Service riser to service riser.
   2. Gauges shall be placed on either side of the bypass area.
   3. Monitor pressure before and after isolation of the area.
   4. When removing bypass from mains or services, the tubing or pipe shall be cut and capped at the tee as close as practical, but a minimum of 1 ft. from the tee.

8.4 SAFETY

A. Every effort shall be exercised to prevent entering area of blowing gas.

B. The preferred method to control escaping gas is to drop back a safe distance to control gas flow either by squeezing, use of valves or control fittings.

C. Should the situation require entering an area of escaping gas, the appropriate fire protection steps shall be implemented.
Refer to Section B-2, Personal Safety

PROCEDURES
PLASTIC PIPE REPAIRS

9.0 PURPOSE (192.311)

This section covers the safe procedures in making permanent repairs to plastic pipe. Each segment of pipeline that becomes unsafe must be replaced, repaired, or removed from service.

9.1 GENERAL

A. The only approved method to permanently repair damaged polyethylene pipe is to replace the damaged section of pipe between squeeze points. **Do not attempt permanent repair to damaged plastic pipe smaller than 4 inches in diameter.**

Exception: For damages in which the total length of the damage is less than 3-7/8 inches in overall length on 2-inch IPS PE pipe (and the damaged section can be completely removed by cutting out a cylindrical section of pipe) the LycoFit Repair Fitting can be used to affect a permanent repair.

B Approved repair clamps may be utilized for emergency temporary repair of plastic pipe. **(Not to exceed 48 hours). 192.720**

C. The use of an Electrofusion repair patch is approved for 4 inch and larger diameter PE pipe when replacement is impractical.

9.2 PLASTIC PIPE REPAIRS

A. To facilitate the repair, use pre-tested pipe (if available) and the appropriate fusion procedure. Follow the applicable, appropriate joining procedure for replacement as established for plastic pipe installation.

B. Soap test tie-in points.

C. In the case of a service line repair, test service repair up to and including the riser.

D. Purge at the riser.

E. Always mark and soap test squeeze points.

PROCEDURES
PLASTIC PIPE MECHANICAL FITTINGS

10.0 PURPOSE

This section identifies the mechanical fittings approved for use in the Operator's gas system.

10.1 GENERAL

A. Only approved mechanical fittings may be installed in PE gas systems.

B. The use of lubricants with mechanical fittings is not permitted.

10.2 CONTINENTAL TAP TEE (PE) PIPE APPLICATION

A. Approved tools:
- 7/16 in. wrench
- Marking pen
- 1/8-in tapping tool
- Clean cotton cloth or paper towel

B. Joining procedure #05 (tee to main):
- Clean main with clean cloth or towel.
- Inspect pipe for defects.
- Inspect tapping tee and components for defects.
- Make sure that O-rings are clean and properly positioned.
- Mount tapping tee on main and insert bolts.
- Bring top and bottom of tapping tee together evenly by cross tightening the bolts.
- Ensure that tee is secured firmly to the main.

C. Join fitting outlet connection procedure #06:
- Clean the pipe end with a clean cotton cloth or paper towel. The pipe end should be undamaged and squarely cut.
- Inspect the pipe to ensure there are no cuts or gouges located in the sealing area of the pipe.
- Remove the components from the plastic bag and examine for defects. Make sure the O-rings are clean and positioned properly.
- Mark the stab length on the pipe.
  - 1" IPS outlet 2 3/8" stab length

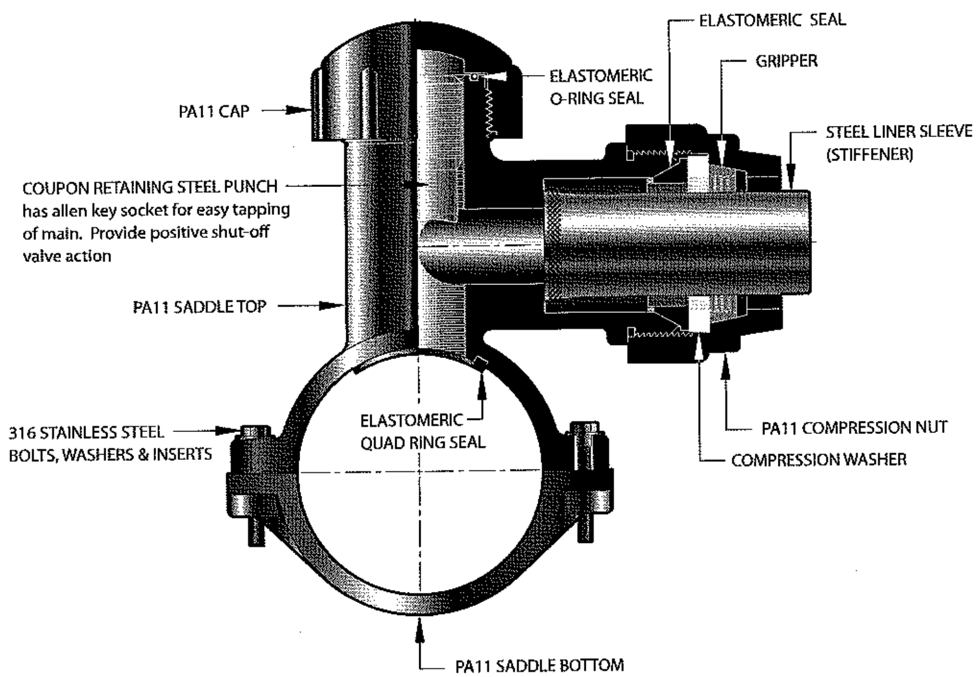
- Loosen the compression nut until the seal ring is no longer compressed, then insert the pipe until it bottoms out in the outlet.
- Tighten the compression nut until it shoulders against the outlet. Do not over tighten. The line marked for stab length should be no more than ¾ inch from the face of the compression nut.

D. Tapping the tee:

- Use only manufacturer tapping tool or prefab tool in accordance with manufacturer spec. (Tool shall have preset stop)
- Insert the proper tool into the proper tapper.
- Tap the main by turning the tapper in a clockwise direction. The tap is complete when the top of the tapper is below the top of the tee tower:
    - 2” main — 1 ½” below
    - 3”, 4” & 6” main — 2” below
- After the main has been tapped, bring the tapper up until it is flush with the top of the tee tower.
- Replace the O-ring and cap. Thread completion cap onto the tapping tee until it is hand tight. **Do not use a wrench**.
- **Do not use soap on the O-ring.**

PROCEDURES
PLASTIC PIPE MECHANICAL FITTINGS

10.3 CONTINENTAL HVTT (PE) PIPE APPLICATION



A. Approved tools:
- ½-in wrench
- Marking pen
- Continental tapping tool
- 24-in pipe wrench
- Clean cotton cloth or paper towel

B. Joining procedure #07 (tee to main):
- Clean main with clean cloth or towel.
- Inspect pipe for defects.
- Inspect tapping tee and components for defects.
- Make sure that O-rings are clean and properly positioned.
- Mount tapping tee on main and insert bolts.
- Tighten center bolts first, using care to pull the top and bottom together evenly by alternating front to back.
- Tighten remaining bolts evenly by cross tightening the bolts until the flanges of the saddle come together.
- Make sure that the tee is secured firmly to the main.

C. Join fitting outlet connection procedure #08:

Clean the pipe end with a clean cotton cloth or paper towel. The pipe end should be undamaged and squarely cut.

- Inspect the pipe to ensure there are no cuts or gouges located in the sealing area of the pipe.
- Mark the maximum stab depth from the end of the pipe.
  - 2” IPS outlet 4” stab length
- Remove the red cap plug and stiffener from end of outlet without removing the compression nut (discard the plug). Tap the stiffener into the pipe until the ID of the pipe rests on the knurl of the stiffener.
- Stab the pipe into the outlet up to (not past) the stab mark.
- Tighten the compression nut until it shoulders against the body of the outlet. **Do not over tighten**. If you cannot see the stab mark or the end of the compression nut is not within 1 inch, reassemble the fitting.

D. Tapping the tee:

- Remove cap and O-ring, insert tapping tool into punch.
- Screw punch clockwise until the stop on tapping tool contacts the top of the tee.
- To allow flow through the service, rotate the punch counterclockwise until the top of the punch is flush with the top of the tee.
- Replace O-ring and cap and screw cap down ¼ turn past hand tight.

E. Abandonment nut installation procedure #09:

- Inspect the parts to ensure they are in good condition.
- Install the components in the following order: Seal ring, Compression ring, compression nut.
- Tighten the compression nut until it shoulders against the outlet**. Do not over tighten**.

10.4 LYCOFIT (PE) PIPE APPLICATION

A. Approved Tools

- Ratchet
- Ratchet cutter
- Spigot Insertion Aid - Pipe Jaws Vise Grip Clamp / LycoRing (disposable plastic grip ring) for QRP-100 Quick Ratchet Press tool

- LycoRing ONLY for LHP-200 Hydraulic Press tool
- Marking pen
- Lyall tool
  - QRP-100 for ½-inch CTS/IPS through 1-inch CTS/IPS fittings
  - LHP-200 for 1-¼-inch through 2-inch IPS fittings with hydraulic source
- Clean cotton cloth or paper towel

B. Standard Fitting Joining Procedure #10:

- Clean pipe ends with clean cloth or towel. Pipe ends should be undamaged and square cut.
- Inspect pipe for any imperfections within the sealing area. Cut out any imperfections.
- Remove and inspect fitting components for defects.
- Slide completion sleeve onto pipe.
- Place the spigot insertion aid (either Pipe Jaw Vise Grips or LycoRing) on the pipe.
  - If using the Pipe Jaw Vise Grips Clamp, install the Clamp onto pipe with a length of pipe extending behind the pipe jaw that is equal in length to the coupling spigot.
  - If using the LycoRing, slide it, small diameter first onto the PE pipe and position it approximately ½ inch further than the length of the fitting spigot.
    1. Slide the completion sleeve over the LycoRing and against the tab so that the LycoRing grabs the PE pipe.
- Insert the line-up nose of the spigot into the pipe. Position the pipe and the spigot in the Lyco tool location plates.
  - The spigot portion of the fitting should be placed in the fixed jaw of the Lyco tool. (This part of the tool has the jaw rigidly attached to the Lyco tool - not the traveler or rack portion.) The pipe and sleeve will then be pulled onto the spigot by the traveler/rack portion of the assembly tool.
  - When using a reducer fitting, the smaller side of the fitting should be assembled first. The spigot is placed in the fixed jaw of the tool during assembly of both sides.
- Operate the Lyco tool until the pipe completely covers the last spigot barb.
- Remove the Pipe Jaw Vise Grips Clamp from the pipe or remove the LycoRing by pulling on its tab. Position the pipe, completion sleeve and spigot in the tool locating plates. Continue operating the Lyco tool until the completion sleeve meets the coupling flange.

- For double-ended fittings, repeat the assembly process, above.

C. Repair Fitting Joining Procedure #11 – 2-inch IPS Pipe
(Note: The Lyco Repair Fitting allows the use of a single fitting to replace a damaged section of pipe that is less than 3-⅞ inches in length for 2-inch IPS pipe).

The following specialized tools and equipment are needed in addition to those mentioned in paragraph A, above:
- Repair Fitting Spigot Insertion Aid Bolt On Clamp
- Repair Fitting Bolt On Clamp Alignment Guide

- Mark and cut out the damaged PE pipe symmetric to the damage at a distance of 3-7/8 inches.
- Slide the completion sleeves onto both ends of the PE pipe.
- On the pipe to receive the long end of the repair fitting, make a mark 4-5/8 inches from the end of the pipe and align the spigot insertion aid clamp with the groove on the clamp away from the pipe end.
  - Insert the clamp alignment guide in place; tighten the clamp until both sides are in contact. Once the clamp installation is completed, remove the alignment guide.
  - Fully open the tool and align one of the press plates (moveable press plate shown) with the groove in the clamp.
  - Align the other press plate with the flange groove in the fitting making sure the long side of the fitting is facing the clamped pipe.
  - Operate the pump and draw the long side of the fitting into the PE pipe until the end of the pipe reaches the shoulder on the fitting.
- On the pipe to receive the short end of the repair fitting, make a mark 3-1/2 inches from the end of the pipe and align the clamp with the groove on the clamp away from the pipe end.
  - Place the clamp alignment guide in the clamp and tighten the clamp until both sides are in contact.
  - Neutralize the pressure on the assembly by opening the valve on the pump and then re-closing.
  - Adjust the tool so that the pullback plate straddles the pipe between the fitting and the clamp as shown.
  - Operate the pump and draw the short side of the fitting into the PE pipe until the end of the pipe covers the last barb on the fitting. This will simultaneously pull a portion of the long spigot out of the pipe on the

opposite end of the fitting.

- Relieve the pressure to the tool and align the fixed press plate with the flange groove on the fitting.
- Operate the pump and draw the completion sleeve on the long side of the fitting toward the fitting flange until it aligns with the indicator rib on the spigot, approximately 2 inches from the flange.
- Relieve the pressure in the tool and move the tool so that the moveable press plate is in alignment with flange groove on the fitting
- Operate the pump and draw the completion sleeve on the short side of the fitting toward the fitting flange until it touches the flange face.
- Relieve pressure and remove the tool.

10.5 EXCESS FLOW VALVE (EFV) (192.383)

A. Excess flow valves, or EFV's, are designed to limit the flow of gas downstream of the EFV if the service line is completely severed or damaged to the point that the flow of escaping gas permits the EFV to close.

B. When used, EFV's shall be installed as near as practical to the fitting connecting the service line to its source of supply.

C. A tag will be installed on the riser indicating an EFV is installed on the service.

D. EFV's must be installed in the correct direction as indicated on the fitting.

E. Installation of an EFV shall be made by either a Lycofit fitting or by butt fusion.

F. See Section G-2.7 for specific installation criteria for EFV's.

G. Due to the design of the EFV, the service line downstream from the EFV cannot be purged in the typical manner. Once the EFV is installed and the service line is fully pressurized, slightly open the stopcock and purge the air from the service.

H. To test the EFV, quickly open the stopcock to the fully open position. This rate of flow should cause the EFV to close. Once closed the EFV will allow a small amount of flow to bypass. This will allow the pressure to build up downstream and equalize on both sides allowing the EFV to reset and open. If the EFV does not close properly it may be damaged or installed backwards. Replace the EFV as needed.

PROCEDURES
PLASTIC PIPE MECHANICAL FITTINGS

I. Excess flow valves should not be installed where:
   a. There is prior knowledge of contaminants in the gas stream, AND
   b. Contaminants in the gas stream would interfere with the operation of an EFV or cause it to malfunction, OR
   c. The EFV would interfere with necessary operation and maintenance activities on the service, such as blowing down the system, blowing liquids, etc.

   Engineering analysis should include the potential for using a service line to blowdown/purge a section of main. If an EFV is installed on a service line, it cannot be used for blowing down or purging any portion of the system other than the individual service line.

PROCEDURES
STEEL PIPE GENERAL

1.0 PURPOSE

It is the purpose of this section to provide the minimum requirements and information on equipment, materials, and methods utilized in the fabrication of steel pipe and related fittings.

1.1 SCOPE

This section covers the following:

A. D-2 Steel Pipe Handling & Care
B. D-3 Steel Pipe Welding
C. D-4 Welding Process & Procedures
D. D-5 Gas Flow Control
E. D-6 Steel Pipe Repairs
F. D-7 Steel Pipe Service Tees
G. D-8 Threaded Joints on Steel Pipe
H. D-9 Flanged Joints on Steel Pipe
I. D-10 Steel Pipe Cleaning / Pigging
J. D-11 Steel Pipe Prefabricated Riser

1.2 GENERAL

Steel pipe is utilized primarily for systems exceeding a 60 psig MAOP.

A. Newly installed and replacement steel pipe shall be factory wrapped or field wrapped in accordance with the procedures in this manual. (**Section L-6, Wrapping)**

B. The enclosed specific welding procedures have been qualified for steel distribution piping by Sunrise Engineering, Inc.

1.3 ABOVEGROUND INSTALLATIONS

A. May require the installation of either vertical or horizontal dog leg(s) to accommodate expansion and contraction.

B. Pipe shall be appropriately supported to avoid undue stress on pipe and fittings.

C. Plastic pipe may only be used for temporary aboveground installations not to exceed 2 years' time or the manufacturer's recommended maximum period of exposure, whichever is less.

1.4 MARKING

A. Each joint in a steel pipe system shall be marked to identify the qualified individual performing the procedure, using their designated unique identifier.

B. Care shall be exercised in marking the pipe joint as not to damage the pipe. The following are acceptable marking instruments:
- Sanford Sharpies
- Sanford "Gold Coat" slim tip metallic marker
- Sanford "Silver Coat" slim tip metallic marker
- Sanford china marker

C. Pipe and components will not be marked using die stamping.

PROCEDURES
STEEL PIPE HANDLING AND CARE

2.0 PURPOSE

All steel pipe and associated components (including valves, fittings and other appurtenances) shall be handled in such a safe way as to protect the pipe and component and the pipe and component coating from unnecessary damage.

2.1 SCOPE

A. Pipe Handling
B. Care of pipe and coating
C. Inspection

2.2 HAULING PIPE

A. When hauling pipe on a truck or trailer, the pipe shall be securely fastened to the vehicle so as not to allow the pipe to move when the vehicle is starting, turning, or braking.

B. Pipe shall be padded or on skids, and strapped as not to damage the pipe.

2.3 UNLOADING PIPE

A. Steel pipe greater than 2" in size shall be unloaded by the use of mechanical lifting device. The pipe shall not be turned loose to roll down the skids.

B. Signals used during the process of unloading shall be given by only one person in order to avoid confusion.

C Pipe retaining stakes shall remain in place on the truck or trailer body until the bottom layer of pipe is to be unloaded.

2.4 LIFTING

A. Extreme caution shall be exercised when pipe is lifted. Be sure there is a clearance between the pipe and any other object to prevent injury.

B. When lifting, take a firm grip, secure good footing, place feet a comfortable distance apart, bend knees, keep back straight, and lift with leg muscles.

C. Do not twist or rotate the spine to set a load down or pick the load up. If the load is to be carried, keep the spine straight and move the feet.

D. Get help when needed. Use cranes or hoists to lift heavy loads.

E. Use gloves or other hand protection as required when handling materials.

F. Never carry a load in such a way that it obstructs the vision.

G. Use nylon straps or slings when unloading.

2.5 PIPE STORAGE

A. Care shall be taken in the storage of coated pipe.

1. Storage of coated pipe shall not be in areas where gravel, rocks or pavement could damage or penetrate the coating.

2. Storage shall be on wooden strips not less than 3 1/2” wide for 2" pipe and not less than 5 1/2" wide for 4" and larger pipe.

3. Storage on roadsides, right-of-ways, or projects shall be on padding to prevent damage to the coating.

4. Yard storage shall be done in a way to protect the pipe coating from undue exposure to ultraviolet rays.

B. The material delivery truck shall follow the precautions listed above for storage. In addition, the following special procedures must be followed:

1. The coated pipe will be laid on wooden strips to eliminate damage to the coating by residue of gravel and cold patch on the bed of the truck.

2. Sufficient bedding shall be placed on top of the pipe to prevent damage to the pipe coating when the load is tied down.

C. The following equipment shall be used for loading and unloading coated pipe:

1. A 4" or wider rope or belt sling.

2. A "fitted" pipe clamp.

3. A spreader which grips each end of the pipe with aluminum inserts.

4. At no time shall a chain sling or steel wire rope be used to lift or move coated pipe.

2.6 PIPE STRINGING

Coated pipe which is stockpiled or strung along trench side shall be supported on wooden blocks to hold the pipe off the ground. Coating must be protected from damage resulting from supporting blocks.

Bare or coated pipe shall not be rolled from stringing trucks or handled in any manner which would distort the round form of the ends or scratch, scar or dent the pipe.

Pipe stringing shall be done in such a manner as not to cause a hazard to, or be subjected to possible damage by traffic.

No private driveways shall remain blocked overnight, and inform customers of limited access.

2.7 PIPE BENDING

Horizontal and vertical bends may be accomplished by one of three methods:

1. Welded steel elbows.
2. Mechanical bending.
3. Sagging.
4. Miter joints shall not be used unless approved by the engineer.

Refer to Section E-9

2.8 INSPECTION

All pipe will be visually inspected during unloading for damage to the pipe or coating. Any damage to the pipe structure that would be detrimental to the integrity of the facility will be removed or repaired.

PROCEDURES
STEEL PIPE WELDING - GENERAL

3.0 PURPOSE (192.245)

It is the purpose of this section to provide the procedures and requirements that must be used when safely performing welding. **Weld procedures shall conform to API 1104.**

There are a number of inherent hazards in the use of welding and cutting apparatus. It is, therefore, necessary that proper safety and operating procedures be understood prior to the use of such apparatus. Read the following thoroughly and carefully before attempting to operate welding and cutting apparatus. A thorough understanding of the proper safety and operating procedures should always be practiced.

3.1 SCOPE

A. General Safety
B. Equipment Care and Safety
C. Work Area
D. Fire Protection
E. Requirements
F. Segments

3.2 GENERAL SAFETY

The following precautions shall be taken prior to and during welding operations:

A. Welders will be responsible during welding operations to ensure all Operator safety regulations and equipment are at the job site and used by other workers.

B. Appropriate safety equipment must be worn by welders and anyone working near them. Caution must be exercised to protect the public from eye injuries at all times.

C. No welding shall be performed on a main or service while under pressure test.

D. Crew leaders shall assure themselves that no gas or gas-air mixture is present in the excavation before the welder begins work by using a CGI in confined areas. Flashing and sounding the bell hole with an acetylene torch is acceptable.

NOTE: The flashing and sounding procedure for a bell hole will be performed as follows:

1. Light torch with a neutral flame and then pass the torch around the entire excavation.

2. Turn torch off and turn on acetylene gas only. Pass torch around entire excavation. If torch does not light, it is safe to enter the excavation.

E. When welding or cutting work is conducted in areas involving buildings and combustibles, special precautions must be taken to prevent possible fire from sparks.

F. No welding on a given line shall be done within 12" of a transition fitting unless specifically authorized by a field supervisor. Plastic pipe shall be protected from welding sparks or open flame with wet rags.

G. No welding on a given line shall be done within 12" or 1 pipe diameter, whichever distance is greater, of a line stopper fitting.

3.3 EQUIPMENT CARE AND SAFETY

A. Qualifications for Using Welding Equipment

Welders may use any welding equipment for which they have been properly trained and qualified. Welder helpers shall be under the direction and supervision of the welder.

B. Care of Equipment

Oil or grease of any kind shall never be used on any regulator, torch, hose, tank or other equipment used in acetylene welding. Extreme care shall be used to prevent any kind of oil or grease from accidentally contacting acetylene welding equipment.

C. Storing and Using Acetylene Tanks

Acetylene tanks shall be used and stored in an upright position. This is to prevent the liquid (acetone) from flowing from the tank.

D. Transporting Oxygen and Acetylene Tanks

Oxygen and acetylene tanks shall be handled with care. When being moved, except in carts and racks, gauges must be removed and the valve caps screwed on tight.

E. Opening Acetylene Tanks

Acetylene tank valves shall not be opened more than one turn.

3.4 WORK AREA

A. The work area must have a fireproof floor of concrete or dirt.

B. Heat-resistant shields or other approved material should be used to protect nearby walls or unprotected flooring from sparks and hot metal.

C. Adequate ventilation is required to prevent the concentration of oxygen and toxic fumes. It is important to remember that oxygen itself will not burn, but the presence of pure oxygen will serve to accelerate combustion and cause materials to burn with great intensity. **OIL AND GREASE IN THE PRESENCE OF OXYGEN CAN IGNITE AND BURN VIOLENTLY.**

D. Steel benches or tables to be used during oxy-fuel processes must have fireproof tops.

E. Oxygen and fuel gas cylinders should be chained or otherwise secured to wall, bench, post, cylinder cart, etc., to protect them from falling and to hold them in an upright position.

F. When welding or cutting on equipment, the fuel tank shall be protected.

NOTE: **Before welding on equipment, refer to manufacturer's manual for any welding restrictions. Welding on equipment shall be performed by qualified welder utilizing the proper welding rod for that application.**

G. Welding and cutting shall not be done within 3' of oxygen or acetylene tanks or around any combustible material such as grass, lumber, poles, or other material that might catch fire.

3.5 FIRE PROTECTION

A. Fire protection should be practiced whenever oxy-fuel operations are in process. A few simple precautions can prevent most fires and minimize damage in the event a fire does occur. The following rules and safety procedures should always be practiced:

1. Never use oil or grease on or around any oxy-fuel apparatus. Even a trace of oil or grease can ignite and burn violently in the presence of oxygen.
2. Keep flames and sparks away from cylinders and hoses.
3. Flying sparks can travel as much as 35', so move combustibles a safe distance away from areas when oxy-fuel operations are to be performed.
4. Use approved heat-resistant shields to protect nearby walls, floors and ceilings.

B. The operator should protect himself from sparks, flying slag, electric arc, or flame brilliance at all times. Select welding lens with correct tempered shade for particular welding process to protect eyes from injury and to provide good visibility of the work.

Protective gloves, sleeves, aprons, and shoes should be worn to protect skin and clothing from sparks and slag. **KEEP ALL CLOTHING AND PROTECTIVE APPAREL ABSOLUTELY FREE OF OIL OR GREASE.**

C. When working in holes, manholes or vaults, welders shall be assisted by a helper. If they are not needed in the bell hole or the ditch, they shall remain on top of the excavation to attend the welder and watch for fire, cave-in, etc.

D. When performing a Fire Control Tie-in the following shall be followed:

1. Have at least two 20-pound dry chemical fire extinguishers at the job during the entire operation.
2. Before starting welding or cutting operations, flash bell hole before entering.
3. During fire control tie-in operation allow only the minimum number of personnel in bell hole.
4. Personnel shall wear appropriate protective clothing to protect against burns and flashes. At a minimum, safety equipment for welders shall

include:

- Eye protection
- Hand protection
- Ear protection

In addition to the minimum, body protection (leather uppers and apron) may also be used.

E. Pressure gauges shall be monitored at all times during entire operation.

3.6 <u>REQUIREMENTS</u>

A. Field welding shall be done only by qualified welders using one or more of the API 1104 qualified weld procedure, **Section D-4**.

B. Welding shall not be done when the quality of the completed weld may be impaired by the prevailing weather conditions, including airborne moisture, blowing sand, or high winds. The field supervisor or welder shall decide if weather conditions are suitable for welding. Preheating of pipe may be used to remove moisture from the pipe during cold weather.

C. All surfaces to be welded shall be free of rust, paint, slag, scale, dirt or other foreign materials for a distance of at least 1-inch from the edges of the weld.

D. The pipe must be aligned so that the longitudinal seam of the pipe is located in the upper quadrants of the pipe, within 45° of vertical whenever possible. Successive longitudinal pipe joints should be rotated left or right of the previous joint to avoid aligning longitudinal seams.

E. Line-up clamps are to be used on pipe 4.50 inches in diameter and larger. Line-up clamps are not to be removed until at least 50% of the root bead has been deposited in roughly equal segments around the pipe circumference. After line-up clamps have been removed, the pipe is to remain stationary until the entire root bead has been deposited. “High-Low” offsets for pipe of the same nominal diameter must not exceed 1/16-inch.

F. Pipe welding (butt welds), up to and including 8" IPS, will be done by the arc welding process.

G. Short sections of pipe, such as those needed for tie-ins or to facilitate back welding should be at least 1 pipe diameter in length.

H. Visual Inspection of all production welds shall be conducted by individuals qualified by appropriate training or experience to ensure that the welds are of high quality and that the welding is performed in accordance with the welding procedures.

I. Nondestructive testing:
   a. Shall be required over entire circumference of pipe, for pipelines 6 inches in diameter and greater to be operated at pressures that produce a hoop stress of 20% or more of SMYS
      i. Class location 1, Minimum 10%
      ii. Class location 2, Minimum 15%
      iii. Class locations 3 and 4, railroad, river and highway crossings, 100% unless impractical in which case a minimum of 90% is required
      iv. Tie-ins, 100 %
      v. Records shall be retained for the life of pipeline
   b. Shall **not** be required:
      i. Where welds have been visually inspected by a qualified individual and,
      ii. Pipeline is less than 6” in diameter
      iii. Pipelines is operated at a pressure that produces a hoop stress of less than 40% SMYS, and the number of welds are so limited that nondestructive testing is impractical

J. Nondestructive testing of welds shall be performed in accordance with written procedures by persons who have been trained and qualified in the procedures and with the equipment employed in testing.
   a. Only SNT-TC-IA, Level II or Level III can interpret radiography
   b. Ensure the entire circumference of the weld is nondestructively tested
   c. Follow a detailed radiographic procedure to perform a test radiograph (test shot) to be observed by a Company representative.
   d. When conducting production radiography, the procedure used for each radiograph is the same as used for a “test shot”
   e. Allow company representatives to evaluate film for:
      i. An acceptable image, free of fog or other irregularities
      ii. A satisfactory identification system to tie the film to a specific weld
      iii. Film expiration date
      iv. Proper developing chemicals temperature
      v. Proper development techniques

K. The criteria for visual, destructive and nondestructive inspection shall be the requirements set forth by Section 9 of the API 1104 Standards.

L. A welder may not weld with a particular welding process or procedure unless, within the preceding 6 calendar months, the welder was engaged in welding with that process or procedure **192.229 (b).**

M. Except for a welder or welding operator whose work is isolated from the principal welding activity, a sample of each welder or welding operators work for each day must be nondestructively tested, when nondestructive testing is required under 192.241 (b).

N. A welder may qualify to perform welding on pipe to be operated at a pressure that produces a hoop stress less than 20% of SMYS by performing an acceptable test weld, for the process to be used, under the test set forth in Section I of Appendix C of Part 192. Each welder who is to make a welded service line connection to a main must first perform an acceptable test weld under Section II of Appendix C of Part 192 as a requirement of the qualifying test.

O. A welder or welding operator may not weld on pipe to be operated at less than 20% hoop stress of SMYS unless they are tested in accordance with 192.227 (c) (1) or re-qualifies under 192.227 (d) (1) or (d) (2).

P. A welder or welding operator qualified under 192.227 (b) may not weld unless within the preceding 15 calendar months, but at least once each calendar year, the they have been re-qualified under 192.227 (b) or within the preceding 7.5 calendar months, but at least twice each calendar year, they have had a production weld cut out, tested and found acceptable with the qualifying test or if a welder who welds only 2 inch or smaller service lines has had two sample welds tested and found acceptable in accordance with the test in Section III of Appendix C in Part 192.

Q. Repairs to pipeline welds shall be made in accordance with this section and the requirements of **Section D-6**.

3.7 SEGMENTS

Factory-wrought steel welding elbows or transverse segments cut from the elbows may be used for all angles in steel pipe. Segments shall be cut perpendicular to the tangent of the welding elbow. The arc length measured along the crotch of transverse segments of welding elbows shall be at least 1" on pipe sizes 2" - 8". The minimum segment size for each diameter welding elbow is shown in Table 2. Minor deflections in pipe can be accomplished using segmented fittings as stated in **Section E-9.3.A**

TABLE 2

Minimum Welding Elbow Segment Size *

Nominal Diameter Inches)	Minimum Arc Length (Degrees)
2	32
3	21
4	16
6	11
8	8

* Based Upon: 1" along crotch on sizes 2" - 8"

The elbow selected for use shall have a design pressure equal to or greater than the intended operating pressure of the piping system.

Welding elbows and segments whose nominal wall thickness is different than the wall thickness of the pipe or fitting to which they are to be joined shall meet the end preparation requirements of this section.

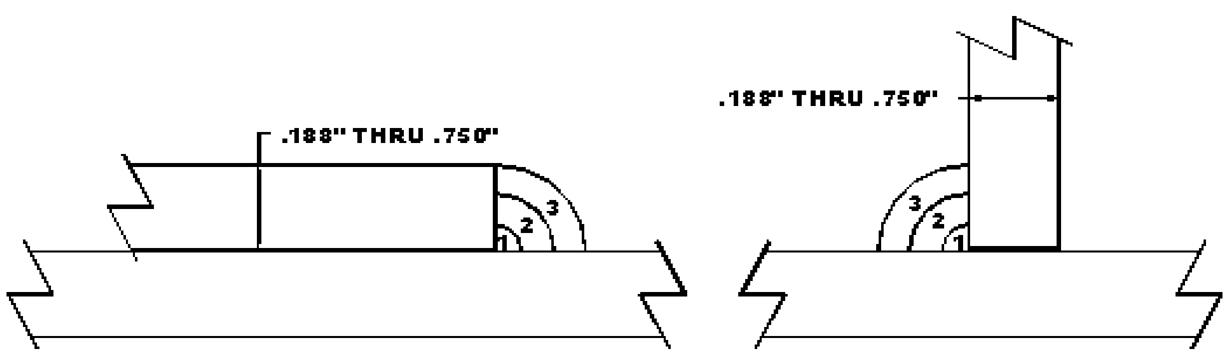
Shield Metal Arc Welding
Procedure No. 39

	Variables	Essential	Non Essential
A	Process	Manual	
B	Material	42,000# and under	
C	Outside Diameter	2.375" Through 12.750"	
D	Wall Thickness	.188" through .750"	
E	Filler Metal	First 2 Passes Group 1; Remaining Passes Group 2	
F	Position	Fixed	
G	Direction	Downhill	
H	Time Between Passes	Completion of root bead and start of 2nd bead, **Maximum 5 minutes**	Maximum of 36 hours to completion of weld
I	Shielding Flux	Cellulose	
J	Travel Speed	6 - 16 IPM	
K	Polarity	DCRP	
L	Clean / Grind		Hand or Power Tools

Lineup Clamps	N/A		
Preheat Pipe or temp below 40 F	Oxy/Arc or propane Torch	Preheat to at or above 150 F	Use Temp stick or Pyrometer

Electrode Size and Number of Beads

Minimum # of Beads and Sequence	Electrode Size and Type	Voltage	Amperage
1 Root Bead	3/32" E6010/E7010	15-35	40-70
2 Hot Pass	1/8" E6010/E7010	16-40	75-130
	5/32" E6010/E7010	17-40	90-175
3 Fillers (when needed) Cap	1/8" E8010	15-35	70-140
	5/32" E8010	16-40	80-190
	3/16" E8010	17-40	130-240



Welder	Anthony P. Barber		
Tested By	Jay K. Tuttle	Date	7/16/2001
Approved By	Darren S. Fox	Date	7/16/2001

PROCEDURES
STEEL PIPE ELECTRIC ARC WELDING PROCESS

4.0 PURPOSE

All welding to be performed on the Operator's natural gas facilities shall be performed by qualified welders and shall conform to the following qualified Shielded Metal Arch Welding (SMAW) procedures:

4.1 SCOPE

Procedure No.	**Shield Metal Arc Welding** Procedure Description
1	Butt/Fixed/Cellulose - 42,000# and under - less than 2.375 - .188 through .750
2	Butt/Fixed/Cellulose - 42,000# and under - 2.375 through 12.750 - .188 through .750
3	Butt/Fixed/Cellulose - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
4	Butt/Fixed/Cellulose- 42,000# and under - 2.375 through 12.750 - .188 through .750 - Back Weld
5	Butt/Fixed/Cellulose - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
6	Butt/Fixed/Cellulose - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750 - Back Weld
7	Butt/Fixed/Cellulose - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750 - Back Weld
8	Butt/Fixed/Cellulose- 42,000# and under - less than 2.375 - .188 through .750
9	Butt/Rolled/Cellulose - 42,000# and under - 2.375 through 12.750 - .188 through .750
10	Butt/Rolled/Cellulose - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
11	Butt/Rolled/Cellulose - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
12	Butt//Fixed/Low Hydrogen - 42,000# and under - less than 2.375 - .188 through .750
13	Butt//Fixed/Low Hydrogen - 42,000# and under - 2.375 through 12.750 - .188 through .750
14	Butt//Fixed/Low Hydrogen - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
15	Butt//Fixed/Low Hydrogen - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
16	Fillet/Rolled/Cellulose/Non-Beveled - 42,000# and under - less than 2.375 - .188 through .750
17	Fillet/Fixed/Cellulose/Non-Beveled - 42,000# and under - less than 2.375 .188 through .750
18	Fillet/Fixed/Cellulose/Non-Beveled - 42,000# and under - 2.375 through 12.750 - .188 through .750
19	Fillet/Fixed/Cellulose/Non-Beveled - above 42,000# up to and including 60,000# -

PROCEDURES
STEEL PIPE ELECTRIC ARC WELDING PROCESS

	2.375 through 12.750 - .188 through .750
20	Fillet/Fixed/Cellulose/Non-Beveled - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
21	Fillet//Rolled/Cellulose/Beveled - 42,000# and under - less than 2.375 - .188 through .750
22	Fillet/Fixed/Cellulose (2)-Low Hydrogen (1+)/Non-Beveled - 42,000# and under - 2.375 through 12.750 - .188 through .750
23	Fillet/Fixed/Cellulose (2)-Low Hydrogen (1+)/Non-Beveled - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
24	Fillet/Fixed/Cellulose (2)-Low Hydrogen (1+)/Non-Beveled - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
25	Fillet/Fixed/Cellulose/Beveled - 42,000# and under - less than 2.375 - .188 through .750
26	Fillet/Fixed/Cellulose/Beveled - 42,000# and under - 2.375 through 12.750 - .188 through .750
27	Fillet/Fixed/Cellulose/Beveled - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
28	Fillet/Fixed/Cellulose/Beveled - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
29	Fillet/Fixed/Low Hydrogen/Non-Beveled - 42,000# and under - less than 2.375 - .188 through .750
30	Fillet/Fixed/Low Hydrogen/Non-Beveled - Non-Beveled - 42,000# and under - 2.375 through 12.750 - .188 through .750
31	Fillet/Fixed/Low Hydrogen/Non-Beveled- above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
32	Fillet/Fixed/Low Hydrogen/Non-Beveled - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
33	Fillet/Fixed/Low Hydrogen/Beveled - 42,000# and under - less than 2.375 - .188 through .750
34	Fillet/Fixed/Low Hydrogen/Beveled - 42,000# and under - 2.375 through 12.750 - .188 through .750
35	Fillet/Fixed/Low Hydrogen/Beveled - above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
36	Fillet/Fixed/Low Hydrogen/Beveled- above 42,000# up to and including 60,000# - Less than 2.375 - .188 through .750
37	Fillet/Fixed/Low Hydrogen/Beveled - 42,000# and under welded to above 42,000# up to and including 60,000# - 2.375 through 12.750 - .188 through .750
38	Butt/Fixed/Cellulose – 42,000# and under – 2.375 through 12,750 - .188 through .750
39	Fillet/Fixed/Cellulose/Beveled – 42,000# and under – 2.375 through 12,750 – .188 through .750

4.2 WELDING PROCEDURES

Procedures developed and qualified by Sunrise Engineering, Inc. in conformance with API 1104.

PROCEDURES
STEEL PIPE / GAS FLOW CONTROL

5.0 PURPOSE

During installation and repairs to steel mains and services, the following approved methods may be used for safely controlling the flow of gas.

5.1 SCOPE

A. Squeezing
B. Valves
C. Stopple Fitting / Service Connection
D. Repair Clamps

5.2 SQUEEZING

Steel pipe (2" and less) - Hydraulic squeezer method may be used for controlling the gas flow for damaged steel pipelines 2" and less.

A cold squeeze shall not be reopened, but may be left in an active piping system provided the line is 2" or smaller, the Maximum Allowable Operating Pressure (MAOP) of the line is 125 psig or less, and reinforcement is installed.

A. Preparation - prior to squeezing, the following procedures should be followed:

1. Select a location remote from a gaseous area when possible.

2. Clean the existing wrap, primer, rust and/or scale from pipe approximately 18" in length.

3. Examine squeeze area for location of excessive pitting.

4. Locate seam, if possible and mark with soapstone.

5. Squeeze shall be at least one pipe diameter from any weld.

B. Cold Squeezing Method

1. Assemble squeezer on pipe.

2. Use approved grounding cables to control static electricity (Refer to

Section B-6).

3. Open needle valve on squeezer.

4. Open the pump valve until the squeezer piston is fully retracted, then close the valve. Open vent on pump reservoir.

5. Place squeezer on pipe.

6. Insert the lower jaw through side rail slot with notches down until they fit over side rails.

7. Slide upper jaw through side rail slots over pipe all the way to the stop. Lock upper jaw in place.

8. Center squeezer over squeeze point, hold square to the pipe and operate pump slowly and with caution.

NOTE: **Squeezer without gauge must be used with caution to avoid squeezing the pipe in half. Apply only enough pressure to secure a squeeze shutoff.**

5.3 VALVES

Valves may be used for controlling the gas flow for damaged steel pipelines. As noted in the Emergency Plan Manual, Section C.1 and in the O&M Plan Manual, Section G-4.1, when operating a valve in response to an emergency condition, when considered to be necessary to protect life or property, operation of steel valves shall be acceptable without supervisor's approval. A supervisor should be notified of valve operation during an emergency situation as soon as possible after the valve is operated.

In the case of a relatively minor leakage incident, the attempted contacts may be 10 to 15 minutes apart. In the case of a significant leakage incident, the attempted contacts may be to two different supervisory personnel within a couple of minutes, after which the qualified operator will determine the course of action, including possible valve operation.

Refer to Section G of this manual for detail procedures

5.4 STOPPLE FITTINGS

For steel main lines sizes 1” through 8” gas flow may be controlled by use of existing or installed line stopper fittings. For services, the service-to-main connection may be used to control gas flow.

A. Fitting type can be selected with the following considerations:
- Safety
- Pressure ratings
- Economics

B. When replacing a section of main using one or more line stopper fitting(s), all line stopper fittings shall be welded and operated by qualified personnel only.
- Select location for installing fitting or fittings on main.
- If pipe is leaking, make temporary repair or select location out of gaseous atmosphere.
- Fitting(s) should be installed on clean pipe that is free of corrosion or excessive pitting.
- It is recommended that fittings should be installed at least one pipe diameter from a weld. Fittings shall not be installed on a weld under any circumstance.
- Follow appropriate procedures for controlling static electricity.
- Flash bell hole before welding starts.

Refer to Section M of this Manual for detail procedures.

5.5 REPAIR CLAMPS

Steel gas line leaks can be temporarily or permanently repaired by using the appropriate leak repair clamp. Refer to Manufacturers Guidance Manual or this section for procedures and the selection chart for various types of leak repair clamps with their pressure rating and size range. **Refer to section D–6 for approved installation procedures.**

5.6 BYPASSING

A. When a temporary bypass is required on a main or service, it should be in place and verified that its operational by use of purge stack, gauges, and placing a demand on the system before the existing line is taken out of service to avoid possible customer outage.

NOTE: **When necessary, contact the Engineer to determine size of bypass needed.**

5.7 SAFETY

A. Every effort shall be exercised to prevent entering area of blowing gas.

B. The preferred method to control escaping gas is to drop back a safe distance to control gas flow either be squeezing or by use of valves.

C. Should the situation require entering an area of escaping gas, the appropriate fire protection steps shall be implemented. **Refer to Section B-2.**

PROCEDURES
STEEL PIPE REPAIRS

6.0 PURPOSE (192.309, 192.487, 192.703)

All known leaks, any imperfections or damages to the pipe metal affecting its serviceability for the use intended, or any segment of segment of pipeline that becomes unsafe must be repaired or replaced. Each gouge, groove, dent or arc burn that is not repaired using one of the approved methods in this section must be removed and replaced by cutting out a cylindrical section of pipe. Any section of pipe that has general corrosion and either (A) a wall thickness less than required for the MAOP of the pipe or (B) a wall thickness less than 30% shall be replaced. All repairs shall meet the following requirements as stated in the appropriate sections:

A. Testing, **Procedure H-3**

B. Cathodic Protection, **Section L**

C. Purging, **Procedure H-5**

D. Wrapping, **Section I**

6.1 SAFETY

Safety procedures shall be followed whenever working in gaseous atmospheres. **Refer to Section B-6,** for procedure to be taken to prevent accidental ignition. Frequent review of that material is recommended.

Particular attention shall also be given to use of personal safety equipment. **Refer to Section B-2.**

6.2 REPAIR CLAMPS

Steel gas line leaks can be temporarily or permanently repaired by using the appropriate leak repair clamp.

A. Permanent Bolt-On Leak Repair Clamps.

Steel gas lines 8" or smaller with an MAOP of 60 psig or less will be considered permanently repaired using the appropriate bolt-on clamp using the following guidelines:

1. Bolt-on clamps must pass a soap test.

2. All clamps shall be wrapped using Trenton Temcoat grease wrap & polyply wrap or other approved method.

3 Cathodic protection requirements should be verified.

B. Bolt-On Repair Clamp Installation Procedure:

1. Clean all around pipe to bare metal at location where clamp is to be installed.

2. Select clamp as shown on selection chart of this section.

3. Select clamp wide enough to cover adjacent corrosion pits.

4. Assure that gasket is properly placed and fitted.

5. Lubricate gasket with a rubber lube solution or LPS #1 Lubricant.

6. Attach approved ground strap.

7. Center clamp over leak.

8. If clamp has more than one bolt, tighten bolts evenly.

9. Soap test to assure leakage has been stopped.

10. Grease wrap clamp and adjoining steel pipe.

NOTE: Bolt-on clamps shall be considered temporary repairs when used for the following conditions:
1) Welds
2) Seams
3) Tears or deformed pipe
4) Weld ells

6.3 <u>LINE STOPPER FITTINGS</u>

All line stopper fittings shall be welded and operated by qualified personnel only. If main cannot be shut down, install a bypass.

A. Select location for installing fitting or fittings on main.

1. If pipe is leaking, attempt to make temporary repair, or select a location for installation of the fitting that is out of the gaseous atmosphere.

B. Install approved ground strap.

C. Fitting should be installed on clean pipe that is free of corrosion or pitting.

D. It is recommended that fittings should be installed at least one pipe diameter from a weld. Fittings shall not be installed on a weld under any circumstance.

E. Flash bell hole before welding starts.

Refer to Section M–1 for detailed procedures in using stopple equipment.

6.4 VALVES

This procedure shall be used only when main can be shut down.

A. Close valve(s). **Refer to Section G for approved procedure for operation of valves.**

B. Purge down section of line to be replaced.

C. Install new section line. **Refer to Section D-3 for welding procedures.**

D. Purge new section through purge nipple. **Refer to Section H-5.**

E. Line pack new section and soap test.

F. Restore new section back to operation.

6.5 PATCHES

A. Gouges, grooves and dents can be repaired using patches. Patches are not allowed on lines operating above a hoop stress of 20% of SMYS.

B. Patches shall be made of steel and have a design pressure at least equal to the design level of the pipe.

C. Patches shall be round or have corners with radius of not less than 1”.

D. At least 3” of sound metal exists between the welds of adjacent patches fillet welds or bands.

E. The length of patch is not limited along the longitudinal axis of pipe.

6.6 SHIELDS AND SLEEVES

Shields and sleeves shall be made of steel and have a design pressure at least equal to the design level of the pipe. This method is used for the following types of repairs:

A. All types of leaks including corrosion, damage from external force, defective (including cracked) circumferential and longitudinal welds and cracked parent metal.

B. Corroded areas.

C. Gouges, grooves and dents, when the stress at design level is below 20% of SMYS, and are less than 1/4" deep in pipe 8" or less in diameter.

E. Hard spots associated with other defects when stress at design level is less than 20% of SMYS.

F. Defect (but not cracked) circumferential welds including those on which unsuccessful repair attempts by grinding and re-welding have been made.

G. Welding bands, weld reinforcing sleeves, and canopies are to be installed so that the two halves fit together and fit around the pipe onto which they are to be welded. The gap at the root between the parts to be joined by welding shall not exceed 1/16" except at the longitudinal weld where the gap may be as much as 1/8".

6.7 GRINDING

The use of grinding as a method of repair is acceptable as long as the following conditions are met:

A. The entire imperfection (scratch, gouge, arc burn) is removed.

B. The remaining wall thickness, after grinding, must at least be equal to the nominal thickness required for the design pressure of the pipeline.

6.8 WELD REPAIRS

A. Defects in unacceptable welds may be repaired one time. Cracks in welds are not allowed to be repaired, but must be removed. Only if the Operator determines that a crack is determined to be repairable, can it be repaired using a procedure provided by the Operator.

B. Each weld that is repaired must have the defect removed down to sound metal. Before welding has commenced, pipe may be preheated between 300° F and 400° F.

C. The welding performed in making repairs shall be visually inspected. The weld repair shall meet the standards of acceptability of API 1104.

D. On existing lines operating at a hoop stress of less than 40% of SMYS welds may be repaired using a full encirclement weld reinforcing sleeve of appropriate design and using approved welding procedure.

E. Non-destructive testing involving repairs or cutouts shall consist of two X-rays, the first one showing the defect, and the second one showing the sound weld as accepted by a qualified welding inspector or supervisor.

6.9 ARC BURN

On line pipe, any arc burn outside the weld area that cannot be consumed by the finish weld shall be cut out.

In situations involving weld fittings such as valves, insulators, line stopper fittings, etc., it may be desirable to attempt a repair in an effort to salvage the fitting. Arc burns can be a serious defect regardless of size and should be treated as such. Arc burns may contain minute cracks hardly visible to the naked eye. These small cracks may be present in the arc burn or beneath the arc burn in the heat-affected zone.

The following is a step-by-step procedure for examining and repairing arc burns:

Step #1 - File down arc burn area blending it with the contour of the pipe until visual evidence of the arc burn is completely removed.

Step #2 - Etch arc burn area with a 20% (by volume) solution of ammonium sulfate.

Step #3 - Visual inspection of the arc burn area should etch out to the same color. If evidence of any darkened areas is still present, repeat the above three steps.

Step #4 - Wash arc burn with water to dilute the enchant and to remove the residue of the enchant solution from the pipe surface.

Step #5 - Check arc burn area with a thickness gauge to see if the remaining wall thickness of the pipe meets the API requirements for which the pipe was manufactured and also meets the design criteria for which the pipe is being used.

If a repair is made by grinding, the arc burn must be completely removed and the remaining wall thickness must be at least equal to either:

A. The minimum wall thickness required by the tolerances in the specification to which the pipe was manufactured; or

B. The nominal wall thickness required for the design pressure of the pipeline.

Step #6 - Arc burn shall be cut out as a cylinder if the criteria in Step #5 is not met.

Step #7 - Keep records on the location (Station Number) and amount of pipe wall removed, also X-ray number of welds.

PROCEDURES
STEEL PIPE REPAIRS

MUELLER® 520 AND 530 SERIES FULL-SEAL® STAINLESS STEEL PIPE REPAIR CLAMPS

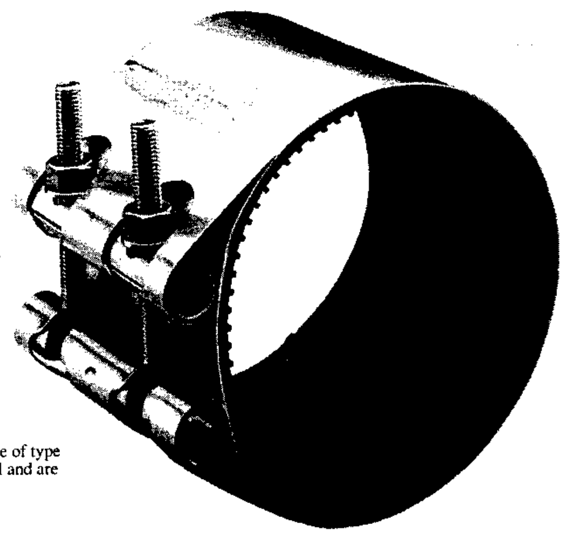
Mueller Co. 12.1

Mueller 520 and 530 series Full-Seal Pipe Repair Clamps provide ecomomical repairs and resist corrosion

MUELLER Full-Seal Pipe Repair Clamps provide an economical repair for circumferential breaks or cracks, multiple leaks or holes in pipe. They are available in 5", 6", 7-1/2", 9", 10", 12", 15", and 18" lengths for cast iron, ductile iron, and standard steel pipe. Each clamp size can accommodate a wide range of O.D. variations.

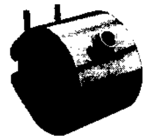
Lightweight all stainless steel clamps resist corrosive atmospheres and hot soils. Available in single-section Full-Seal® style (Series 520), in two-section Xtra-Range® style(Series 530), and in Servi-Seal® style with welded-in service outlet. Servi-Seal style is available in either single-section (Series 521-529) or two-section (Series 531-539).

- ☐ UNIQUE LOW-PROFILE DESIGN--- of the bolting mechanism makes clamp easy to handle, easy to fit around pipe.
- ☐ TAPERED END GRIDDED GASKET--- is made of specially compounded rubber, has a gridded pattern for positive sealing and tapered ends to make installation quick and easy.
- ☐ HIGH STRENGTH STAINLESS STEEL BOLTS--- have spin-fit threads, treated with an anti-galling agent, for fast installation — plus special tee-heads so they drop into bolt bar slots easily yet do not turn during tightening.
- ☐ STAINLESS STEEL BOLTING MECHANISM--- is pre-assembled. Unique weight-saving Mueller design features lug and bolt bars which rotate as the clamp is tightened. This avoids bolt bending or binding, keeps tightening force close to the pipe surface and allows more efficient transfer of tightening force on the bolts to clamping force on the pipe.
- ☐ STAINLESS STEEL GAP BRIDGES--- cemented to the gasket where the band sections join, to provide the 360° clamping pressure.
- ☐ MAXIMUM GAS WORKING PRESSURE---for properly installed clamps at 150° F. maximum working temperature: 2"-8" 100 psig, 10"-12" cast iron or ductile iron pipes 60 psig, 10"-12" steel pipes 100 psig.
- ☐ BANDS---are made of type 304L stainless steel and are machine-welded.

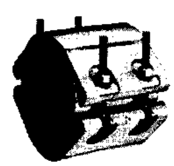


520 SERIES CLAMP

- ☐ Repair circumferential breaks, cracks
- ☐ Repair leaks and holes in pipe
- ☐ Repair longitudinal cracks
- ☐ Repair pulled services, broken pipe with Servi-Seal Clamp



SERVI-SEAL Clamp

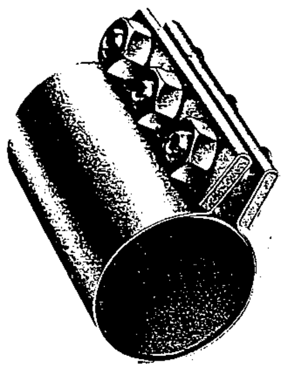


530 Series Clamp

PROCEDURES
STEEL PIPE REPAIRS

STYLE 3137 FULL CIRCLE

STAINLESS STEEL REPAIR CLAMPS



Carton Quantity 10

CATALOG NUMBER	IPS PIPE SIZE	LENGTH	NO. OF BOLTS	BOLT SIZE	PRICE
3137-15-0204	1-1/4"	4"	2	1/2" X 2"	20.85
3137-15-0306	1-1/4"	6"	3	1/2" X 2"	40.60
3137-15-0408	1-1/4"	8"	4	1/2" X 2"	44.30
3137-16-0204	1-1/2"	4"	2	1/2" X 2"	28.25
3137-16-0306	1-1/2"	6"	3	1/2" X 2"	40.90
3137-16-0408	1-1/2"	8"	4	1/2" X 2"	43.35
3137-17-0204	2"	4"	2	1/2" X 2"	28.50
3137-17-0306	2"	6"	3	1/2" X 2"	40.75
3137-17-0408	2"	8"	4	1/2" X 2"	48.45
3137-18-0204	2-1/2"	4"	2	1/2" X 2"	26.75
3137-18-0306	2-1/2"	6"	3	1/2" X 2"	38.50
3137-18-0408	2-1/2"	8"	4	1/2" X 2"	53.50
3137-19-0204	3"	4"	2	5/8" X 2"	32.75
3137-19-0408	3"	8"	4	5/8" X 2"	58.50
3137-19-0612	3"	12"	6	5/8" X 2"	71.25
3137-21-0204	4"	4"	2	5/8" X 2"	30.30
3137-21-0408	4"	8"	4	5/8" X 2"	65.50
3137-21-0612	4"	12"	6	5/8" X 2"	90.35
3137-23-0204	5"	4"	2	5/8" X 2"	41.85
3137-23-0408	5"	8"	4	5/8" X 2"	63.95
3137-23-0612	5"	12"	6	5/8" X 2"	84.85
3137-24-0204	6"	4"	2	5/8" X 2"	47.00
3137-24-0408	6"	8"	4	5/8" X 2"	73.30
3137-24-0612	6"	12"	6	5/8" X 2"	124.10
3137-26-0308	8"	8"	3	3/4" X 3"	94.90
3137-26-0410	8"	10"	4	3/4" X 3"	111.70
3137-26-0512	8"	12"	5	3/4" X 3"	145.15
3137-27-0308	10"	8"	3	3/4" X 3"	105.40
3137-27-0410	10"	10"	4	3/4" X 3"	125.70
3137-27-0512	10"	12"	5	3/4" X 3"	144.00
3137-28-0308	12"	8"	3	3/4" X 3"	117.35
3137-28-0410	12"	10"	4	3/4" X 3"	127.80
3137-28-0512	12"	12"	5	3/4" X 3"	184.00

ITEM: STAINLESS STEEL REPAIR CLAMPS, Style 3137

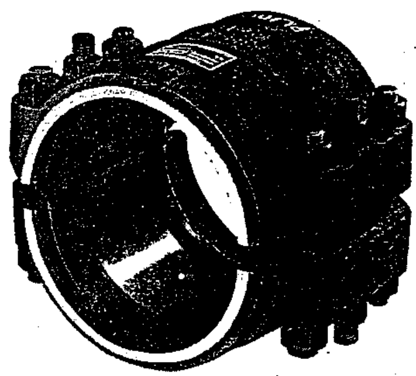
STOCK NO.	PART NUMBER	DESCRIPTION	APPROVED MANUFACTURER
13010	3137–16–0306	1 1/2 x 6	Continental
13030	3137–17–0306	2 x 6	Continental
13050	3137–21–0408	4 x 8	Continental
13070	3137–24–0408	6 x 8	Continental

DATE: 3/4/96 APPROVED BY: SW

PROCEDURES
STEEL PIPE REPAIRS

PLIDCO® SPLIT+SLEEVE

Plidco Split+Sleeves are used for making permanent repairs to a variety of pipelines while the line continues on stream.



ITEM: Split Sleeve with Buna N Packing

STOCK NO.	PART NUMBER	DESCRIPTION	APPROVED MANUFACTURER
13130	SSO-060018	6"x18", 1000 wp, 12 sa, dr 769	Plidco

DATE: 3/4/96 APPROVED BY: SW

PROCEDURES
STEEL PIPE SERVICE TEES

7.0 STEEL TAPPING TEES

The purpose of this section is to identify tapping tees approved for use in the Operator's gas system.

7.1 MUELLER SERVICE TEE

This procedure presents the method used for the installation of the Mueller service tee on a steel main.

A. Installation - Tee on Main:

1. Clean the main of all coatings, rust, scale, dirt, etc., in the area where the service tee is to be welded to the main.

2. Remove completion plug and place these parts in an area where they will remain clean.

3. Replace cap. Attach the tee body to the main utilizing approved welding procedures.

B. Installation - Steel Service Piping and/or transition fitting:

1. Attach service piping to the tee utilizing approved welding procedures.

2. Let the weld and the tee cool naturally to the ambient temperature.

3. Pressure test the installation in accordance with section H-3.

C. Tapping:

1. Attach the proper valve or control chamber. Check the operation of the valve by cycling fully and counting the turns.

2. Measure and record the travel distance for the tap.

3. Install the proper drill, attachments and fittings to the drilling machine. Coat the drill thoroughly with Mueller cutting grease.
4. Retract the boring bar to its uppermost position and install the drilling

machine on the valve. Fully open the valve while supporting the boring bar to prevent damage to the valve.

5. Drill the main:

   (a) Slowly advance the boring bar until the point of the drill contacts the main.

   (b) Adjust the feed tube and the yoke so the yoke engages the collar on the boring bar. Tighten the clamping collar against the feed yoke.

   (c) Drill the hole by operating the ratchet handle clockwise and turning the handle clockwise a little at a time. Continue drilling until the main is perforated by the drill. Do not exceed the marked, predetermined travel distance.

   (d) When the drilling operation is complete, retract the boring bar to its uppermost position and fully close the valve.

   (e) Purge the drilling machine and connect jumper cables prior to removing the machine from the valve.

D. Completion:

1. Install the proper attachments and fittings on the drilling machine (the drilling machine serves as the completion unit).

2. Attach the completion plug to the drilling machine.

3. Retract the boring bar to its uppermost position and install the drilling machine on the valve using jumper cables.

4. Advance the boring bar until the plug contacts the first thread in the tee body. Hold the boring down with the yoke if desired. Rotate the boring bar clockwise until the plug seats firmly in the tee body.

5. Once the plug has seated, release it by rotating the boring bar counterclockwise until the inserting tool is free from the EZ release adapter. To release the plug, it may require a sharp blow with the hand in a

counter- clockwise direction to break the EZ release adapter free.

6. Purge the drilling machine to verify that the plug has seated properly. If gas is escaping from the valve, it will be necessary to rotate the boring bar back in a clockwise direction to seat the plug tighter.

7. After the plug is properly seated and released, the drilling machine and valve may be removed.

   (a) The EZ adapter will prevent the valve from being closed at this point.

   (b) Use grounding cables when removing the drilling machine.

8. Lubricate the O-ring if applicable.

10. Install the completion cap per the manufacturer's procedure.

PROCEDURES
THREADED JOINTS ON STEEL PIPE

8.0 PURPOSE

This section presents the procedure for fabricating gas tight threaded connections that will sustain the longitudinal pullout or thrust forces caused by contraction or expansion of the piping or by anticipated external or internal loading.

Each threaded joint shall be made in accordance with this procedure.

8.1 GENERAL

Threaded joints are intended for above ground installations and **shall not** be buried.

8.2 PROCEDURE

All threaded pipe and fittings purchased or fabricated for utilization on the Operator's pipeline facilities shall use the American National Standard Thread (NPT).

A. Maximum size for pipe and associated fittings to be joined using the threaded procedure shall be 4".

B. Pipe and fitting threads shall be inspected prior to assembly for gouges, nicks, missing or malformed threads, or any other defect that would affect the integrity of the joint.

C. Pipe thread sealant shall be of an approved type. It shall be applied to the male threads only on pipe sizes up to and including 1½" and to both the male and female threads for pipe sizes larger than 1½". Care must be taken to avoid getting excess sealant inside the pipeline at all times.

D. After inspecting and applying sealant to the pipe threads, the joint shall be made up wrench tight to produce a gas tight seal.

E. Prefabricated facilities should incorporate at least one flanged fitting, or union to accommodate future work on the facility. (Only above ground facilities)

F. Test the completed joint in accordance with **Section H-3**.

PROCEDURES

FLANGED JOINTS ON STEEL PIPE

9.0 PURPOSE

This section presents the procedure for fabricating gas-tight flanged joints.

Each new facility installation in which a flanged joint is to be incorporated shall comply with engineering specifications detailing the proper design and fabrication of the flanged connections being assembled.

When assembling flanged connections to which no engineering specifications are available, the following procedure shall be utilized.

9.1 GENERAL

A. Flanges shall be used to facilitate installation and removal of pipe, fittings or equipment in facilities in **above ground** installations & **shall not** be buried.

B. Raised face weld neck and blind flanges will be used for natural gas piping. Threaded flanges may be used on meter sets only.

C. The ends of stud bolts shall extend completely through the nuts with at least one thread on the bolt showing from each nut, unless the body design does not allow the bolt to protrude enough for one thread to show.

D. Standard wall thicknesses of the flange hub at the weld bevel are provided in Table 5. Flanges <u>shall not</u> be taper bored. It is recommended to use pipe of the same wall thickness or within 3/32" for fabricated assemblies. Back welding and transition segments are acceptable.

E. Recommended stud bolt sizes for standard and insulating flanged connections are shown in Tables 1, 2, 3, and 4. The bolt lengths shown may be greater than those found in other sources to allow for thicker gaskets and to allow at least one thread showing on each end of stud bolts. Stud bolts may be used for all flanges.

F. When flanged connections are made to fittings or valves, consideration shall be given to non-standard bolting requirements, such as cap screws or changes in bolt lengths due to flange thickness or clearance behind the flange. Non-standard items may be used where necessary. **A minimum of one thread must extend beyond the nut.**

G. Ring gaskets are for use with raised-face flanges only.

H. Only steel flanges and steel stud bolts will be used in following applications:

1. Bridge crossing and spans.

2. Areas of known unstable ground or significant vibration.

I. Documentation. The as-built information will show the flange specification.

J. All studs and nuts to be utilized shall be new.

9.2 PROCEDURE

A. All components and materials to be installed while assembling the flanged joint should be suitable for the intended application.

B. The sealing surface area of the flange should be inspected and cleaned of dirt, old gasket material, worn or plugged serrations, gouges or nicks, paint, and any other defect that could affect the integrity of the joint.

C. The stud bolts should be clean, lubricated with an approved thread lubricant, and free of burrs or any other defects that could affect the integrity of the joint.

D. The gasket should be inspected for dirt, gouges, or any other defect that could affect the integrity of the joint.

E. Assembly

1. Install the gasket on the gasket seating surface and bring the cover flange in contact with the gasket.

2. Install all studs, making sure they are clean and well lubricated with an approved lubricant.

3. Run-up all nuts finger tight.

4. Develop the required bolt stress in a minimum of four steps, following a tightening sequence (see Figure 1). It is important that no more than 30% of the required bolt stress is achieved on the initial set. Should this occur,

serious damage can be inflicted to the gasket and subsequent tightening cannot offset the damage. After following this sequence, a final tightening should be performed in a bolt-to-bolt pattern to ensure that all bolts are evenly stressed.

In the absence of assembly torque specifications the bolts may be torqued to a stress level of 45,000 psi or 50% of their yield strength.

F. The final installation shall be tested in accordance with **Section H-3**.

PROCEDURES
FLANGED JOINTS ON STEEL PIPE

TABLE 9-1

RECOMMENDED STUD SIZE AND TORQUE SETTINGS FOR
CLASS 125 CAST-IRON OR 150 ANSI STEEL FLANGES

Pipe Size Inches	No. Bolts Req'd	Bolt Diameter Inches	Bolt Type	Bolt Length Inches			Torque Specifications
				Standard	Insulating		Stud 45,000
				Raised Face			(ft lbs)
1	4	1/2	Stud	2 3/4	3		45
1 1/2	4	1/2	Stud	3	3 1/4		45
2	4	5/8	Stud	3 1/4	3 1/2		90
3	4	5/8	Stud	3 3/4	4		90
4	8	5/8	Stud	3 3/4	4		90
6	8	3/4	Stud	4	4 1/2		150
8	8	3/4	Stud	4 1/4	4 3/4		150
10	12	7/8	Stud	4 3/4	5		240
12	12	7/8	Stud	4 3/4	5 1/4		240
16	16	1	Stud	5 1/2	5 3/4		370
18	16	1 1/8	Stud	6	6 1/2		530
20	20	1 1/8	Stud	6 1/4	6 3/4		530
22	20	1 1/4	Stud	6 3/4	7 1/4		750
24	20	1 1/4	Stud	7	7 1/4		750
26	24	1 1/4	Stud	7 1/4	7 1/2		750

TABLE 9-2

PROCEDURES
FLANGED JOINTS ON STEEL PIPE

RECOMMENDED STUD SIZE AND TORQUE SETTINGS FOR
CLASS 250 CAST-IRON OR 300 ANSI STEEL FLANGES

Pipe Size Inches	No. Bolts Req'd	Bolt Diameter Inches	Bolt Type	Bolt Length Inches		Torque Specifications 45,000 Stud
				Standard	Insulating	
				Raised Faces		
2	8	5/8	Stud	3 1/2	3 3/4	90
3	8	3/4	Stud	4 1/4	4 3/4	150
4	8	3/4	Stud	4 1/2	5	150
6	12	3/4	Stud	5	5 1/4	150
8	12	7/8	Stud	5 1/2	6	240
10	16	1	Stud	6 1/4	6 3/4	370
12	16	1 1/8	Stud	6 3/4	7 1/4	530
16	20	1 1/4	Stud	7 1/2	8	750
18	24	1 1/4	Stud	7 3/4	8 1/4	750
20	24	1 1/4	Stud	8 1/4	8 1/2	750
22	24	1 1/2	Stud	9	9 1/4	1380
24	24	1 1/2	Stud	9 1/4	9 1/2	1380
26	28	1 5/8	Stud	10 1/4	10 1/2	1675
30	28	1 3/4	Stud	11 1/2	11 3/4	2190
34	28	1 7/8	Stud	12 1/2	13	2190
36	32	2	Stud	13	13 1/2	3300

TABLE 9-3

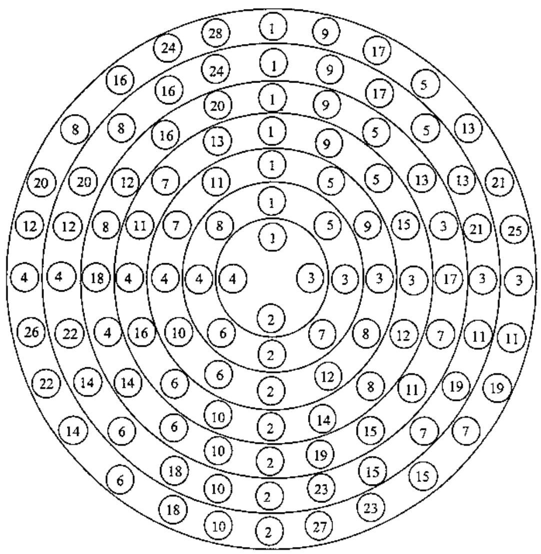
WELD NECK FLANGES

Nominal Size (Inches)	Wall Thickness Flange Hub at Bevel	
	ANSI 150 & 300	ANSI 400 & 600
2	.154	.218
3	.216	.300
4	.237	.337
6	.280	.432
8	.322	.500
10	.365	.500
12	.375	.500
16	.375	.500
20	.375	.500
24	.375	.500

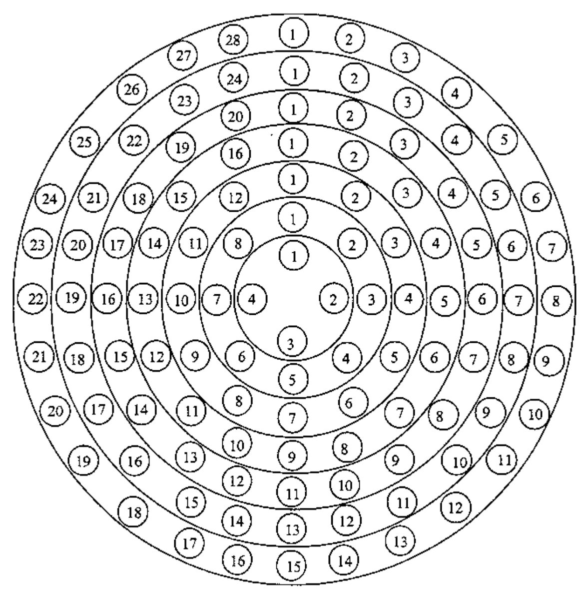
FIGURE 9-1

PROCEDURES
FLANGED JOINTS ON STEEL PIPE

Sets 1-3
Torque Set Sequence



Final Set
Torque Set Sequence



PROCEDURES
FLANGED JOINTS ON STEEL PIPE

TABLE 9-4

FLANGE PRESSURES

Material	Class	Max. Test Pressure psig
Cast Iron	125	275
Cast Iron	250	600
Steel	ANSI 150 lbs	425
Steel	ANSI 300 lbs	1100
Steel	ANSI 400 lbs	1450
Steel	ANSI 600 lbs	2175
Steel	ANSI 900 lbs	3250

PROCEDURES
STEEL PIPE CLEANING/PIGGING

10.0 PURPOSE

After testing a newly installed steel main 4" or greater in size, the gas pipeline will be flushed clean to remove of all dirt, rust, construction debris, water, and drying agents before being placed in service.

Cleaning (drying) shall be accomplished by pneumatically propelling pipeline pigs down the pipe tube. The pigs shall be introduced into the pipeline by means of a launching device.

10.1 PROCEDURE

The following general cleaning procedure shall be accomplished:

- Pig the pipeline with foam pigs until dry.
- Pig the pipeline with brush pigs to scrape and remove all mill scale, rust, and debris.
- Pig the pipeline with foam pigs until a ¼" or less of dust residue had penetrated the foam pig.

10.2 EQUIPMENT

Pigging shall be done with equipment that is capable of providing (blowing) -70°F dew point, dry air.

The cleaning pig shall be constructed of a flexible, polyurethane, (open cell) ester type foam. Drying types shall weigh approximately 2 lbs/cu.ft. The density of wiping and scraping type pigs shall be 8-10 lbs/cu.ft.

The cleaning pigs are to have a dished base and parabolic nose and have a length of approximately two times its normal diameter.

The cleaning pigs shall have the ability to negotiate short radius bends, ells, tees, and reduced port valves.

The cleaning pig for drying shall have a flexible seal composed of polyurethane on its tail.

10.3 SAFETY

Extreme caution shall be exercised when propelling pigs with compressed gasses as the pig may act as a projectile when exiting the pipeline.

10.4 PIPELINE CLEANING PLAN

Before cleaning and pigging any section of pipeline, a specific pipeline cleaning procedure (including pigs and equipment to be used) shall be developed and reviewed by the Operator.

PROCEDURES
STEEL PIPE PREFABRICATED RISERS

11.0 PURPOSE

Either prefabricated steel risers or anodeless risers may be used.

11.1 PREFABRICATED RISER

A. Prefabricated risers shall be properly bent without causing a wrinkle bend or with a weld ell and shall not contain a threaded or flanged joint.

B. Riser shall be 8" to 12" from the building or structure to which it serves.

C. When a steel riser is connected to a plastic service, locator rise shall not be electrically connected to the riser.

D. The locator wire shall be tied to the riser below the stopcock. **Not Cad welded.**

E. Sleeves, when required, are to be installed so that the top of the sleeve is approximately 6" below bottom of stopcock and above finished grade.

F. **Refer to section L-7 for proper wrapping procedure.**

G. Prefabricated risers shall have an approved factory coating or the riser shall be field wrapped.

H. Prefabricated risers shall include cathodic protection by placement of an approved anode or connection to the impressed current system.

I. Connection of the riser to the plastic service shall be by means of an approved fusion procedure, use of an approved transition fitting or use of an approved mechanical fitting.

PROCEDURES
MAIN AND SERVICE INSTALLATIONS / GENERAL

1.0 PURPOSE (192.301 – 192.143)

It is the purpose of this section to provide minimum requirements and information on the methods for the installation, extension, and abandonment of mains and services.

1.1 SCOPE

This section covers the following:

A. E-2 Installation Requirements
B. E-3 Methods of Installation
C. E-4 Locater Wire
D. E-5 Excavation / Backfill / Compaction
E. E-6 Casing and Sleeving
F. E-7 Abandonment and Reinstatement
G. E-8 Caution Tape
H. E-9 Pipe Bending

1.2 GENERAL

A. Mains:
1. Mains should be run parallel to the street or highway centerline, and in the location specified on the approved design plans.
2. Mains shall not be run through manholes or footings, but shall be offset around them.
3. Offsets in mains should preferably be made at a 45-degree angle, although a 90-degree offset may be used where field conditions require.
4. Mains should be installed in such a manner as to minimize any stress induced by construction and protect the pipe against damage.
5. EMS markers should be placed over any fitting, valve, electrofusion coupling, service tee or change of direction.

B. Services:
1. Commercial and industrial service lines may have a property line valve installed on service facilities when the service shutoff adjacent to the **MSA** will not be, or is not readily accessible for emergency use.
2. Services should be installed in such a manner as to minimize any stress induced by construction and protect the pipe against damage.
3. Service line valves shall be installed on a new or replaced service with an

installed meter capacity of more than 1,000 CFH if an excess flow valve is not installed **192.385. See Section G-2.**

NOTE: A facility can be considered a readily accessible location if, in an emergency situation, access can be gained 24 hours a day on any given day. Access arrangements can include the use of an Operators lock, an interlock arrangement with another entity, the use of bolt cutters to cut off locks, etc. If extraordinary means for gaining access are necessary, such as damaging structures (other than removing locks) or having to request access from another individual, a service shutoff valve should not be considered accessible.

4. Installation of services under concrete or paving, when continuous between structures, should be avoided whenever possible. If unavoidable, a sleeve shall be installed around the riser at ground level to allow venting. Existing risers encased in paving should be sleeved when the service line is repaired or replaced. **Refer to Section E-6.**
5. Polyethylene stubs are extended by squeezing off the pipe approximately one foot from the end cap. (**Refer to Section C-8**.) After the balance of the service has been leak tested, the tie-in connection shall be made and then soap tested at line pressure.
6. Risers, while not in use, shall have the stopcock in the off position, locked and plugged to prevent against unauthorized use of the facility.
7. Risers shall be installed in locations consistent with the operator's standards. (**Section F-2)**

C. Mains and Services shall be tested in accordance with **Section H-3**.

D. Under no circumstances may a main or service line run under a building. For building encroachments over a pipeline, the Operator will require the property owner to resolve the encroachments (i.e. move the building, or reimburse the Operator for the full cost of relocating the pipeline). The Operator will discontinue service to the customers for which the encroachment issues are not resolved.

E. All property corner markers, survey monuments, construction staking, archeological antiquities, mining claim monuments, etc., will be protected from damage. In the event of uncovering archeological antiquities, stop work (unless in an emergency situation), and report findings to the supervisor immediately.

Restoration is required if removal is necessary, unless previous arrangements have been made.

1.3 <u>INSTALLATION RECORDS</u>

A. Installation records for all gas pipeline and pipeline facilities shall be maintained for the useful life of the facility.

B. Records and Maps shall include the following:
   1. Size and type of all pipe and appurtenances
   2. Location including measurements from landmarks such as centerline, property line, milepost, stationing, etc.
   3. Type and location of tie-in
   4. Test record (see **Section H)**
   5. Sleeve or casing location and type including measurements from landmarks such as centerline, property line, milepost, stationing, etc.
   6. Placement of locator wire and/or caution tape
   7. EMS markers
   8. Footages
   9. Depths

C. Installation involving plastic pipe shall include the following additional information:
   1. Pipe batch number(s)
   2. Fitting manufacturer's unique lot identification number (bar code/QR code/written identifier
   3. Joint connection procedure utilized
   4. Pipe joiner signature and ID number

D. Installations involving steel pipe shall include the following additional information:
   1. Grade and wall thickness
   2. Specific rating of valves and other appurtenances
   3. Weld procedure utilized
   4. Location of welds and non-destructive tests performed
   5. Cleaning / pigging and purge procedures utilized and results
   6. CP reads

PROCEDURES
INSTALLATION REQUIREMENTS

2.0 PURPOSE

The purpose of this section is to establish the minimum requirements for which to install mainline and service line piping.

2.1 SCOPE

A. Depth/Cover
B. Bedding & Shading
C. Clearance

2.2 MAIN & SERVICE REQUIREMENTS

A. The depth to which pipe must be installed is termed cover. Cover is defined as the distance from the top of the pipe to the finished grade (or flow line if applicable). Plastic pipe is only to be installed below ground. When pipe is crossing a gutter or drainage area, the distance is measured to the bottom of the channel.

Distribution Main

Location	Normal Depth	Minimum Depth
Street/Right-of-Way	30 inches	24 inches
Other	30 inches	24 inches

Distribution Service

Street/Right-of-Way	24 inches	18 inches
Private Property	24 inches	18 inches

B. Trench bottoms should be:
- Relatively smooth
- Relatively free of rocks and debris that could damage the pipe
- Able to be sifted through a 3/8” screen

If the trench bottom material does not meet these requirements, bedding (padding) material should be used. The pipe must be continuously supported on undisturbed or well compacted soil or bedding material.

Where padding material is required, as noted above, pipe must be padded a minimum of 6” under the pipe and shaded a minimum of 6" over the pipe with material meeting the requirements for trench bottom materials.

C. Pipe shall not be installed against the trench wall. A minimum distance of 2" clearance shall be maintained between the pipe and trench wall. This will allow shading material to fill the void between the pipe and the trench wall.

D. There shall be a minimum clearance, both vertical and horizontal, of 8", wherever possible; between the gas line and any underground utilities that are parallel with or crossing the gas facilities (6” and larger pipe shall be 12” minimum). Less than 8" clearance is allowed only if gas lines are protected by a sleeve, but gas lines must never come in contact with other underground utilities.

Notwithstanding the clearances noted above, plastic pipe shall be installed far enough from underground sources of heat, or insulated against those sources of heat, so that the serviceability of the plastic pipe is not impaired.

E. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at a minimum of two feet from the edge of the excavation.

F. While lowering pipe into an excavation, care must be taken to avoid any damage to the pipe.

G. All piping and tubing shall be carefully visually inspected for cuts, dents, gouges and deep scratches before installation.

<u>Plastic Pipe and Tubing</u>
Any damage that is deeper than 10% of the wall thickness must be removed. **192.305 & 192.307**

1” IPS 0.120-inch wall thickness – 0.012-inch maximum allowable damage
2” IPS 0.216-inch wall thickness – 0.021-inch maximum allowable damage
3” IPS 0.318-inch wall thickness – 0.031-inch maximum allowable damage
4” IPS 0.409-inch wall thickness – 0.040-inch maximum allowable damage
6” IPS 0.602-inch wall thickness – 0.060-inch maximum allowable damage

In Service Plastic Pipe and Tubing
When in-service plastic pipe is exposed, damage as noted above will be repaired by cutting out and replacing a cylindrical section of pipe containing the entire damaged portion.

Steel Pipe
Each imperfection or damage that impairs the serviceability of a length of pipeline must be removed or repaired. If a repair is made by grinding, the remaining wall thickness must a least be equal to either:

(1) The minimum thickness required by the tolerances in the specification to which the pipe was manufactured; or
(2) the design pressure of the pipeline.

For the purpose of this section a "dent" is a depression that produces a gross disturbance in the curvature of the pipe wall without reducing the pipe-wall thickness. The depth of a dent is measured as the gap between the lowest point of the dent and a prolongation of the original contour of the pipe.

If a dent in steel pipe contains a stress concentrator such as a scratch, gouge, groove, or arc burn or affects the longitudinal weld or a circumferential weld. the dent shall be removed by cutting out and replacing a cylindrical section of pipe containing the entire damaged portion or by repairing using procedures in O&M Section D-6.

In Service Steel Pipe
When in service steel pipe is exposed, damage as noted above (dents, gouges, deep scratches), as well as corrosion damage will be repaired by cutting out and replacing a cylindrical section of pipe containing the entire damaged section or by repairing using procedures in O&M Section D-6.

Corrosion Damage
General corrosion. Each segment of generally corroded distribution line pipe with a remaining wall thickness less than that required for the MAOP of the pipeline, or a remaining wall thickness less than 30 percent of the nominal wall thickness, must be replaced by cutting out and replacing a cylindrical section of pipe containing the entire damaged section or by repairing using procedures in O&M Section D-6. Corrosion pitting so closely grouped as to affect the overall strength of the pipe is considered general corrosion for the purpose of this paragraph.

Localized corrosion pitting. Each segment of pipe with localized corrosion pitting to a degree where leakage might result must be replaced by cutting out and replacing a cylindrical section of pipe containing the entire damaged section or by repairing using procedures in O&M Section D-6.

H. Trenched located on steep grades may be subject to water penetration resulting in possible erosion of the trench. When such potential exists, trench breaks shall be installed. **Refer to Section E-5**

I. In the case of plastic pipe installations a locator or tracer wire shall be installed parallel with the pipe. Tracer wire may not be wrapped around the pipe and contact with the pipe should be minimized but is not prohibited. Electrical tape can be used to attach the tracer wire to the main at intervals not to exceed 20 ft. to assure that it remains in place over the pipe during backfilling.

2.3 <u>SERVICE AND TAP TEES</u>

A. Service tees shall be installed on top of the main whenever possible. If not possible the service or tap tee can be installed on the side of the main. In no case is it acceptable to install the service or tap tee on the bottom half of the main. **192.367 (a)**

B. The service tee shall have a minimum of 24” of cover, measured from the completion cap, whenever possible.

C. Caution shall be exercised during backfill to prevent undue torsional loading on the tee which may cause damage to the tee or mainline. Always support branch connections by adequately compacting the bedding material under the branch before continuing with the backfill.

D. PE service tees and tap tees may use an optional protective sleeve covering the connection of the tee to the service or main.

E. EMS marker ball shall be placed over the service tee.

PROCEDURES
METHODS OF INSTALLATION

3.0 PURPOSE

Four methods of installation are presented in this section. The installation methods are open trench, joint trench, boring and suspended.

Every effort will be made to protect customer property and vegetation from undue damage.

3.1 SCOPE

A. Open Trench
B. Joint trench
C. Boring
D. Suspended

3.2 OPEN TRENCH

The majority of pipeline installations are made in open trench excavations. This section outlines the procedure to be followed during excavating.

A. Preparation
1. The size and depth of the excavation will be determined by the nature of the job; however, the overall objective shall be to make the excavation as small and shallow as will permit the job to be safely and efficiently completed.
2. Field crews shall not start excavations or pavement cuts until the best location for the installation has been obtained from the available data.
3. All underground utility structures and obstructions should be located, marked and exposed ahead of trenching and digging equipment. Adequate and proper support shall be provided for other structures encountered in order to eliminate the possibility of resulting damage.
4. Trench bottoms should be smooth and free of rocks and debris that could damage the pipe or tubing. The pipe or tubing must be continuously supported on undisturbed or well compacted material.
5. Bedding material shall be used where rocky areas exist.

B. Barricading

Effective barricading is the primary means of both protecting the crew members at all construction sites and protecting the public from hazards incurred by the excavations. The crew leader will be responsible for placing barricades, signs, flagman, etc., in compliance with the governing body to:

1. Maintain as free a flow of traffic as practical.
2. Protect the crew from traffic.
3. Protect motorists and pedestrians.
4. Protect excavations, which are left open and unattended during darkness.

C. Drainage

1. During wet weather, provisions must be made for proper flow of drainage water. The flow of water should be directed to follow its natural course and away from the trench. Implement City's Best Management Practices (BMP's).
2. Drainage runoff should not be allowed to accumulate in an excavation.

D. Sloping and Shoring

1. Shoring or sloping the sidewalls of the trench or excavation is required under certain conditions to the protect individuals entering the excavation from cave-ins and personal injury
   Refer to Section B-8.

3.3 JOINT TRENCH

This section provides the specifications that will meet Operator requirements for providing a trench, which would accommodate gas mains and other utilities. Gas mains may be installed with other utilities provided the trench is located within a dedicated street or recorded easement. The gas mains may be installed in a joint trench with the following utilities: electric (primary or secondary), telephone, television or water, provided the stated clearances are maintained.

Gas lines installed in the same trench as sewer lines should be avoided. When this is not possible a minimum vertical clearance of 24" should be maintained between the gas line and sewer line. The sewer line must be on the bottom.

A. Installation Procedure

1. All trench depths shown on Figures 1 through 3 will be from finished or final grade.
2. There shall be a minimum clearance, either vertical or horizontal, of 8" between the gas line and any underground utilities that are parallel with or crossing the gas facilities (6" or larger line shall be 12" min.). This applies to all crossings of other utilities. Less than 8" clearance is allowed if gas lines are protected by a sleeve, but gas lines and sleeves must never come in contact with other underground utilities.

3.4 BORED

A. Installation

This section presents the methods for bore installation.

1. Prior to any boring operations, all underground structures must be located and exposed where necessary. Site holes shall remain open throughout the entire process to ensure safe installation is completed. **192.329 (a), 192. 376 (a)**
2. There shall be a minimum clearance, either vertical or horizontal; of 8" between the gas pipe and any other underground utilities (6" or larger line shall be 12" min.)
3. The section of existing main shall be located and exposed prior to boring. The bell hole at the main should be of sufficient size to allow for the tie-in.
4. Bore pits should be spaced so as to permit the job to be efficiently completed.
5. The borehole should be reamed to provide easier pipe installation.
6. When coated pipe is to be installed in a bore, care must be exercised to prevent damage to the coating during installation.
7. Installation of polyethylene pipe by the boring method, where soil conditions do not meet the requirements of **Section E-5** for bedding and shading material must be inserted in a protective sleeve. **Refer to Section E-6, Sleeving Requirements.**
8. Precautions shall be taken to prevent damage or undue stress on plastic pipe when the pipe is pulled through a bore with the aid of a bore machine or other mechanical pulling devices. A break link or weak link must be used with mechanical boring equipment. **192.329 (b), 192.376 (b)**
9. It is good practice to install two (2) locator wires with plastic pipe through the protective sleeve.
10. Only individuals qualified in the operation of the equipment shall use such equipment. Refer to manufacturer's operation manual.

11. The aiming, alignment and leveling of the equipment is very important in assuring an accurate bore shot.
12. During the bore operation, some method should be used to allow the leading end of the bore equipment to be located by measurements, or instrumentation.
13. For push-pull type equipment, special care should be taken if an expander is used to enlarge a borehole. The expander can damage other utilities, when pulled back through due to the larger size.

B. Safety

1. Prior to making any underground boring, tunneling, or piercing operation the work area shall be marked for other utilities that may be in conflict with the path of proposed boring operation. These crossings shall be potholed to expose the facilities in question to ensure no contact or damage is inflicted by boring equipment. Potholes or sight holes shall remain open during the entire boring process to ensure that no damage is caused and that backfill is adequate.
2. All hydraulic supply hoses and fittings shall be inspected periodically while in use to guard against failure.
3. Boring equipment shall be maintained and lubricated per manufacturer's operator's manual.
4. Entry and receiving excavations shall comply with the requirements set forth in the excavation safety section of this manual. (Section B-7)
5. Crew members shall avoid entering the receiving excavation while the boring equipment is in operation if in the judgment of the crew leader the force of the equipment may subject the excavation to excessive vibration.
6. Upon completion of the bore, the equipment shall be examined prior to being handled to ensure that it has not been subjected to voltage by contacting underground electric cables. Personnel shall check for voltage by using a voltage meter before handling boring equipment after the bore.
7. Due to the weight of hydraulic boring equipment, care should be taken to avoid personal injury during handling.
8. Appropriate verbal and hand signals shall be established prior to starting the boring operation should the need for emergency shutdown arise. To avoid confusion, only one person should give signals.
9. Proper personal protective equipment shall be utilized anytime boring equipment is in operation.
10. Avoid placing tools and supply lines across traffic areas to help reduce tripping hazards.

PROCEDURES
METHODS OF INSTALLATION

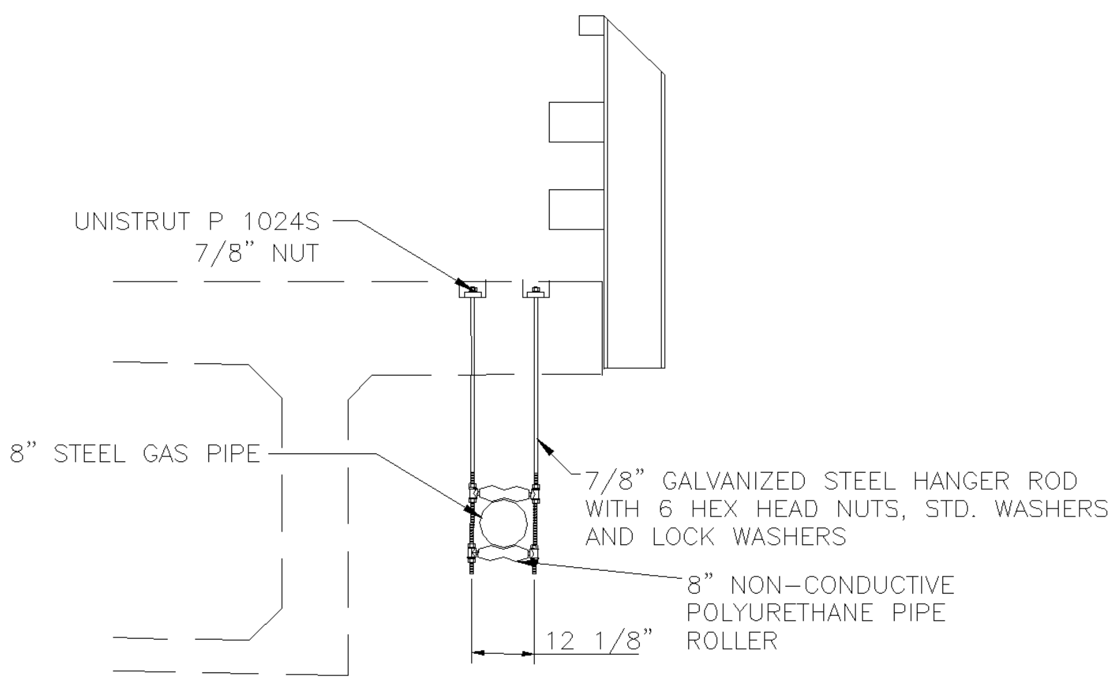
3.5 SUSPENDED

A. There are occasions when it is necessary to suspend gas facilities from existing or newly constructed above ground facilities to facilitate the best possible installation.

B. Steel facilities may be permanently suspended in an above ground location. Approved for above ground UV protective coating shall be applied. Suspended pipe shall be installed in a way to allow for movement caused be expansion and contraction of the pipe caused by temperature changes.

C. Plastic facilities may be temporarily suspended in an above ground location for a maximum of 2 years not to exceed 24 months. Precautions shall be taken to protect the plastic pipe for damages caused by outside forces.

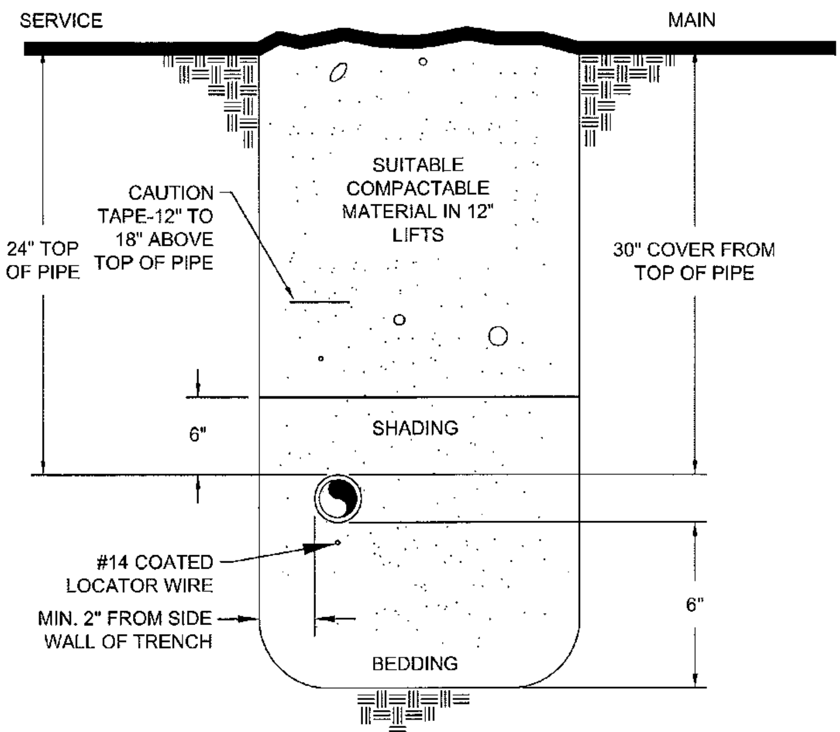
PIPE HANGER DETAIL



PROCEDURES
METHODS OF INSTALLATION

FIGURE #1

(TYPICAL) GAS ONLY



NOTE:

a. Nominal cover for gas main-30". Nominal cover service 24".

b. 24" Minimum cover from top of service tee.

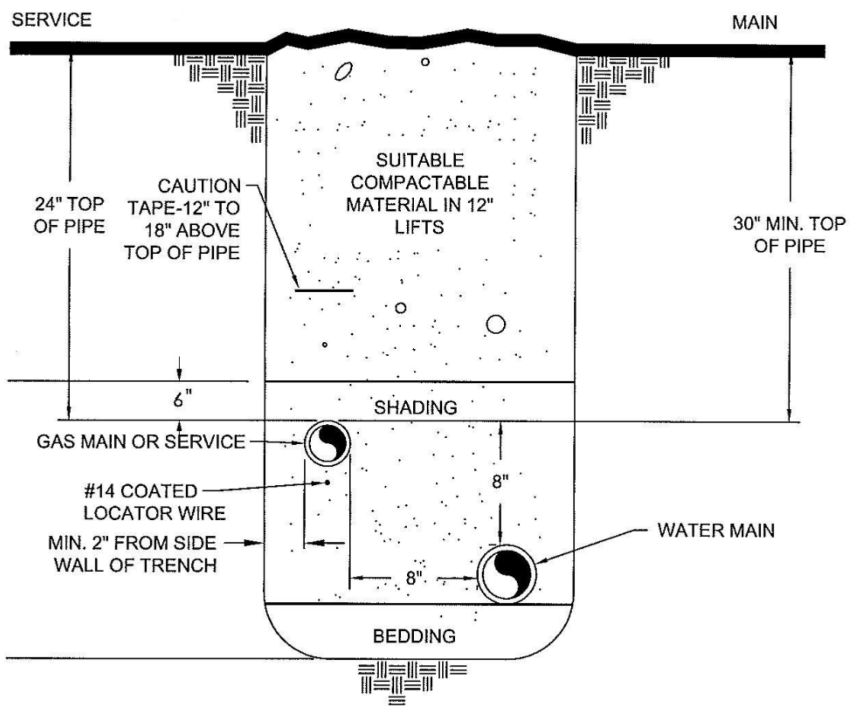
c. Minimum clearance of 8" between gas main and nearest utility.

d. All compaction will comply with the government agency involved.

PROCEDURES
METHODS OF INSTALLATION

FIGURE #2

(TYPICAL) GAS & WATER



NOTE:

a. Nominal cover for gas main-30". Nominal cover service 24".

b. 24" Minimum cover from top of service tee.

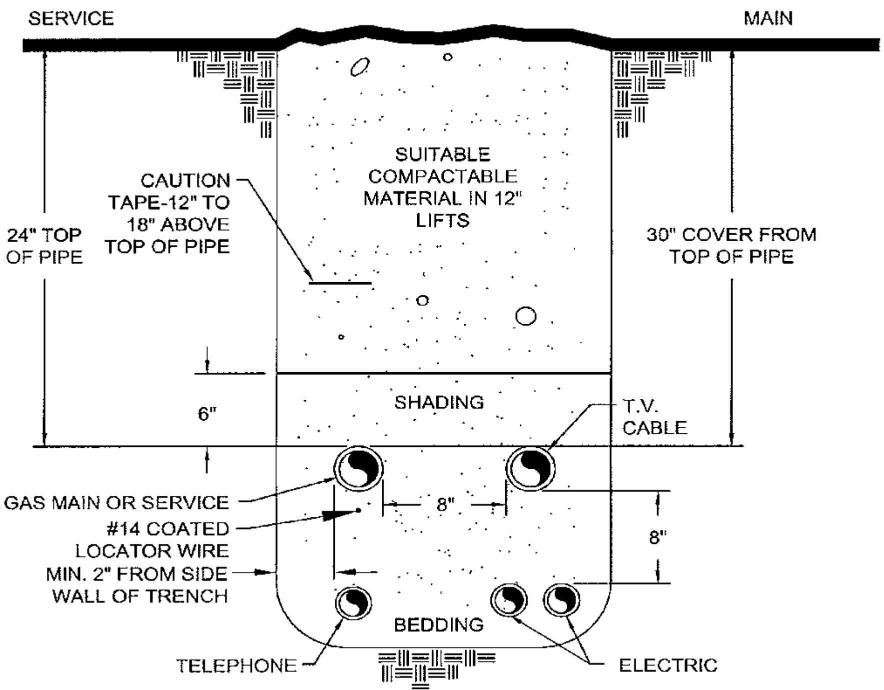
c. Minimum clearance of 8" between gas main and nearest utility.

d. All compaction will comply with the government agency involved.

e. Electric must be below or to the side of gas pipe.

PROCEDURES
METHODS OF INSTALLATION

FIGURE #3
(TYPICAL) GAS,
ELECTRIC, TEL. &
T.V.



NOTE:

a. Nominal cover for gas main-30". Nominal cover service 24".

b. 24" Minimum cover from top of service tee.

c. Minimum clearance of 8" between gas main and nearest utility.

d. All compaction will comply with the government agency involved.

e. Electric must be below or to the side of gas pipe.

PROCEDURES
LOCATOR WIRE

4.0 PURPOSE

Locator wire (also referred to as tracer wire) shall be installed with all PE or other non-metallic pipe for accurate locating of the natural gas facilities as required by law.

NOTE: It is of paramount importance that all broken or damaged locator wires be spliced or replaced.

4.1 SCOPE

A. Wire
B. Wire Connectors
C. Connection to Steel Main

4.2 WIRE

1. Locator wire shall be coated and resistant to corrosion damage, suitable for burial.
2. Wire shall be a minimum #14 gauge, solid copper (Type TW). Other approved locator wires include the following:
   a. #12 solid copper coated
   b. Copper clad steel wire with 30 mil high density PE jacketing
3. Wire shall be installed directly below or above the pipe when and where possible.
4. Wrap wire once around service tee to avoid separation.
5. Wire shall be installed as to allow only minimum contact with the pipe, **NOT** spiral wrapped around the pipe.
6. Wire may be taped to the pipe at intervals sufficient to maintain a close proximity to the pipe for locating purposed and when inserting the pipe.
7. Wire shall be installed with sufficient slack as to allow for expansion and contraction, and shall be brought up 12 inches (minimum) above grade in valve boxes.
8. Locator wire shall be wrapped a minimum of three times around the service riser, below the stopcock, secured to the riser with electrical tape, and a wire connector placed over the end of the wire.
9. **Do Not** allow the wire to make direct contact to the metal riser creating a short.

4.3 WIRE CONNECTORS

A. There are a number of approved methods for connecting multiple locator wire(s) including but not limited to the following list:
   1. 3M Wire Connector
   2. Split Bolt
   3. Crimp Sleeve
   4. Wire Nut
   5. Direct Bury Lug

B. Wire connector may incorporate self waterproof, corrosion proof seal.

C. All connections shall be sealed.

4.4 DEAD END / BRANCH STUBS

Where it may become difficult to accurately locate stubs and dead ends you shall:
1. Place an EMS marker.
2. Place a depth marker and run tracer wire up depth marker above grade with a wire connector.

4.5 CONNECTION TO STEEL MAIN

Installations where a plastic service line is tied on to steel mainline piping, for locating purposes, the service locator wire may be attached to the steel by using either the brazing or thermit weld process. This should be first approved by your corrosion department before attaching the wire. **Refer to Section L-3.**

4.6 CONNECTION TO ISOLATED STEEL SECTION

There are instances where a short section of PE pipe is utilized for repair / replacement of an existing cathodically protected steel pipeline.

1 A bond wire may be required to continue adequate cathodic protection across the replacement pipe. In some cases a length of locator wire may be adequate.

2 Ensure that bond wire is sized appropriately for adequate cathodic protection. **(Reference Section L C.P.)**

PROCEDURES
EXCAVATION / BACKFILL / COMPACTION

5.0 PURPOSE

The requirements for backfill and compaction pertain to new construction and repairs and are applicable any time the pipeline is uncovered and the back fill is replaced.

5.1 SCOPE

A. Excavation
B. Protection against shear loads
C. Padding & Shading
D. Backfill Material
E. Compaction
F. Trench Breaks

5.2 EXCAVATION

A. The operator/contractor shall be responsible to mark planned excavation area and call the appropriate **One-Call System**. Appropriate time shall be allowed for applicable locates to take place before any excavation begins.

B. Dust control shall be maintained throughout the job by watering and clean up of materials creating the dust.

C. Noise control is the responsibility of the company/contractor performing the work. All work equipment shall have appropriate noise muffling devices. Local noise ordinances must be followed throughout the job.

D. The Company/contractor shall limit normal hours of operation between the hours of 7:00 AM and 7:00 PM unless emergency conditions warrant otherwise.

E. The company/contractor shall remove all foreign water entering the trench. **Refer to Section E-10**

G. All excavations shall be clearly marked with barricades / cones / caution tape to protect the general public and keep unauthorized individuals from entering work site.
Section B-5, Traffic Safety

5.3 PROTECTION AGAINST SHEAR AND BENDING LOADS

A. Support pipe, polyethylene branches and service pipe where joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main with properly placed and compacted backfill under and around the pipe and fittings. The backfill should be compacted sufficiently to support the pipe and appurtenances eliminating vertical movement.

If compacted backfill will not provide sufficient support, other protective measures such as protective sleeves may be used where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main.

B. Proper support and, if needed, additional protective measures are necessary for all types of plastic and non-plastic branch connections including heat fusion, mechanical, and electrofusion types.

C. Properly placed, compacted backfill may be used together with a protective sleeve or other protection measures, but whether or not additional protective measures are used, the area surrounding the connection must be embedded in properly placed, compacted backfill to protect the polyethylene pipe against shear and bending loads.

5.4 PADDING AND SHADING

A. When protection from the back-fill material and operation is required, the pipe must be padded a minimum of 6” under and shaded a minimum of 6” over the pipe.

B. Shading and bedding shall be a sandy/silty material smooth, free of rocks, and must be able to sift through a 3/8” screen. In certain conditions additional shading may be required.

NOTE: Manufactured material, such as crushed rock, should not be used due to sharp edges. If only manufactured material is available, close inspection is necessary.

5.5 BACK-FILL MATERIAL

The back-fill material and its compaction shall meet the requirements of the City of

Victorville.

A. In general, back-fill material shall be of the same material as that removed from the excavation except:
1. Where no-shrink material, or other imported material is required by the governing authority.
2. Where material is of such a nature as to be harmful to the pipe. Avoid rocks larger than 3" in diameter back-filled in the first lift above the shading material.
3. Where wet conditions have rendered the back-fill material too soft for adequate support.

5.6 <u>COMPACTION</u>

A. Excavations shall be compacted as required by the City of Victorville or the Operator's standard as may apply.
1. Adequate support for the pipe must be provided during the back-fill process to avoid damage to pipe caused by torsion forces.
2 Pay particular attention to material providing adequate support under tees, particularly service / tap tees.
3 No lift shall be greater than 12".
4 Where slurry cement backfill is necessary it shall consist of a fluid, workable mixture of commercial quality concrete sand, cement and water. Not less than 94 pounds of cement shall be used for each cubic yard of material product.
5 An appropriate aggregate base equal to any removed shall be place back at the top of the trench in preparation for asphalt or as required by the City of Victorville.

B. The purpose of compaction is to prevent trench failure i.e. sinking, washout, etc.

C. Acceptable methods of achieving compaction are:
1. Wheel roll (non-paved and non-travel areas only)
2. Mechanical and air tampers
3. Water jetting
4. Compaction wheel

D. Outside laboratory testing should be utilized when required.
1. Shall meet the requirements of the City of Victorville.

5.7 TRENCH BREAKS

Where uphill trenches may be subject to heavy water run-off it may be necessary to install trench breaks to prevent loss of backfill material which may subject the gas pipe to potential damage.

A. Slope grade exceeding 20%:

1. Trench breaks shall be placed at intervals of 100 linear feet in separation.
2. Trench breaks may consist of sandbags, clay bags, and / or other material sufficient to slow potential erosion of the trench backfill materials.
3. Trench breaks shall be carefully placed under and around the gas pipe as not to damage the pipe.
4. Over excavation of the trench bottom and side walls at the placement location will assist in holding the trench breaks in place.

PROCEDURES
CASING AND SLEEVING

6.0 PURPOSE

It is the purpose of this section to provide minimum requirements and information on the installation of pipe casing and sleeving.

When installing sleeving or casing in an open trench, caution tape shall be placed 12” to 18” above the sleeve or casing. **Refer to Section E-8**

6.1 SCOPE

A. Sleeve Installation
B. Casing Installation
C. Documentation

6.2 SLEEVING

Sleeving is normally installed through a bored hole; however, in some instances, permission may be obtained to open cut for the installation. When the open cut method is used, the soil beneath and around the sides of the lower one-half of the sleeving shall be properly compacted. If the native soil is not suitable for compaction, sand, or other suitable compatible material shall be used.

A. For bores, when the native material does not meet the shading/padding requirements. **Refer to Section E-5**

B. To protect the gas carrier piping when minimum clearances from substructures cannot be maintained.

C. When minimum cover cannot be obtained.

D. To facilitate future replacement of gas facilities, such as street or ROW crossings.

Each sleeve shall comply with permitting and regulatory requirements.

E. The following requirements should be followed when using sleeving:

1. Sleeving material shall be yellow PE, yellow schedule 40 PVC, or steel pipe.

<u>NOTE</u>: **Schedule 40 PVC may be used for sleeving. At no time should this material to be used for gas carrier piping**. Plastic sleeving shall be marked "natural gas sleeving".

2. Shading material is not required where sleeving is utilized. Care must be used to avoid damaging the sleeving during installation and backfill operations. Tracer wire should be installed inside the sleeving.

3. Plastic pipe that is inserted into a sleeve or casing must be installed in a manner that will protect the plastic pipe. The plastic pipe must be protected from damage at all entrance and exit points of the sleeve or casing. The leading edge of the plastic pipe must be closed before insertion. **192.321**

4. When sleeving terminates at or near a building, the end nearest the building shall be sealed to avoid possible migration of escaping gas. End seals may also be used to minimize backfill materials from entering the sleeving.

   - Remove any burrs or sharp edges from end of sleeve/casing.
   - Slide end seal onto sleeve/casing before installation of carrier pipe.
   - Install appropriate bushing into end of sleeve/casing. Electrical tape can be used to hold bushing in place.
   - Insert carrier pipe (with tracer wire where applicable). Install sealant strip by sandwiching tracer wire between two layers of sealant. Over wrap with one layer of electrical tape.
   - Hold cold shrink seal and pipe in proper position and unwind core counterclockwise.

4. The PVC sleeving should be joined using cement. Care must be used to minimize the amount of cement used on the socket, as any excess will puddle inside the sleeving. Allow adequate time for cement to dry to avoid wet cement from contacting the PE pipe.

6.3 <u>CASING</u>

A. Welding

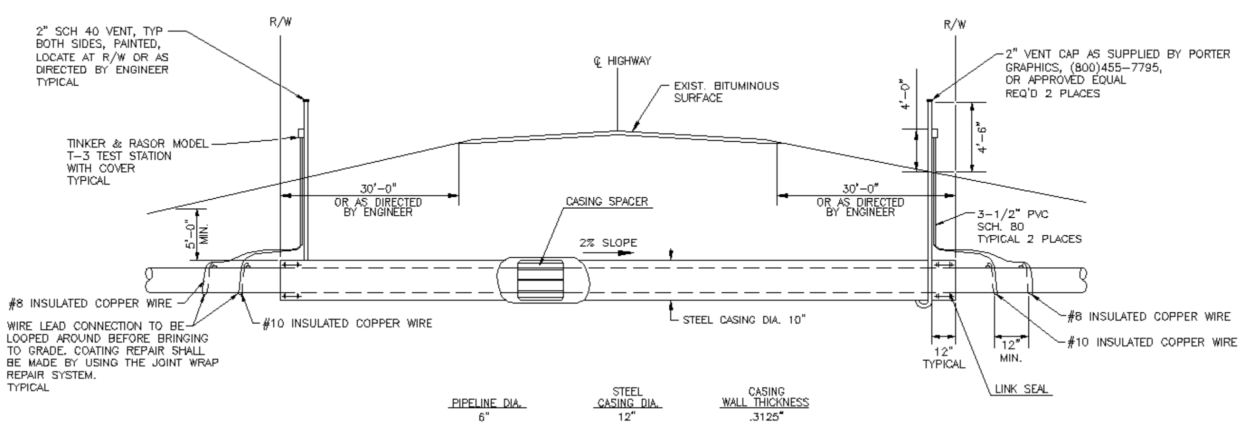
All welds in casing pipe shall be complete, full-penetration welds, properly aligned and made by a qualified welder. Any offset in casing pipe shall be held to 1/16" or less in the bottom quadrant. Casing pipe shall be installed so that alignment and slope are uniform throughout the entire length.

B. Vent Pipes

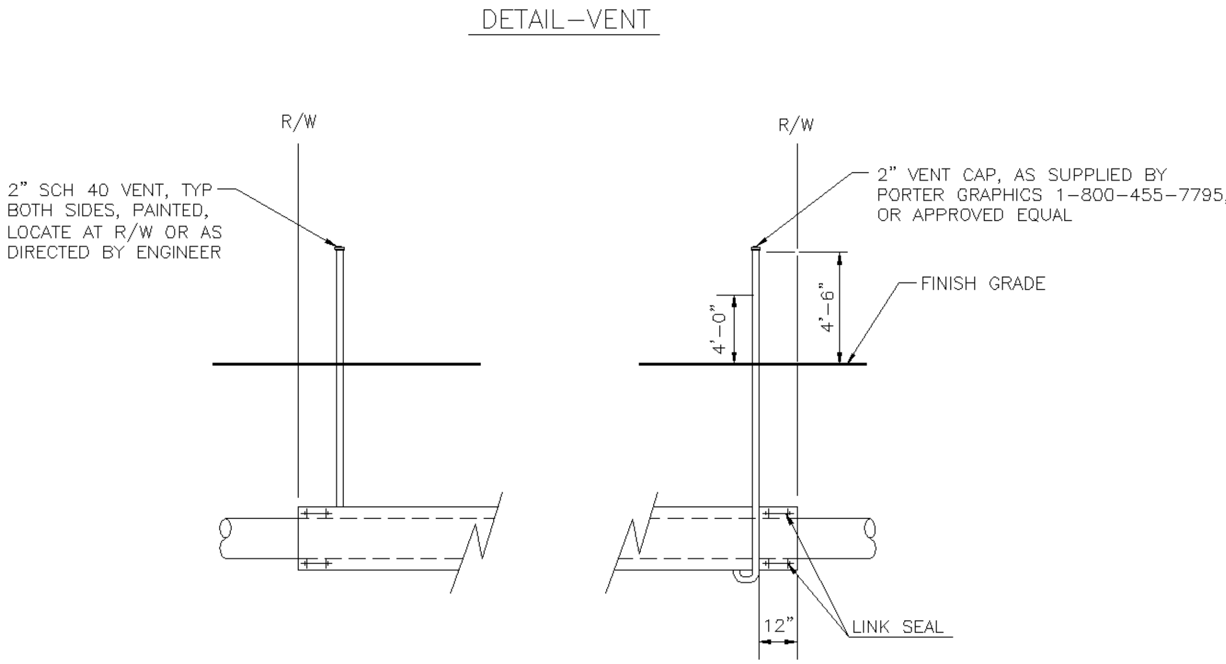
1. All steel casings shall include vent pipes.

2. Vents shall be installed 3 ft aboveground with an approved vent cap adequate to prevent rain or other foreign material from entering the vent and causing a blockage.

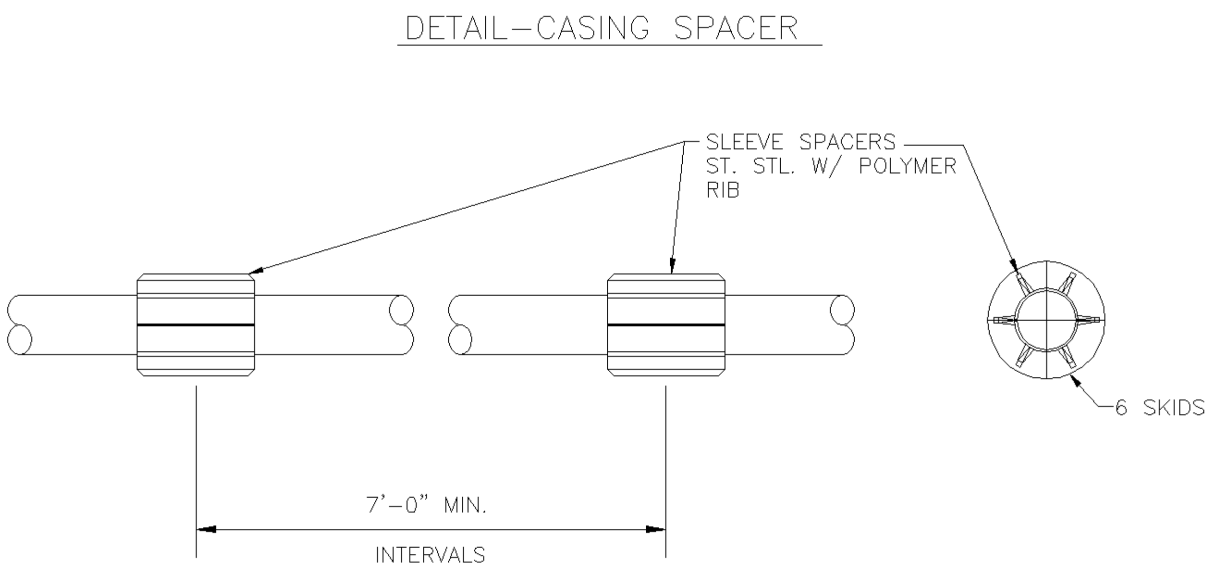
DETAIL – CASING UNDER HIGHWAY (STEEL NATURAL GAS PIPE)

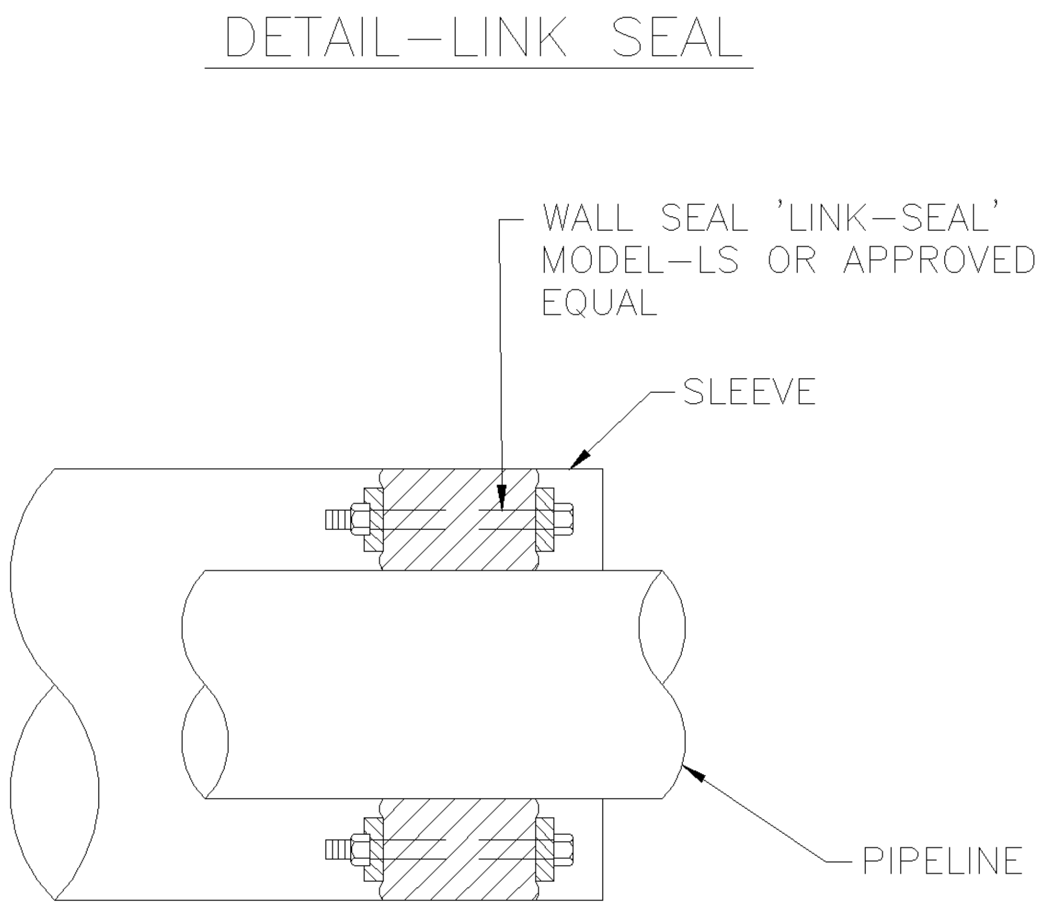


PROCEDURES
CASING AND SLEEVING



PROCEDURES
CASING AND SLEEVING





6.4 DOCUMENTATION

When casing or sleeving is used, the location, size, and type of casing or sleeving shall be clearly documented on the appropriate forms.

PROCEDURES
ABANDONMENT AND REINSTATEMENT

7.0 PURPOSE (192.725 & 192.727)

This section describes the methods to be used for abandonment and reinstatement of pipeline facilities.

7.1 SCOPE

A. Abandon
B. Reinstate

7.2 ABANDONMENT

Each Operator facility or pipeline that is abandoned or inactivated within its operating area must be abandoned or inactivated in accordance with a plan which shall include the following:

A. Each facility abandoned in place and lines not subject to gas pressure, except when undergoing maintenance, must be disconnected from all sources and supplies of gas, purged of gas, and the ends sealed.

B. If air is used for purging, the operator shall ensure that a combustible mixture is not present after purging.

C. Except for service lines, each inactive pipeline that is not being maintained under this operations and maintenance manual must be disconnected from all sources and supplies of gas, purged of gas, and the ends sealed.

D. Each abandoned vault must be filled with a suitable compacted material to prevent future collapse.

E. A gas service should be abandoned when it is no longer used or useful for carrying gas or when inactive for 36 months. Part or of all of a service line may be abandoned, depending on the circumstances.

F. Services to be abandoned will normally be cut at the source of supply when any of the following conditions exist:

1. The main is not under pavement.

2. The condition of the pipe indicates that a stub would not remain leak free

PROCEDURES
ABANDONMENT AND REINSTATEMENT

for the life of the main.

G. In all other cases, services should be abandoned adjacent to the curb or property line.

H. Verify 0% gas with CGI. **Refer to Section H-5**.

I. All open ends of abandoned main and service piping shall be securely sealed.

J. Service riser shall be cut off below grade.

7.3 <u>REINSTATING ABANDONED FACILITIES</u>

Abandoned facilities may be reinstated under the following conditions:

A. Facility must be polyethylene pipe or protected wrapped steel pipe.

B. Facility must have existing locator wire or be able to be accurately located by documentation.

C. Facility must pass a pressure stand-up test. **Refer to Section H-3**

D. Purge facility. **Refer to Section H-5**

PROCEDURES
CAUTION TAPE

8.0 PURPOSE

The purpose of this section is to establish the minimum requirements for the installation of caution tape with all newly installed or replaced gas mains and services.

8.1 SCOPE

A. Installation of caution tape.

8.2 CAUTION TAPE

Caution tape shall be:

A. Installed 12” to 18” directly above the pipe.

B. Yellow in color.

C. Caution tape shall state **CAUTION - BURIED GAS PIPELINE.**

D. Installer shall take precautions to ensure that the caution tape is protected and remains above the gas piping during the backfill process.

E. When installing main or service in sleeve or casing in an open trench, place the caution tape 12” to 18” above the sleeve or casing.

F. Plastic material.

PROCEDURES
PIPE BENDING

9.0 PURPOSE (192.313 192.315)

Bending is an acceptable method to accomplish a change of direction during the installation of steel and plastic pipe.

9.1 SCOPE

A. Plastic Pipe
B. Steel Pipe

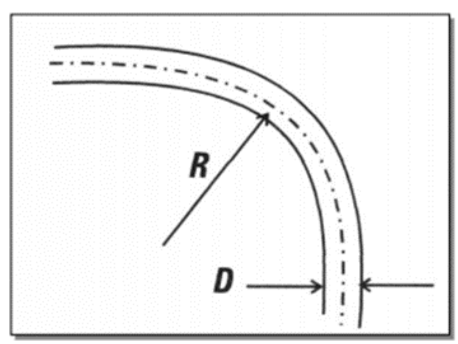
9.2 PLASTIC PIPE:

A. When necessary to bend pipe around a corner or avoid an object, there is a minimum bend radius that must be adhered to. This radius is based on the OD and wall thickness of the pipe.

Note that considerable force may be required to field bend polyethylene pipe and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending. This is the case whether bending coiled or straight-stick pipe.

Use the following table to determine the bend radius, as indicated by the figure.

Pipe Size	Actual OD ("D")	SDR 11 and 13 Bend Radius ("R")
½" CTS	0.625"	16" (1'-4")
1" CTS	1.125"	29" (2'-5")
1" IPS	1.315"	33" (2'-9")
2" IPS	2.375"	60" (5'-0")
4" IPS	4.500"	113" (9'-5")
6" IPS	6.625"	166" (13'-10")



B. No fittings may be installed within the bend area.

C. The bend area refers to the change in direction of the main other than the normal snaking of the pipe in the trench.

D. Turns of 90 degrees or greater shall be accomplished by means of installing a manufactured elbow.

9.3 STEEL PIPE:

A. Wrought steel elbows shall be used where bends are required to construct the pipeline on the alignment shown on the plans and when bending of the steel pipe is not practical or allowed.

Elbows may be trimmed to create the exact deflection angle. Wrought steel welding elbows and trimmed segments of these elbows may not be used for changes in direction unless the arc length measured along the crotch is at least 1 inch. Elbows shall be trimmed if necessary to taper the wall thickness to match the pipeline wall at welds.

B. Mechanical bending of the steel pipe shall be allowed when done in compliance with the following requirements:

1. A bend must not impair the serviceability of the pipe.
2. Each bend must have a smooth contour and be free from buckling, cracks, or any other mechanical damage. Bends having excessive distortion or flattening will be rejected.
3. Wrinkle bends are not permitted.
4. The longitudinal weld on the pipe must be near as possible to the neutral axis of the bend (pipe seam not in the bend area) unless: the bend is made with an internal bending mandrel; or the pipe is 12 inches or less in outside diameter or has a diameter to wall thickness ratio of less than 70.
5. Each circumferential weld of steel pipe which is located where the stress during bending causes a permanent deformation in the pipe must be non-destructively tested either before or after the bending process.
6. The bend shall not exceed the maximum bending radius for the particular pipe in use. The maximum bending radius for the pipe shall be specified by the engineer or as shown on the plans.
7. Sagging may be used to make vertical adjustments in the pipe to accommodate crossings of other structures. Minimum sag distances shall be calculated using the following formula:

$$L = 227 * (H*D)^{0.5}$$

L = the minimum length to achieve by the bend in feet,
H = the difference in elevation achieved by the bend in feet,

and

D = the outside diameter of the pipe in inches.

Sags must begin and end a minimum of this distance from the structure to be crossed.

PROCEDURES
BEST MANAGEMENT PRACTICES (BMPs)

For any Best Management Practices related to construction on the VMUS system, refer to the City of Victorville BMP's maintained by the City of Victorville Engineering Department.

PROCEDURES
METER SET ASSEMBLIES

1.0 PURPOSE:

It is the purpose of this section to provide minimum requirements for meter set assemblies.

1.1 SCOPE:

This section covers the following:

A. F-2 Meter & Riser Locations
B. F-3 Meter Handling & Installation
C. F-4 Meter Turn-On & Regulator Flow & Lockup
D. F-5 Meter Turn-Off & Removal
E. F-6 Meter Bypassing
F. F-8 Stopcock Change-out

1.2 GENERAL

A. Meter set assemblies (MSA) normally conform to standardized designs but may require specialized designs by the Engineer.

B. All meters will have been tested to a minimum of 10 psig.

B. Each meter set assembly will include an appropriate service regulator unless the design specifically requires full line pressure.

C. Each meter set assembly will include a stopcock. New installation will include a bypass on the riser & the meter set assembly.

D. Whenever a technician visits an MSA, he/she shall note any presence of atmospheric conditions observed.

E. MSA shall always be level to avoid undue stress on pipe and fittings.

F. Meter set assemblies shall be in a well ventilated area.

PROCEDURES
METER & RISER LOCATIONS

2.0 PURPOSE

This section provides minimum requirements on the approved locations for gas meter set assemblies (MSA).

2.1 SCOPE

A. Location

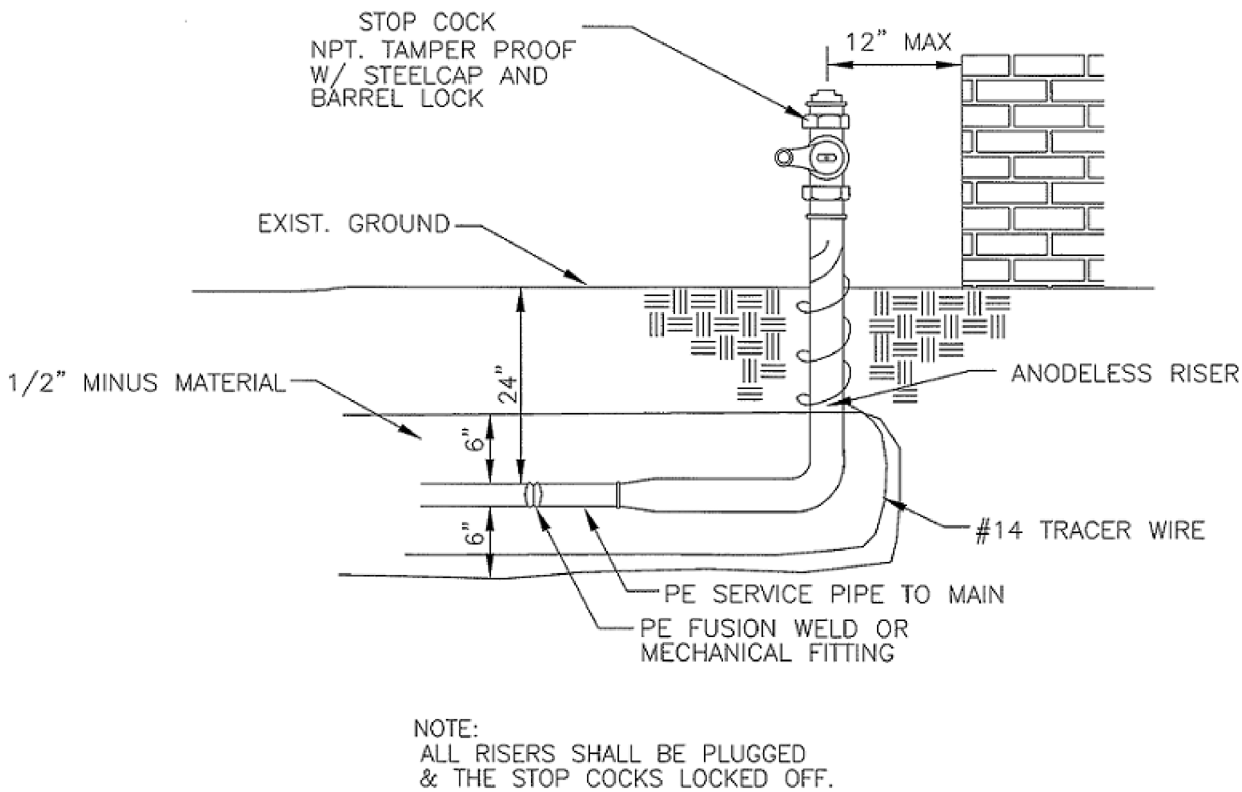
B. Exception

2.2 LOCATION

A. Service risers and MSA shall be located outside in safe locations.
   1. Be outside where readily accessible and in a well ventilated area where gas from the vent can escape freely into the atmosphere and away from any opening into the building.
   2. Be adequately protected from damage.
   3. Include the installation of a readily accessible stopcock on the high-pressure, inlet side of the meter, before the service regulator.
   4. The regulator vent shall be a minimum of 3 feet from a mechanical intake or a source of ignition and 18 inches from any opening to a building. The distance shall be measured from the regulator vent.

B. Service risers and any portion of the MSA when installed shall **not** be:
   1. In an area where the riser will be subjected to damage, such as adjacent to a driveway, unless protected by an adequate guardrail, etc.
   2. Under an open able window.
   3. In an area where the riser will be subjected to excessive corrosion or vibration.
   4. In an area where the MSA or riser will be under an electric meter and/or electric panels.
   5. Under a mobile home or fire escape.
   6. In unventilated spaces.
   7. In areas where the meter set can be damaged by submergence due to flooding.

PROCEDURES
METER & RISER LOCATIONS



2.3 EXCEPTIONS

Meter may be installed in vaults or other enclosures only when:

1. No aboveground alternative is suitable.
2. The MSA is properly protected from damage.
3. The service regulator is properly vented to the outside atmosphere, or an internal relief regulator is utilized.
4. Appropriate steps are implemented to drain excess water.
5. Any vault installed in a location where vehicular traffic can reasonably be expected shall be a traffic rated vault

PROCEDURES
METER HANDLING & INSTALLATION

3.0 PURPOSE

This section establishes procedures for the proper handling and installation of gas meters.

3.1 SCOPE

A. Proper handling and care of meters

B. Meter set installation

3.2 METER HANDLING

A. Care shall be exercised at all times when handling natural gas meters to avoid jarring or damaging the meter.

B. Meters shall remain in their upright position at all times.

C. Care shall be exercised to ensure that the proper meter is installed to match the customer gas requirements.

3.3 METER SET INSTALLATION

A. Meter Set Assemblies shall, whenever practical, be installed at the structure limiting the installation of customer owned and maintained houseline or yard line.

B. Property line sets are acceptable only when it is most practical for the customer and the Operator.

C. Meters will not be set for mobile homes unless the connection between the rigid mobile home pipe and the gas riser or supply is by an approved, adequately sized, flexible connector. Connector is not to exceed a maximum of 6' in length.

NOTE: Each mobile home shall have an approved gas shutoff valve down stream of the operator's meter. This valve shall not be located under the mobile home.

D. Newly installed service regulators **will not** be located in confined spaces other than a vault or other enclosure previously approved by the Operator.

E. All service regulators shall be vented to the outside atmosphere unless an approved internal relief regulator is used. All regulator vents shall have a screen. **192.355 (b)**

F. If a meter set assembly becomes enclosed, the operator shall require the customer to reimburse the entire cost of relocating the MSA to the closest approved outside location.

G. Regulators should not be installed in a position that results in the vent opening facing upward.

H. Regulators installed in a position that results in the vent opening facing in a horizontal position shall have a street ell installed in the opening, using pipe thread compound on the threads, and the ell secured in place with the opening facing downward. Remove and replace regulator screen in the ell.

I. A manifold should be used on all multiple meter sets.

1. The manifold pipe size shall be minimum 2". This size will be adequate for up to and including 15 AL 250 meters or their equivalent. Installations involving greater capacity shall be sized by the Engineering Department.

2. Each houseline to be attached to the operator’s manifold shall be tagged by the customer to clearly identify the customer to be served.

J. Clean and paint the meter and meter set assembly as necessary, using only approved for above ground UV protective paint, to protect against atmospheric corrosion.

K. Whenever signs of atmospheric corrosion are present, appropriate corrective action shall be taken, up to and including relocating the entire MSA and document findings and disposition on service order.

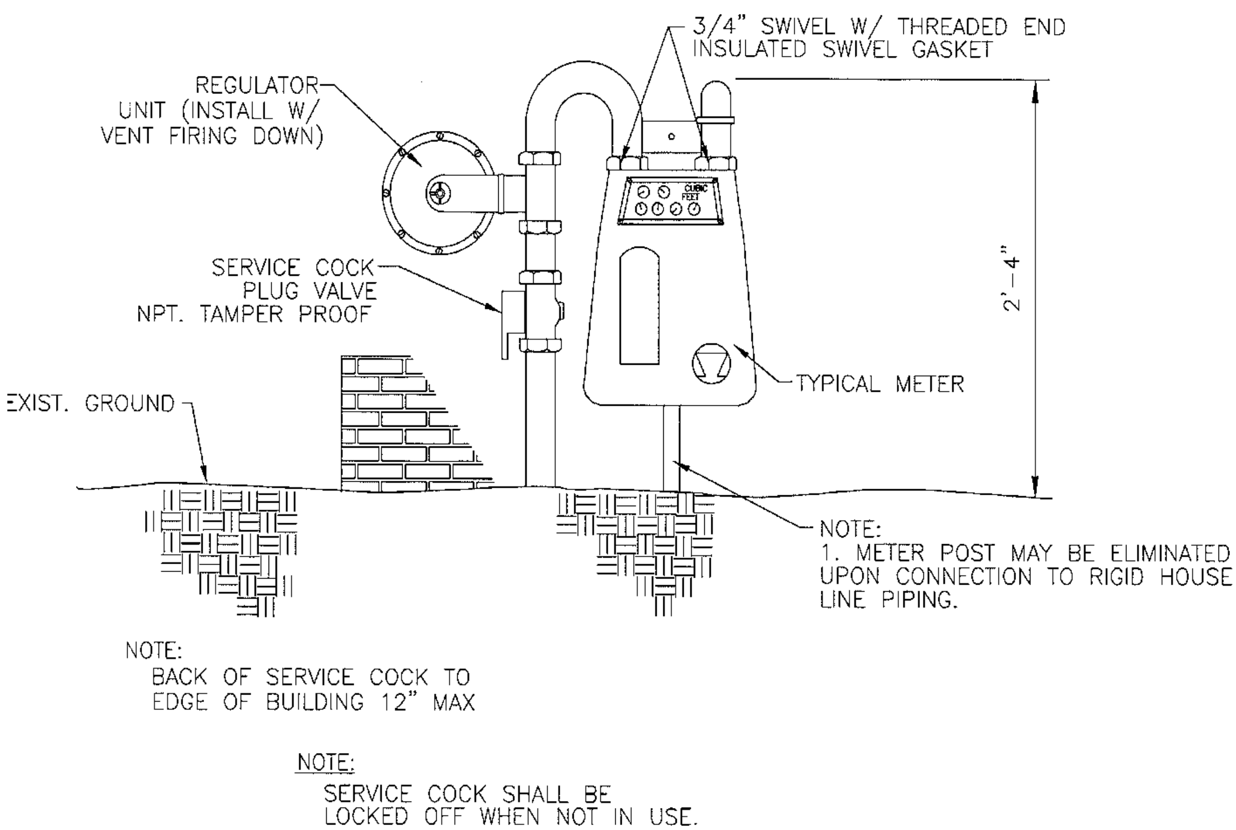
L. Gas flow and lock-up pressure shall be checked each time a meter is turned on regardless of for how long. The only exception will be during emergency relight.

M. Standard customer delivery pressure is 7” water column pressure, or ¼ psig for natural gas.

N. Elevated delivery pressure should be restricted to specific gas equipment requirements, and be in increments including 2 psig, 5psig and increased in 5 psig increments only as necessary.

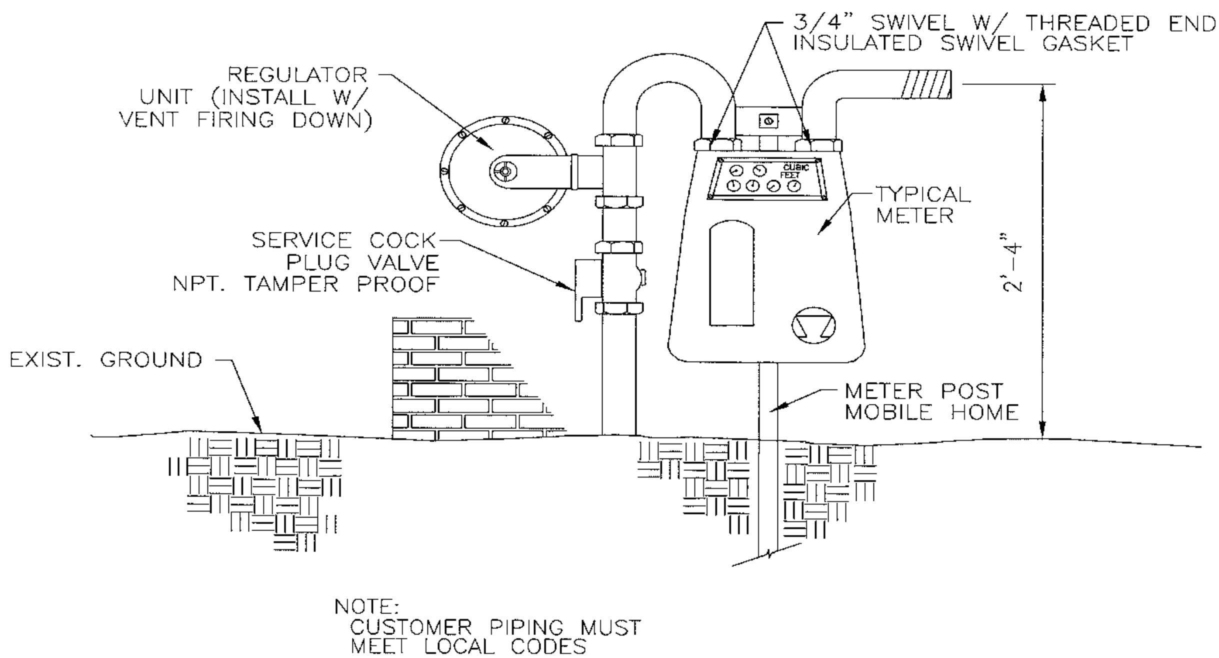
O. Large volume customers may receive line pressure under special circumstances however these instances shall require specialized measuring & monitoring equipment.

RESIDENTIAL OR COMMERCIAL METER SET



PROCEDURES
METER HANDLING & INSTALLATION

MOBILE OR MANUFACTURED HOME METER SET



NOTE: SERVICE COCK SHALL BE LOCKED OFF WHEN NOT IN USE.

PROCEDURES

METER HANDLING & INSTALLATION

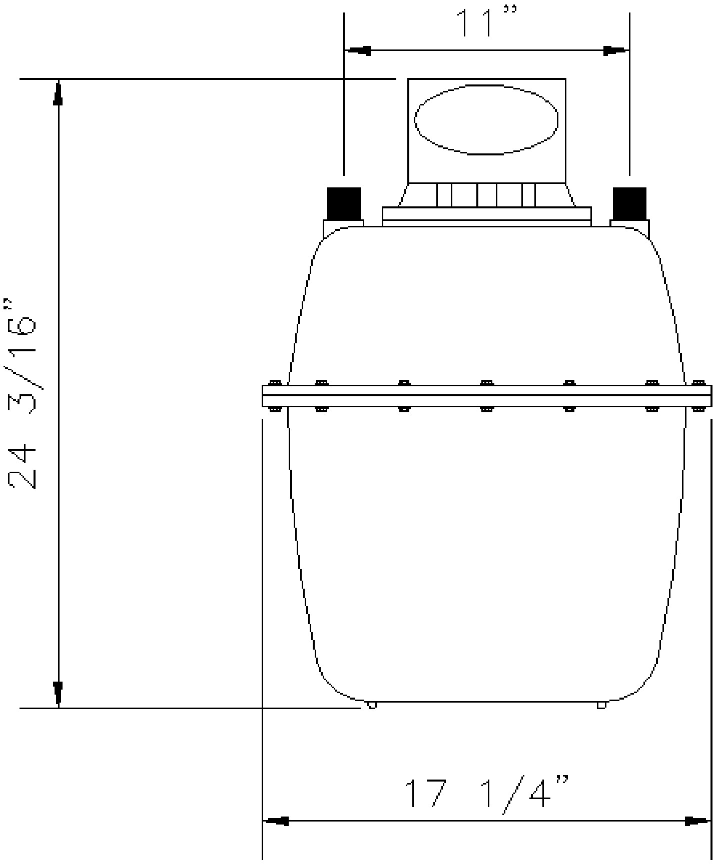
LARGE CAPACITY METER

EQUIMETER 750 OR EQUIVALENT (BULLETIN M-1021)

INLET TO INLET (CENTER TO CENTER)	11"
HEIGHT	24 3/16"
WIDTH	17 1/4"
DEPTH	14 5/8"

DROP

7" WC	1/2" WC	2" WC
MAT	750	– 1600



PROCEDURES
METER HANDLING & INSTALLATION

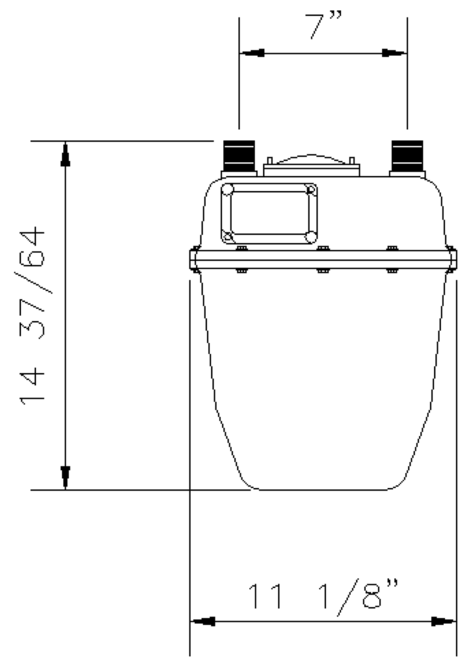
COMMERCIAL METER

EQUIMETER R-415 OR EQUIVALENT (BULLETIN M-1002)

INLET TO INLET (CENTER TO CENTER)	7"
HEIGHT	14 37/64"
WIDTH	11 1/8"
DEPTH	9 3/8"

DROP

7" WC	1/2" WC	2" WC
MAT	415 –	900



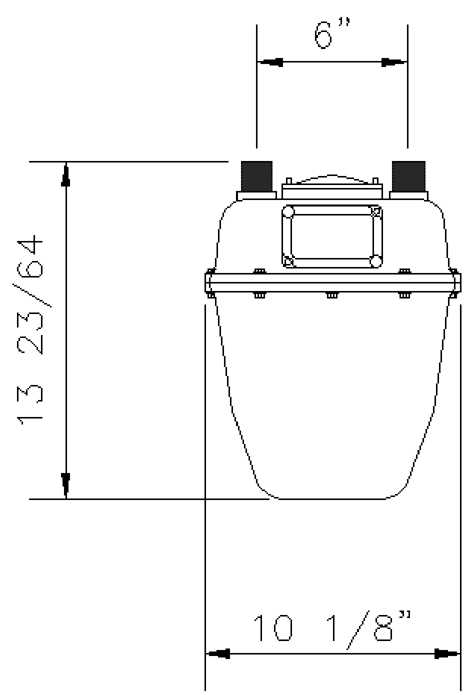
RESIDENTIAL METER

EQUIMETER R-275 OR EQUIVALENT (BULLETIN M-1002)

INLET TO INLET (CENTER TO CENTER)	6"
HEIGHT	13 23/64"
WIDTH	10 1/8"
DEPTH	8 1/2"

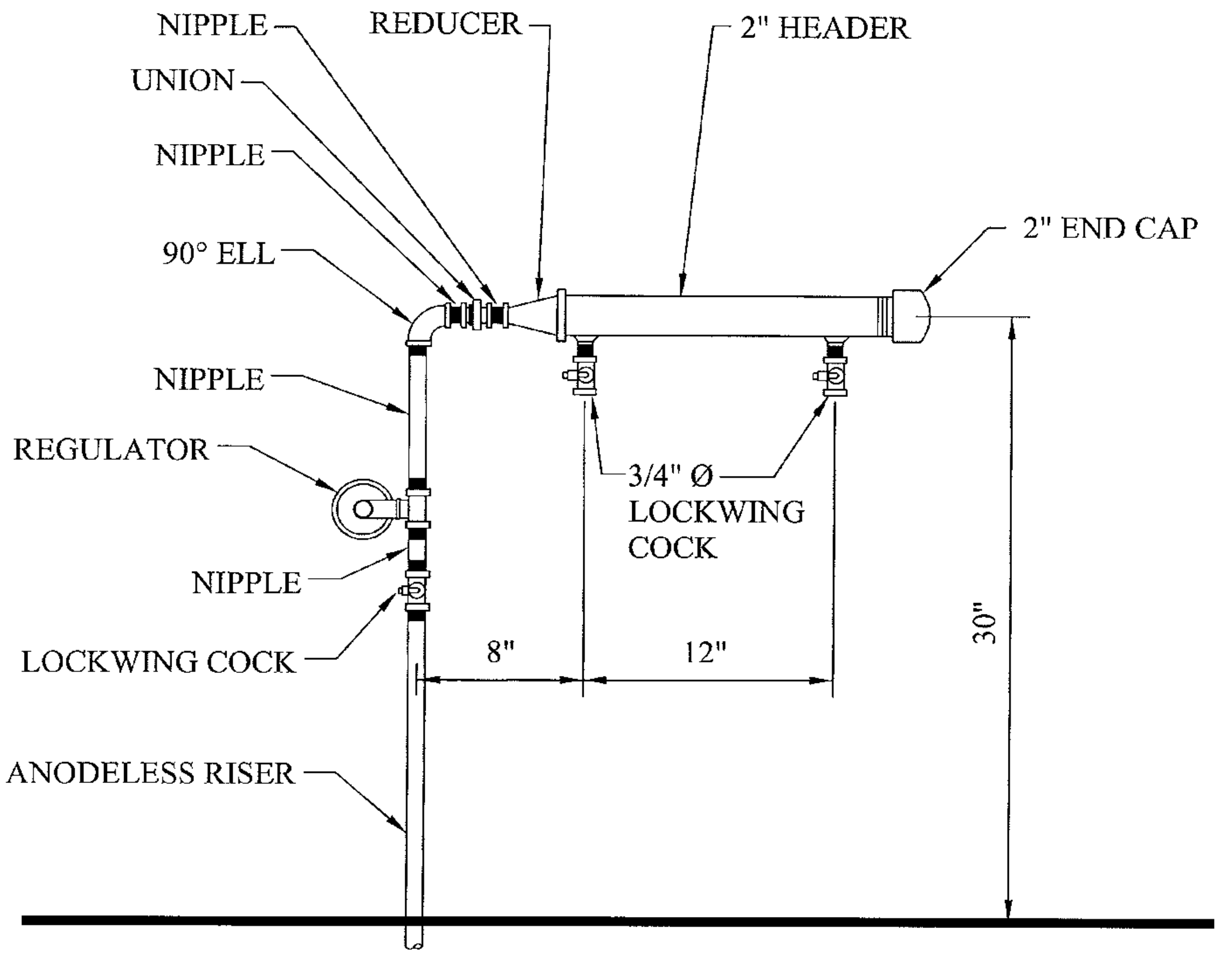
DROP

7" WC	1/2" WC		2" WC
MAT	415	–	900



PROCEDURES
METER HANDLING & INSTALLATION

DETAIL-METER MANIFOLD 2-METER

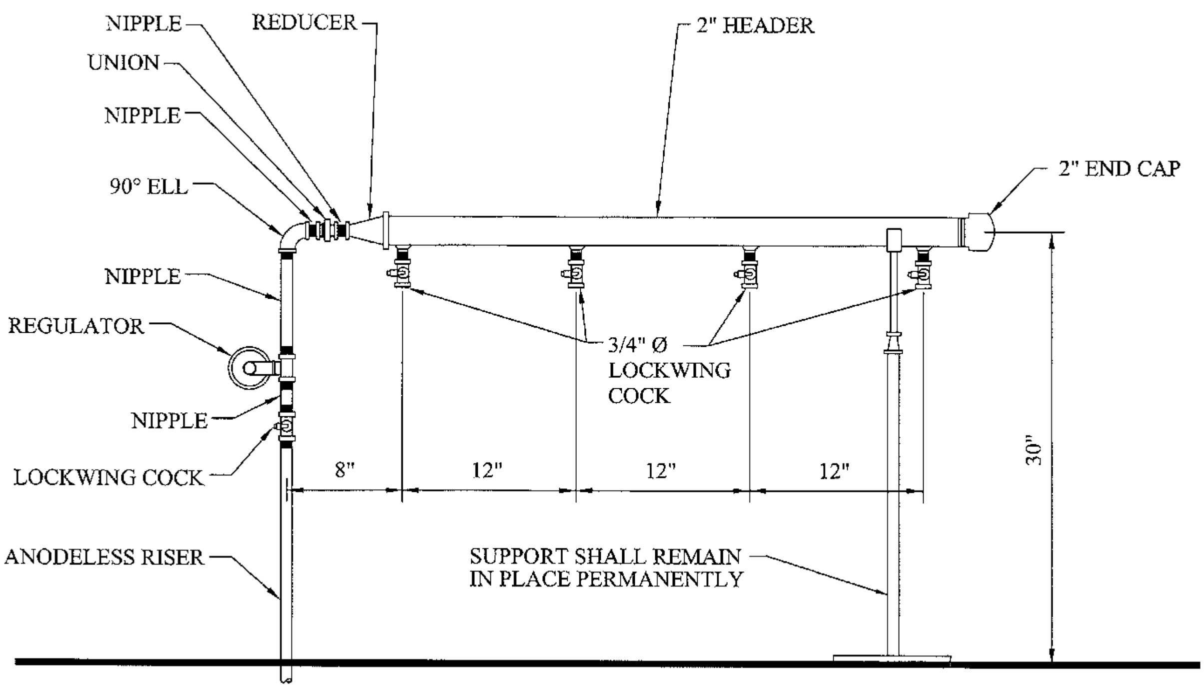


NOTE:

1) ALL FITTINGS AND PIPE ARE THREADED
2) ALL FITTINGS AND PIPE TO BE PAINTED
3) INSTALL SUPPORT IF NO HOUSELINES
CONNECTED AT TIME OF INSTALLATION

PROCEDURES
METER HANDLING & INSTALLATION

DETAIL-METER MANIFOLD 4-METER



NOTE:

1) ALL FITTINGS AND PIPE ARE THREADED
2) ALL FITTINGS AND PIPE TO BE PAINTED

PROCEDURES
METER TURN-ON & REGULATOR FLOW AND LOCKUP

4.0 PURPOSE

The purpose of this section is to establish safe and appropriate meter set turn-on / turn-off procedures.

4.1 SCOPE

A. Turn-on Procedure
B. Flow and Lockup Procedure

4.2 TURN-ON PROCEDURE

A. Prepare the system downstream from the M.S.A. for the meter clock test.
1. Turn off or cap all appliances at the approved appliance shut-off valve.
2. Remove meter blind(s). (Use approved jumper cables)
3. Remove the stopcock lock.
4. Turn on the stopcock slowly to avoid damaging the service regulator.
5. Check regulator flow and lock up pressure. Set flow pressure at 7" water column using a manometer or ounces pressure gauge.
6. Lock up pressure must not exceed 1½ times the flow pressure. If it does the regulator shall be repaired or replaced.

B. Perform the meter clock test (minimum 3 minutes duration) on the downstream system.
1. If leakage is indicated:
   a. Soap test exposed customer piping.
   b. Identify and repair as possible.
   c. Retest the system (minimum 3 minutes duration).
2. When no leakage is indicated proceed with meter turn-on.
3. If a hazardous condition is found due to appliance installation, appliance operation, fuel gas piping, etc. and it cannot be corrected by VMUS personnel, then a "Red Tag" VMT200 will be issued and the appliance left off. All allowable service work should be performed prior to leaving the appliance in an "OFF" condition.

   Always Red Tag each occurrence of a hazardous condition at the time of discovery regardless of the number of previous Red Tags issued at the location.

Complete all sections of the Reg Tag.

Leave the appliance shutoff valve in the "OFF" position and attach the Red Tag to the shutoff valve. If there is not a shutoff valve at the appliance, install one if possible. An alternative will be to disconnect the appliance and cap the supply line to the appliance.

Explain to the customer the condition that was found and why it is important to address the condition. Explain that the work required is beyond the scope of work performed by VMUS. Request that the customer sign the Reg Tag. Other entries that are acceptable are, "Customer did not want to sign" and "Customer not at the premises".

Document actions taken and return the VMUS copy of the Red Tag to the Office.

C. Soap test, check all components on the M.S.A. for leakage with liquid leak detector.

D. Clean and paint meter and meter set assembly as necessary to protect against atmospheric corrosion.

H. Light customer appliances as may be appropriate.

4.2 <u>FLOW AND LOCK-UP PROCEDURE</u>

A. Initiate flow through meter / purge:
1. Open test point downstream of meter at tee or outlet swivel.
2. Test dial must be in the upstroke position.
3. Attach manometer or ounces gauge to test point downstream of meter.
4. Adjust regulator to required pressure:
   a. 7" water column flow pressure
   b. 2 psig flow pressure
   c. 5 psig flow pressure
   d. 15 psig flow pressure
   e. 20 psig flow pressure
5. Lock up pressure not to exceed 1 and ½ times the flow pressure or 6 psig, based on the requirements of 49 CFR Part 192.201:
   (i) If the maximum allowable operating pressure is less than 12 p.s.i. (83

kPa), the pressure may not exceed the maximum allowable operating pressure plus 50 percent.

(ii) If the maximum allowable operating pressure is 12 p.s.i (83 kPa) gage or more, but less than 60 p.s.i. (414 kPa), the pressure may not exceed the maximum allowable operating pressure plus 6 p.s.i. (41 kPa).

This limits the lockup pressures for each meter set as follows:

a. 10.5” water column for 7” water column flow pressure
b. 3 psig for 2 psig flow pressure
c. 7.5 psig for 5 psig flow pressure
d. 21 psig for 15 psig flow pressure
e. 26 psig for 20 psig flow pressure

6. When flow and lockup are satisfactory:
   a. Disconnect manometer or ounces gauge.
   b. Restore service to customer.

B. If flow and lock up are unsatisfactory, replace service regulator and restart procedure.

C. Advise the customer of service(s) performed before departing.

D. Document all work performed using appropriate form(s).

PROCEDURES
METER TURN-OFF & REMOVAL

5.0 PURPOSE

The purpose of this section is to establish safe appropriate procedures for turning off customer meters, removing customer meter and regulator, and making all conditions safe for the general public.

5.1 SCOPE

A. Meter Turn-Off Procedure
B. Meter & Regulator Removal

5.2 METER TURN-OFF PROCEDURE

A. Verify removal order with customer whenever possible.

B. Verify meter number. Record meter number and meter reading.

C. Turn off stopcock.

D. Insert meter blind in outlet swivel or flange of meter or disconnect and plug or cap customer houseline. **Jumper cable shall be used to ground MSA before any disassembly of the facility.**

E. Soap test and correct any leakage indicated.

F. Install lock on stopcock.

G. Complete all applicable paperwork.

5.2 METER AND REGULATOR REMOVAL

A. Verify removal order with customer when applicable.

B. Verify meter number. Record number and read.

C. Turn off stopcock.

D. Properly install jumper cable across the MSA before any disassembly or removal is attempted.

PROCEDURES
METER TURN-OFF & REMOVAL

E. Remove MSA and disassemble all fittings from the stopcock to the customer's line. Cap or plug customer's line.

F. Soap test inside core of stopcock for leakage. Repair or replace stopcock as necessary.

G. Plug riser stopcock.

H. Install lock on stopcock.

I. Install "Caution Natural Gas" tag on riser.

J. Complete all applicable paperwork.

K. Meter and regulator shall be brought to the warehouse no later than the next working day.

PROCEDURES
METER BYPASSING

6.0 PURPOSE

The purpose of this section is to establish safe and appropriate procedures for bypassing a customer meter.

Contact the customer to explain the work to be performed. Request that the customer keep gas equipment usage to a minimum until work has been completed.

6.1 SCOPE

A. Meter Bypass
B. By-pass Removal

6.2 METER BYPASS

A. Check the MSA for any abnormal conditions. Ensure that the work can be completed by means of bypassing. If it cannot, notify your supervisor and prepare to turn off the meter.

B. Soap-test the entire MSA.

C. Observe the test dials for minimum registration.

D. Remove plugs from valves “A” and “D.” (see bypass methods 1 and 2)

E. Connect bypass including regulator at valve “A”.

1. Use regulator of equal or greater capacity to that of the MSA.

2. Use approved connectors for bypass.

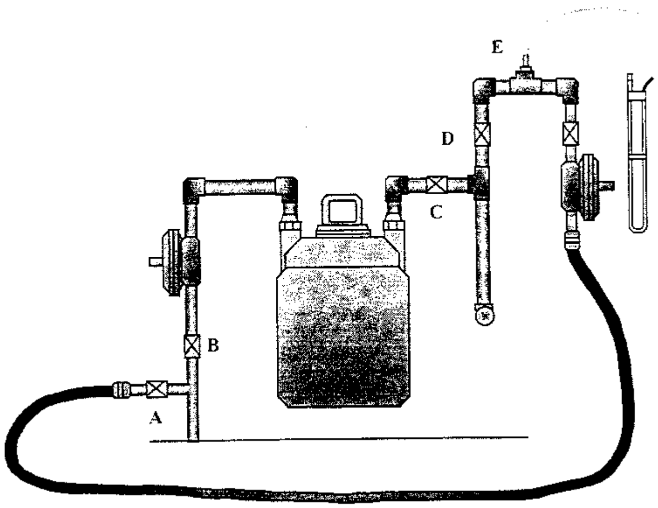
F. Connect bypass at valve “D”.

1. Use hose or pipe of equal or greater capacity to that of the single meter set or to that of the header for multiple meter sets.

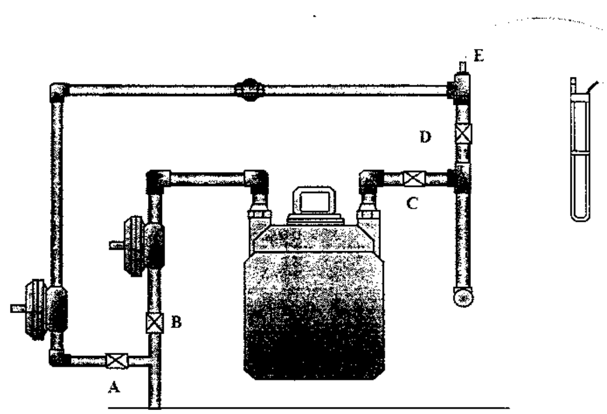
2. A gauge or manometer connection is necessary on the bypass near valve “D”.

PROCEDURES
METER BYPASSING

Method One (Using approved hose)



Method Two (Using solid piping.)



G. Turn bypass regulator adjusting screw counterclockwise until spring is completely relaxed.

H. Open valve “A” slowly and allow bypass inlet pressure to manometer/gauge connection “E”. Purge air from the bypass piping or hose.

I. Install manometer or gauge at connection and set flow and lock-up.

J. Open valve “D” and check the MSA regulator delivery pressure.

K. Turn bypass regulator adjusting screw clockwise to raise the houseline pressure ½” water column above set pressure.

NOTE: If house line pressure is in “pounds”, raise pressure ½ psig above set pressure.

L. Turn the MSA regulator adjusting screw counterclockwise approximately 8 turns. Observe Manometer/gauge. House line pressure should not decrease.

M. Close valve “B” slowly. Observe manometer/gauge. House line pressure should not decrease.

N. Close valve “C”.

O. Change meter.

6.3 BYPASS REMOVAL

A. When the MSA regulator is changed, check the new regulator for proper flow and lock-up pressure.

B. Turn MSA regulator adjusting screw counterclockwise until the spring is completely relaxed, if the regulator was changed.

C. Open valve “B” and allow MSA to purge at the meter outlet swivel, union or purge valve, as applicable.

D. Open valve “C” and allow MSA outlet to purge.

PROCEDURES
METER BYPASSING

E. Tighten meter outlet swivel, union and other purge points.

F. Soap-test MSA.

G. Verify pilots are still on after completing bypass if possible.

PROCEDURES
APPLIANCE DERATING & CONVERSION

7.0 HELD FOR FUTURE USE

PROCEDURES
STOPCOCK CHANGE OUT

8.0 PURPOSE

The purpose of this section is to establish the minimum requirements for safely changing out a damaged or defective service riser stopcock.

8.1 MAINTENANCE

A. A service stopcock valve found to be leaking may be lubricated and/or tightened to stop the leaking.

B Use only manufacturers recommended lubricant.

C. Caution should be exercised to not over tighten the stopcock thus preventing its intended operation.

8.2 REPLACEMENT

A. When a service riser stopcock is found to be damaged or defective the stopcock shall be changed out or the service riser replaced.

B. The service line should be shut down and purged of gas to allow for safe removal and replacement. This may be accomplished by use of a service valve or squeezing.

C. Once isolated, remove and replace the stopcock taking care not to damage the threads or replace the service riser entirely.

D. Check for leakage after reenergizing, and repair as necessary.

E. If the service and/or service riser cannot be safely isolated, the use of an approved stopcock changer may be required for replacing the stopcock.

8.3 MUELLER NO-BLO VALVE CHANGER

A. Select the proper unit to be utilized according to the size of the stopcock to be removed. Refer to manufacturers Operating Instructions.

B. Close the stopcock, purge gas, and disassemble the MSA.

PROCEDURES
STOPCOCK CHANGE OUT

C. Free up the rubber plug by operating it several times before use.

D. Lubricate the rubber plug (Dip in soap solution)

E. Lubricate bleeder “O” rings (apply soap solution)

F. Assemble the plugging unit to stopcock

G. Attach approved safety clamp and jumper cable

H. Open stopcock then insert and expand the rubber plug

I. Remove existing stopcock

J. Install new stopcock then loosen rubber plug

K. Remove NO-BLOW changer and jumper cable

L. Purge and operate stopcock

M. Lubricate and tighten as necessary

N. Leak check

O. Reassemble MSA

P. Document work on appropriate form.

PROCEDURES
VALVES / GENERAL

1.0 PURPOSE

It is the purpose of this section to introduce the basic types of valves utilized by the Operator and to establish procedures for the installation, operation, and maintenance of valves in the operator's system.

The operator shall identify those **Key Isolation Valves** in its system to be utilized for emergency shutdown of the system. The Operator has established a gas system isolation plan for this purpose.

1.1 SCOPE

A. G-1 General Design
B. G-1 Types of Valves
C. G-2 Valve Installation
D. G-3 Valve Maintenance
E. G-4 Valve Operation

1.2 GENERAL DESIGN

A. All valve installations will be consistent with the following procedures and documented on appropriate forms to record manufacturer, valve type, flange or weld neck, materials, model number, serial number and valve location.

B. All new sealant injected valves must have packing grease purged out and valve sealant injected at time of installation. Check valve for proper operation after installation is complete. **Use only the valve manufacturer's recommended sealant in the appropriate type valve.**

C. It is recommended that all buried valves include raised heads extensions with 2 inch square head wrench adapter. This will limit variations in valve wrenches required for proper valve operation.

D. Flanged neck valves are approved for aboveground or vault installation only and shall not be buried.

1.3 TYPES OF VALVES

PROCEDURES
VALVES / GENERAL

The Operator utilizes the following valves in its distribution system. The choice of a valve for a particular location depends on the valve's construction, the design pressure to which it will be subjected and the designed use for the valve.

A. Buried main line valve installations shall be full opening ball valves:
- PE ball valves
- Steel ball valves

B. Aboveground and vault installations may include:
- Steel plug valves
- Steel ball valves
- Needle Valves – Steel

C. Buried service line valve installations may include:
- PE or steel ball valves
- PE or steel excess flow valves

D. Each service line riser shall include an approved stopcock.

PROCEDURES
VALVES INSTALLATION

2.0 PURPOSE

It is the purpose of this section to provide the minimum requirements for the installation of valves.

2.1 SCOPE

A. Valve Installation
B. Location
C. Regulator Stations
D. Stopcocks
E. Manual Service Line Shutoff Valves
F. Excess Flow Valves
G. Buried Valves

2.2 VALVE INSTALLATION

Valves shall be approved type and shall be protected from damage and tampering. Valves shall be installed according to the Operator's system criteria. They may be installed above ground, in vaults, or buried. A device to open or close operating valves shall be readily accessible to authorized persons. Each valve must be able to meet its anticipated operating conditions.

2.3 LOCATION

Each valve on a main installed for operating or emergency purposes shall comply with the following:

1. Full opening
2. Placed in a readily accessible location so as to facilitate its operation in an emergency. **192.181 (c) (1)**
3. The operating stem or mechanism must be readily accessible. **192.181 (c) (2)**
4. The box or enclosure must be installed so as to avoid transmitting external loads to the main. **191.181(c) (3)**
5. Have a raised head with common 2" square adaptor head.

2.4 REGULATOR STATIONS (191.181)

A. Inlet Valve: Regulator stations controlling the flow or pressure of gas in a distribution system must have a valve installed on the inlet piping at a distance from the regulator station sufficient to permit the operation of the valve during an emergency that might preclude access to the station (**Recommended 20 LF**).

B Outlet Valve: Each regulator station shall include an outlet valve rated to the MAOP of the Regulator station installed on the outlet piping at a distance from the regulator station sufficient to permit the operation of the valve during an emergency that might preclude access to the station (**Recommended 20 LF**).

2.5 STOPCOCKS

A. Stopcocks shall only be used aboveground in service and MSA installations.
1. At least one stopcock shall be installed in every new, replaced, altered or reinstated MSA in a readily accessible location. **192.363 (a) and 192.365 (b)**
2. Every stopcock must be installed upstream of the regulator or, if there is no regulator, upstream of the meter. **192.365 (a)**
3. The stopcock shall be designed and constructed to minimize the possibility of the removal of the core of the valve without specialized tools. **192.363 (c)**
4. The stopcock shall have a means of being locked in the closed position and shall be closed and locked to prevent the flow of gas through the MSA and to prevent the opening of the valve other than by those authorized.

B. Property line valves shall be installed on service facilities when the stopcock adjacent to the MSA will not be readily accessible for emergency use. This criteria does not apply to a single family residence.

2.6 MANUAL SERVICE LINE SHUTOFF VALVES (192.385)

A. Manual service line shutoff valves must be installed on a new or replaced service line with an installed meter capacity of more than 1,000 CFH if an excess flow valve is not installed. A manual service line shutoff valve may be installed on a service line with an installed meter capacity of 1,000 CFH or less in addition to an excess flow valve at the discretion of the operator.

B. If a manual service line shutoff valve is installed in place of an excess flow valve (not in addition to an excess flow valve as noted in paragraph A, above) shall be installed in an accessible valve box appropriate for the installation location. The manual service line shutoff valve box will be service once each calendar year, not to exceed 15 months, to ensure that the valve box is in serviceable condition and the valve operator is accessible. The valve is not required to be operated during this annual inspection but is to be operated according to any schedule provided by the valve manufacturer.

C. The manual service line shutoff valve is required to be accessible and operable by employees or designated third parties. It is not required to be accessible to first responders.

2.7 EXCESS FLOW VALVES (EFV) (192.383)

A. Excess flow valves MUST be installed on a new or completely replaced service lines to the following customer types before the service line is activated:

1. A single service to one Single Family Residence.
2. A branch service to a Single Family Residence installed concurrently with the primary Single Family Residence service line (a single EFV can be installed to protect both service lines).
3. A branch service line to a Single Family Residence installed on a previously installed Single Family Residence service line that does not contain an EFV (the EFV should be installed as near to the branch service tee as possible downstream of the branch connection).
4. Multifamily residences with known customer loads not exceeding 1,000 SCFH per service, at the time of service installation. The known customer load is to be based on installed meter capacity.
5. A single, small commercial customer served by a single service line with a known customer load not exceeding 1,000 SCFH. The known customer load is to be based on installed meter capacity.

In each case in paragraph A, the EFV must be installed as close as practicable to the source of supply, whether that source of supply is the service-to-main connection or it is the tee connection for a branch service line. When an EFV is installed, the riser(s) downstream of the EFV will be marked with a tag to indicate that the meter set assembly is protected by an EFV.

B. An excess flow valve is not required to be installed in the following situations:

1. The service line does not operate at a minimum pressure of 10 psig throughout the year.
2. Experience indicates that contaminants in the gas stream may interfere with operation of the EFV or cause loss of service to the customer.

3. An EFV could interfere with necessary operation or maintenance activities, such as blowing liquids from the line or purging activities.
4. An EFV meeting the requirements of 192.381 is not commercially available. An engineering analysis will be conducted for all new service lines not meeting the criteria in paragraph A to determine the potential for installation of an EFV. If an EFV is determined not to be commercially available, VMUS will install a manual service line shutoff valve, as noted in paragraph C.

C. VMUS must install a manual service line shutoff valve ("Manual SLSV") if an EFV is not installed on service lines with a total meter capacity of greater than 1,000 SCFH. The Manual SLSV is to be accessible by VMUS personnel or other personnel authorized by VMUS. First responders are not required to be given access to the Manual SLSV. The Manual SLSV will meet the following criteria:
1. The Manual SLSV will be installed in a valve box and be located as near as practicable to the service-to-main connection.
2. The valve box for the Manual SLSV is to be supported independently of the service line.
3. The valve box will be inspected once each calendar year, not to exceed 15 months, to assure that the box is clear and that the operating nut for the valve is accessible. The valve will be operated on intervals to be determined by the manufacturer, or at more frequent intervals as determined by VMUS.

D. EFVs must be reported on the annual report form PHMSA F 7100.1-1

E. Customer notification requirements and distribution of costs for the installation of an EFV are included in the Public Awareness Plan.

2.8 BURIED VALVES

A. Steel Valves:
1. All buried steel valves shall be weld-neck.
2. No flanged or threaded valves may be buried unless installed in an underground vault.
3. Ensure that valve is installed on firmly compacted trench bottom.

B. PE Valves:

1. Every valve installed with plastic pipe must be designed so as to protect the plastic pipe against excess torsion or shearing loads when the valve is operated and from any other secondary stresses that might be exerted through the valve or its enclosures. **192.193**
2. Support valve boxes for PE installations independently from the valve and on firmly compacted trench bottom.
3. Tracer wire should be brought up approximately 12 inches above grade inside valve box.

PROCEDURES
VALVE MAINTENANCE

3.0 PURPOSE

It is the purpose of this section to provide the minimum requirements for the maintenance of valves.

3.1 SCOPE

A. Maintenance Intervals
B. Valve Maintenance
C. Valve Records

3.2 MAINTENANCE INTERVALS (192.747)

Key valves or Emergency Isolation valves shall be maintained once during each calendar year at intervals not to exceed 15 months.

3.3 VALVE MAINTENANCE

A. Valve maintenance shall include the following:

1. Verifying the proper valve identification and location detail.

2. Clear the valve box or vault of any debris, which could interfere with or delay the operation of the valve.

3. Check valve alignment for proper position to permit the use of a key or wrench. This includes checking valve box and support for PE valves to ensure excessive torsion or stress is not placed on the pipe.

4. Maintain plug and other lubrication valves by injecting only manufacturer's approved cleaners and/or sealant utilizing a high pressure grease gun.

B. All valve maintenance shall include operation of the valve to ensure its operability.

1. Approximately 1/16 to 1/8th turn is required for each valve that is a 90 degree positive shut off.

2. A minimum of 25% of the turns required for positive shut off of those

valves requiring greater than 90 degree normal shut off.

3. Caution should be taken to return each valve to its full open or full closed operating position, whichever may be applicable.

4. Caution shall be exercised as to not damage the valve stops.

C. Any valve found to be inoperable must have prompt remedial action taken on it to address the problem unless an alternative valve can be designated.

3.4 VALVE RECORDS

A. Documentation shall include:

1. Valve Maintenance Record – appropriately record maintenance performed.

2. Valve Location Record – record or update findings.

PROCEDURES
VALVE OPERATION

4.0 PURPOSE

It is the purpose of this section to provide the minimum requirements for the operation of main and service valves.

4.1 VALVE OPERATION

A. Valves are used to control the flow of gas in the system.

B. Check the maps and Valve Location Record(s) to ensure the proper valve is being prepared to be operated.

C. Verify normal operating position.

D. Verify what will be affected downstream of valve when changing normal operating position.

E. Verify number of turns required for on / off (Refer to manufacturer's operating procedures).

F Supervisors approval should be gained prior to the operation of any main valve other than during normal annual maintenance.

G. Place gauge downstream of valve to verify pressure before operating valve if possible.

H. Operate valve in accordance with manufacturer's operating procedure and monitor system.

PROCEDURES
TESTING / GENERAL

1.0 PURPOSE (192.509 & 192.513)

It is the purpose of this section to provide the requirements and procedure for testing gas facilities. The pressure/strength test is by design greater than the desired actual operating pressure of the system. In the distribution system it is accurate to pressure test at 1 ½ times the desired operating pressure but never less than 90 psig.

1.1 SCOPE

This section covers the following:

A. H-1 Test Records
B. H-1 MAOP Determination
C. H-2 Leak Testing Components
D. H-3 Pressure Testing
E H-4 Testing Damaged Repairs
F. H-5 Purging lines
G. H-6 Odorization Testing
H. H-7 Pressure Gauges
I. H-8 Manometer / Ounces gauge
J. H-9 Carbon Monoxide Testing

1.2 GENERAL

A. All newly-constructed, replacement, reinstated, or relocated gas facilities will be tested as required by this section.

B. All piping shall be leak tested at the time of, or prior to placing it in operation.

C. All newly-constructed, replacement, reinstated or relocated piping shall have a pressure stand-up test. A soap bubble test will be considered acceptable for tie-in connections where a pressure stand-up test is not practical. Soap bubble test will be done at normal operating pressure.

D. At no time will a pressure stand-up test be less than 90 psig for lines operating at or below 60 psig. (**Refer to Section H-3.)**

E. <u>Do not</u> pressure test against a closed valve, stopper or squeeze that is connected to a live gas line.

F. <u>Do not</u> pressure test through gas meter or service regulator.

G. In order to verify that facilities to be tested are isolated, open test connection to atmosphere before connecting test line.

H. Plastic pipe shall be shaded prior to testing and in no case shall the temperature of the pipe exceed 100° Fahrenheit when under test.

I. The maximum test pressure for plastic pipe will be 120 psig.

J. The maximum test duration for plastic pipe will be 8 hours.

K. The pressure test mediums must be liquid, air, or inert gas. These mediums must be compatible with the pipeline material and relatively free of sediment and, except for natural gas, non-flammable **192.503 (b).** Without specific approval by management for each project, natural gas will only be allowed for testing tie-ins at operating pressure. Natural gas shall not be used from any compressed source for testing.

L. If a qualified pipe joiner produces a joint that is found to be unacceptable during pressure testing, that joiner will not be allowed to perform further production pipe joining in the procedure until the joiner has been successfully retrained, retested and requalified in that procedure.

This is not intended to remove that joiner from performing production joints using other, different procedures.

M. All components of the newly constructed, replacement, reinstated or relocated gas facilities will be tested as part of the final installation. If a service line is temporarily disconnected from its source of supply, it must be pressure tested from the point of disconnection to the customer riser before being reinstated.

This testing is not required when the point of disconnection is bypassed to maintain service to the customer.

1.3 <u>TEST RECORDS</u>

A. For all testing, the appropriate form or chart will be completed by the person conducting the test. Documentation shall be reviewed and verified by a qualified individual.

B. Test records shall be maintained for the useful life of the pipeline/pipeline facility.

C. A company employee will verify that documentation is correct and complete when a test is conducted by a contractor or other non-utility employee.

D. For tests that are documented using a chart recorder, the system pressure should be verified using an approved test gauge. The pressure chart must show a clear representation of the test pressure and duration. Clearly mark the start and end of the test period on the face of the chart, noting the time of start and stop on the chart.

E. Perform a new test if:

- At any time, the test pressure changed during the test period and the change cannot be explained
- At any time, the test pressure dropped below the minimum test pressure or exceeded the maximum pressure allowed/required for the test (no matter the reason)
- The ink pen in a chart recorder did not show a clear line on the chart
- The recorded pressure line in a chart recorder was too short to distinguish the correct pressure duration (this is generally the result of using a chart with the wrong clock duration)

F. The minimum information on the test documentation is:

1. The operating company's name, i.e., Victorville Municipal Utility Services or VMUS
2. The name and signature of the individual performing the test (Include company name if by contractor), and the individual reviewing the record.
3. If testing was conducted by a contractor or non-utility employee, the VMUS employee's name, signature and date documenting the test
4. Date test conducted
5. The type of facility and location of the test, described by a project number, a physical location, street address, etc. to clearly allow a reviewer to determine the ends of all test section points. (2" PE installed under project no. 1234, 1" service line at 999 Address St.)
6. The test medium
7. The test pressure
8. The test duration
9. The test results, including a description of each leak or test failure and how the leak or failure was corrected.

10. Size, type, and length of pipe
11. It is recommended that a map of the facilities accompany the test record form or recorder chart.
12. Serial number / I.D. number of gauge and / or chart recorder

1.4 <u>MAOP DETERMINATION 192.619</u>

A. All PE pipe and components installed prior to January 1, 2005, which does not have any known pressure test data, will have an MAOP of 20 PSI. This pressure has been determined to be the maximum safe pressure after considering the history of the system, particularly known corrosion and the actual operating pressure. **192.619(a)(4).** Overpressure protective devices shall be installed on these segments in a manner that will prevent the maximum allowable operating pressure from being exceeded, in accordance with §192.195. **192.619(b).**

Exception: All PE pipe and components installed prior to January 1, 2005, which does not have any known pressure test data and is connected to the Southwest Gas master meter located at George Blvd. and Carolina Ave. will have an MAOP of 25 PSI.

B. All PE pipe and components installed after January 1, 2005, will have an MAOP of 60 PSI. This pressure is determined by 4 factors, the lowest of these factors determines the MAOP.

1. Design calculation of pipe – 80 PSI MAOP per manufacturer.
2. Pressure rating of components – All components are pressure rated above 60 PSI MAOP.
3. Test pressure – Test pressure shall be a minimum of 90 PSI for lines operating at 60 PSI or below. The minimum 90 PSI test pressure meets the requirements of 192.619 (a) (2) (i), which states that for plastic pipe in all locations, the test pressure is divided by a factor of 1.5.
4. 49 CFR 192.621 (a) (2): A high pressure distribution system may not operate at a pressure that exceeds 60 PSI unless the service lines in the system are equipped with regulators or other pressure limiting devices in series that meet the requirements of 192.197 (c).

PROCEDURES
LEAK TESTING COMPONENTS

2.0 PURPOSE

All fittings for PE and Steel are to be tested as part of the final pressure test for the installation when possible. Fittings that cannot be included in the final pressure test shall be installed in accordance with established procedures and leak tested in accordance with **H-3.**

2.1 GENERAL

All natural gas-carrying polyethylene and steel components are in one of the following categories:

1. The component is not delivered from the supplier certified for an MAOP. Until the component is tested by the operator, MAOP is not established. It may or may not have a designated design pressure. These components must be pressure stand up tested after installation as part of a completed assembly or as a single component prior to installation.

2. The component is certified by the manufacturer for a MAOP. These components meet the requirement by complying with one of the following:
   (a) Testing is conducted at the factory according to established requirements.
   (b) A prototype of the component has been tested by the manufacturer and sufficient quality control procedures have been implemented to ensure that each unit is manufactured to the same specifications and quality as the prototype.

2.2 POLYETHYLENE COMPONENTS

The following components shall be pressure stand up tested:

1. Pipe.
2. Anodeless risers.

The following components may be installed as a single component without a pressure stand up test. Leak test tie-ins in accordance with **Section H-3**.

1. Mechanical fittings, including couplings, tees, ells, reducers, caps & repair couplings.
2. Tapping tees, including High-Volume and Service tees.
3. Electrofusion fittings.

4. Valves not tested as part of the initial installation.
5. Butt fusion fittings, including ells, tees, reducers and caps.

2.3 STEEL COMPONENTS

The following components must be pressure stand up tested:
1. Pipe, tubing and pipe nipples.
2. Flanges.

The following components may be installed as single components without a pressure test as long as the Manufacturers test/MAOP record can be verified. Leak test tie-ins (Soap Test) in accordance with **Section H-3.3**.
1. Valves not tested as part of the initial installation.
2. Filters and strainers.
3. Flange gaskets.
4. Screwed fittings, including ells, tees, caps, reducers and unions.
5. Regulators, relief valves and automatic shutoff devices.
6. Meters.
7. Bolt-on repair fittings.
8. Pressure and differential pressure transducers.
9. Tubing fittings.

PROCEDURES
PRESSURE TESTING

3.0 PURPOSE

The purpose of this section is to establish minimum procedures for the leak and strength testing of gas pipeline facilities.

3.1 PRESSURE TESTING

Pressure testing plastic mains and service lines, and steel mains and service lines operating at or below 60 psig shall be tested as outlined below:

A. Lines Smaller Than 2" IPS

1. 0 – 500 ft	10 minutes	Gauge (Chart Recorder Optional)
2. 500 – 1000 ft	30 minutes	Gauge (Chart Recorder Optional)
3. Over 1000 ft	1 hour	Gauge (Chart Recorder Optional)

B. 2" Lines and Larger

1. 0 - 125 ft	10 minutes	Gauge (Chart Recorder Optional)
2. 126 - 1000 ft	1 hours	Gauge (Chart Recorder Optional)
3. 1000 - 3000 ft	2 hours	Gauge (Chart Recorder Optional)
4. Over 3000 ft	4 hours	Chart Recorder Required

C. All above pressure tests shall be performed at a minimum of one and one half times the desired MAOP or a minimum of 90 psig.

D. Test duration for plastic pipe shall not exceed 8 hours per manufacturer's specifications.

E. Pressure recording charts shall be used to record the data on any tests longer than two hours.

F. When pressure testing both mainline and service line facilities both shall be included in determining total distance.

G. When service lines are being tested as single entities, the service line connection to the main (steel and plastic) should be included in system pressure testing prior to tapping the service to main connection.

H. When pressure testing facilities with pipe sizes in both above groups, the total distance of all pipe shall be included in the higher group.

I. For single components, prefabricated assemblies and short sections (less than 125 ft of pipe) mixing of test mediums is permissible. (Such as nitrogen to top of water).

J. Prefabricated assemblies shall have a pressure stand-up test.

K. Pipeline facilities to operate above 60 psig shall be tested in accordance with DOT Pipeline Safety Standards.

3.2 LOCATING MINOR LEAKS FOUND DURING PRESSURE TESTING

When a pressure test has been completed and there are indications of a minor leak which was not located during the test, the line may be filled with natural gas by means of a temporary connection at a pressure less than the Maximum Allowable Operating Pressure (MAOP). A flame ionization unit may then be used to search for the leak. After the leak has been found and repaired, retest the line as outlined in this section after purging.

NOTE: This procedure will only be used with supervisory approval.

3.3 SOAP TEST

A. If a pipeline component, other than pipe is installed, pressure testing is not required if manufacturer's testing can be verified.

B. Tie-in points shall be leak tested at operating pressure, using liquid leak detector.

C. Relocation, replacement or prefabricated piping shall be pressure tested in accordance with H-3.1. Soap test all pipeline connections and tie-ins.

D. Soap test each squeeze point after squeeze is released.

E. Soap test each meter and MSA after performing any work or repair.

F. If leakage is found (indicated by the presence of soap bubbles) replace or repair the component or pipe.

3.4 REINSTATING FACILITIES

All facilities to be reinstated shall be tested as if newly installed. Conduct stand-up pressure test in accordance with this procedure before service is reinstated.

3.5 TESTING TIE-INS

All tie-ins points and repairs, which cannot be pressure tested shall be soap tested.

3.6 PRE-TESTING PIPE

A. General

When impractical to pressure test pipe after installation, it must be pre-tested. If this option is chosen, the following procedure will be followed. Pre-testing is normally handled by two methods.

1. Job Site Test/Short Pipe Segments

A stand-up test will be conducted prior to installation per H-3.1 of this section. All test information required in Section H-3.1 will be included in the test documentation.

2. Yard Test

Pressure tests will be at a pressure, and time duration appropriate for its intended use as stated in Paragraph 3.1 of this section.

All tests will be documented and will include all information required in Section H-3.1. The chart will be filed for future reference in a specific file for pre-tested documentation.

The tested pipe must be marked or tagged with the test date and the reference number, which is attached to the pressure chart.

When field personnel use the pre-tested pipe, the test date and reference number must be recorded on the appropriate field installation form(s).

NOTE: See H-7 for minimum gauge standards for pressure gauges used for pressure stand up testing.

PROCEDURES
TESTING DAMAGE REPAIRS

4.0 PURPOSE

The purpose of this section is to establish minimum requirements and safe procedures for the testing of damage repairs.

4.1 TESTING DAMAGED / REINSTATED SERVICE LINES (192.725)

A. The following outlines the conditions for testing damaged service lines requiring shutdown or service lines to be reinstated:

1. Stand-up pressure test the shutdown portion in the same way as a new service before reinstating. Soap test the tie-in connection.

2. Survey entire service to main plus 250' each side of the service along the main using F.I. unit or combustible gas indicator.

B. Testing of damaged services not requiring shutdown:

1. Perform a pressure test on any new pipe and non-certified components.

2. Soap test the damaged portion and/or the repair.

3. Survey entire service plus 250' each side of service along the main using the F.I. unit or combustible gas indicator.

NOTE: Follow up leak investigation shall be scheduled within 30 days of all leak repairs to ensure there is no further leakage.

4.2 TESTING DAMAGED / REINSTATED MAINS

A. Use pre-tested pipe or site tested pipe for repair of damaged mains.

B. Soap test the tie-in connection.

C. Survey main 250' on each side of damage or break, using the F.I. unit or combustible gas indicator.

D. Main lines to be reinstated shall be tested in accordance with **Section H-3.**

PROCEDURES
TESTING DAMAGE REPAIRS

NOTE: Follow up leak investigation shall be scheduled within 30 days of all leak repairs to ensure there is no further leakage.

PROCEDURES
PURGING

5.0 PURPOSE (192.629)

The purpose of this section is to provide minimum requirements and information on purging operations.

5.1 Safety

A. Purge stacks shall be:
   1. Made of steel pipe.
   2. Properly grounded using ground clamps and ground rod.
   3. A safe distance above the work area. Recommended minimum of 6 ft. above grade.

B. The purge stack shall <u>not</u> be directed at persons, animals or openings to buildings.

C. Appropriate notification to dispatch and neighbors when purging for an extended time should be made.

D. Proper safety precautions to protect people and property from potential hazards shall be implemented.

5.2 PURGE PROCEDURE

The following outlines the methods to be used when purging plastic lines. Lines 4" and larger should have a preplanned procedure for the tie-in and the purge. This procedure will be established prior to starting the work.

A. Purging is the process of expelling air or gas from the pipe or container and replacing it with air or gas. This is accomplished by introducing gas from the normal feed source and allowing the air and any air/gas mixture to escape to the outside atmosphere until 100% gas is obtained or 0% gas when purging with air. The same principles for purging are valid whether gas is used to displace the air or air is used to displace the gas.

B. When purging, it is desirable that the volume of air/gas mix at the junction of the air and gas remain at a minimum. In order to avoid stratification of the gas/air mix, a purge rate of 300 cfm or greater should be maintained.

C. In order to eliminate initial stratification of the air and gas, it is important that the introduction of the gas or air be done quickly. It is desirable to establish the turbulent, inert slug of gas as soon as possible keeping it as small as possible. If gas or air cannot be supplied in sufficient quantity to prevent the formation of a hazardous mixture of gas and air, a slug of inert gas MUST be released into the line before the gas or air.

D. Purges on all 2" and larger lines shall be checked with a combustible gas indicator (CGI) to ensure that the purge has been successfully completed.

E. For riser purging operation, the riser shall be grounded to the soil with #14 locator wire or jumper cable, along with ground plate or grounding rod. Attach ground wire to stopcock valve or steel purge stack to ensure proper grounding. The escaping gas/air mixture shall be expelled in a manner as to prevent the mixture from collecting in a confined area or enveloping the operating personnel.

5.3 PURGING SERVICES

A. Purge service lines at riser.

B. For riser purging operation, the riser shall be grounded to the soil with #14 locator wire or jumper cable, along with ground plate or grounding rod. Attach ground wire to stopcock valve or steel purge stack to ensure proper grounding. The escaping gas/air mixture shall be expelled in a manner as to prevent the mixture from collecting in a confined area or enveloping the operating personnel.

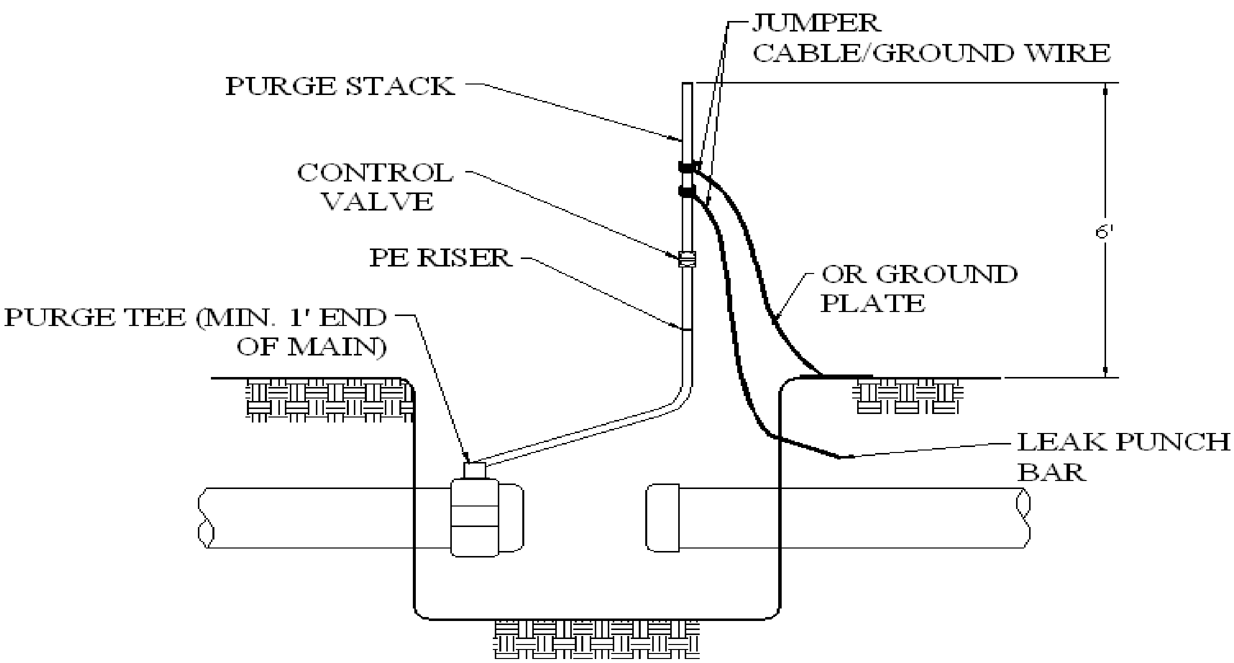
PURGE CHART
Linear feet

Pipe size	0-100’	101-200’	201-500’	501-1000’
1” and smaller				
Purge time (sec)	10	20	45	90

5.4 PURGING MAINS

NOTE: Purge fittings shall be installed within 3' of the end of main.

FIGURE #1



5.5 ABANDONMENT OF GAS FACILITIES

Each Operator facility or pipeline that is abandoned or inactivated must be completed in accordance with a plan, which shall include the following:

A. Each facility abandoned in place and lines not subject to gas pressure, except when undergoing maintenance, must be disconnected from all sources and supplies of gas, purged of gas, and the ends sealed; however, the line need not be purged when the volume of gas is so small that there is no potential hazard. **192.727 (a)**

B. If air is used for purging, the operator shall ensure that a combustible mixture is not present after purging.

C. Long lengths of main shall be cut and sealed every two blocks, or a maximum of 1,000'.

5.6 Methods for Various Purges

Figures 1 and 2 are typical methods used for various types of purges.

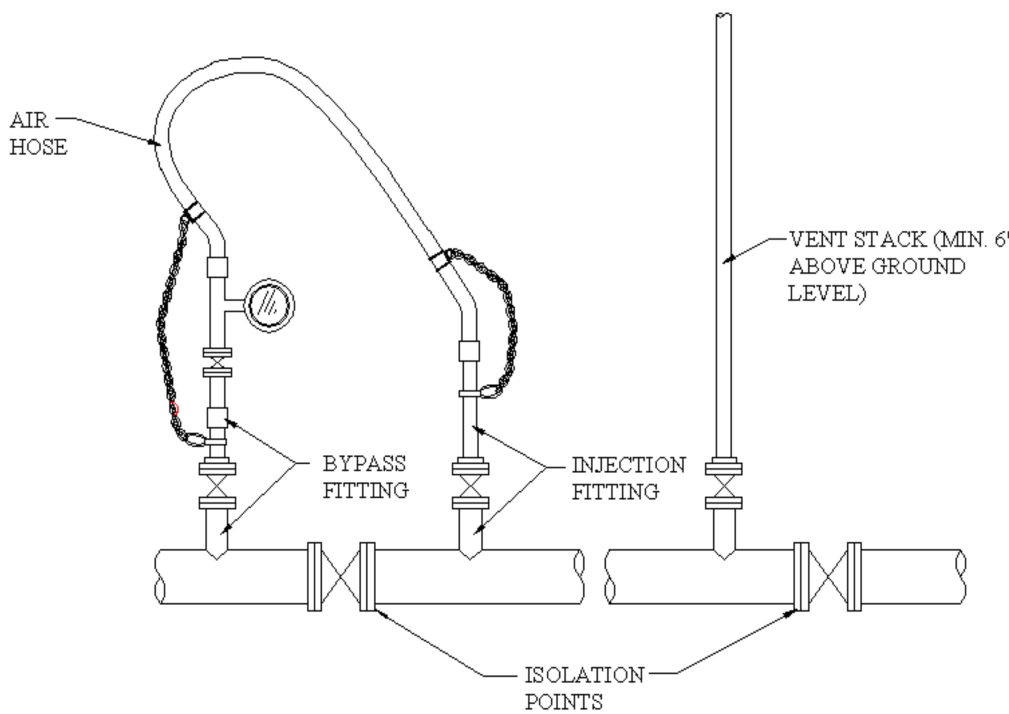
A. Purge Pipeline of Air

It is not necessary to inject gas through a bypass hose when a line valve can be opened at the injection end of pipeline being purged.

PROCEDURES
PURGING

FIGURE #2

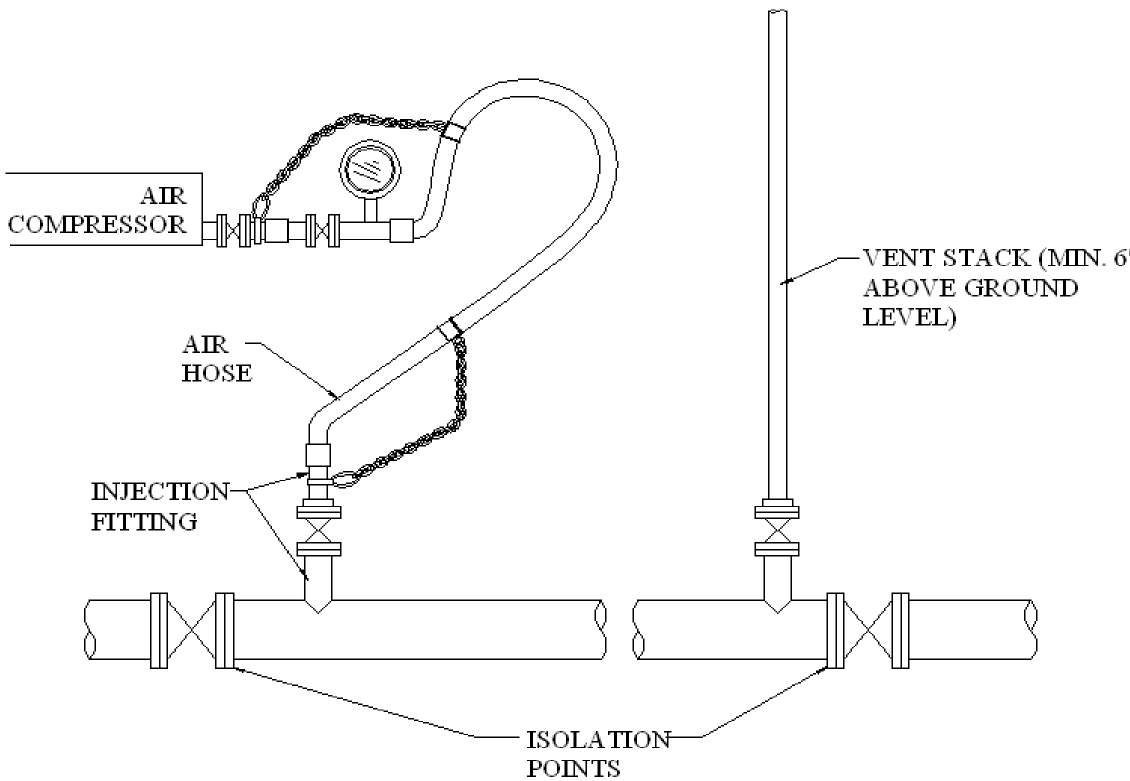
Arrangement for Directly Purging
Air from Pipeline



B. Purging Pipeline of Gas

FIGURE #3

Arrangement for Directly Purging Gas from Pipelines



5.7 VACUUM PURGE / EVACUATION

A high vacuum evacuation may be implemented to remove air and moisture from the pipeline system to be commissioned / gassed.

A. The procedure shall reach a pressure level at which free water begins to boil off (the vapor pressure of water – 0.362 psig at ground temperature, 70 degrees F).

B. After the pressure has been maintained and as water vapor is constantly exhausted, the volume of air in the system will be negligible having been displaced by the water vapor.

C. When all of the water has been evaporated, the final maximum pressure attainable by the vacuum system shall be applied and held until the system reaches a dew point of –40 degrees F.

D. If there is no free water present, the system will reach the pressure attainable by the vacuum system and held until the system reaches a dew point of –40 degrees F.

PROCEDURES
ODORIZATION TESTING

6.0 PURPOSE (192.625)

The purpose of this section is to establish the minimum requirements for odorization of the gas within the Operators system and the monitoring of appropriate levels of odorization.

6.1 ODORIZATION

VMUS shall use Mercaptan or approved equal, as determined necessary by VMUS or gas supplier, as the odorizing agent in all odorizing operations. Odorant must be detectable by a person with a normal sense of smell at levels equal to 1/5th (20%) of the Lower Explosive Limit (LEL) or 1% gas in air. **192.625 (a)**

The gas supplied to the Operator's system by is either:

1. Pre-odorized by the supplier, or
2. Must be odorized by the Operator.

6.2 ODORIZATION TESTING

Quarterly (every 3 months) odorization checks will be made at random locations to determine that odorization is maintained at an adequate level.

A. Random location should represent a new location each quarter not to be repeated within 12 months.

B. VMUS utilizes an odorometer, a portable, gas odorant detector designed to measure the amount of natural gas in a gas/air mixture as determined by an individual's sense of smell, as an effective means by which to accomplish accurate odorant testing.

C. Odorometer(s) shall be calibrated once annually not to exceed 15 months.

6.3 TEST EQUIPMENT SET-UP

The following is a set of general setup instruction for the odorometer:

1. Locate a source of gas, such as an MSA.
2. Gas flow should be present and steady when possible.
3. Pressure should normally be ¼ psig, but never greater than 5 psig.
4. The area must be relatively free of wind currents or odors that may cause errors in

the test results.

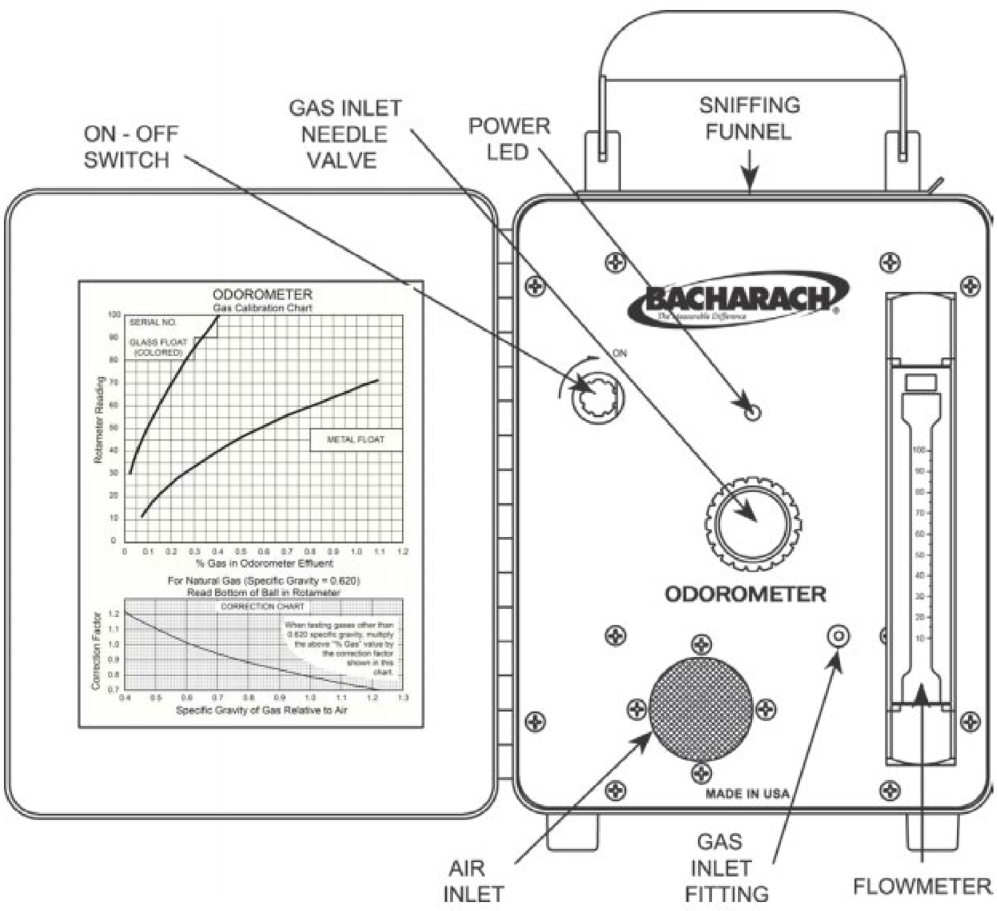
5. Place the odorometer in a vertical position.
6. Connect the odorometer to the gas inlet fitting with an approved, non-odor-absorbing plastic tubing such as Bev-o-line®, Teflon®, or Tedlar®.
7. Operators of the odorometer should be selected with due consideration to smoking habits, colds and other conditions of health, since these factors are known to affect the sense of smell. It is desirable to select operators with an average sense of smell in order to obtain reasonably consistent results from the use of this instrument.

6.4 TEST PROCEDURE

Follow the equipment manufacturers operating instructions for the actual test equipment being utilized:

1. Individuals performing a "sniff test" should be selected with due consideration to smoking habits, colds and other conditions of health, since these factors are known to affect the sense of smell. It is desirable to select operators with an average sense of smell in order to obtain reasonably consistent results from the use of this instrument.
2. Odor level rating must be based on 1st or 2nd sniff due to the sense of smell fatiguing with continued exposure
3. Frequently pause by moving the nose away and breathing fresh air then continuing.
4. Record readily detectable odor/reading on appropriate form.
5. Should adequate odorant NOT be present, immediately report this to the gas supervisor.
6. For systems receiving pre-odorized gas, the Gas Supplier shall be notified to initiate corrective action should low odorant be indicated.
7. The Operator should routinely monitor odorant levels until normal odorant is achieved (High or Low).
8. Record findings on appropriate company form.

6.5 BACARACH ODOROMETER



TEST PROCEDURE:

1. Check batteries

2. Connect **Sample Hose** (plastic or aluminum only, do not use copper or rubber, as these tend to remove odorant compounds) from gas inlet fitting on the front panel, and pressure should be below 5 PSI.
3. Whenever possible run test in odor and draft free environment.
4. Set instrument on level surface.
5. Open the top cover and start the motor by turning switch clockwise until airflow is achieved.
6. Green LED should light, wait a few seconds, if LED does not light, replace batteries and start over.
7. Open gas inlet needle valve slowly while sniffing the discharge air at the top of the instrument.
8. Hold your nose within 1 inch from sniffing funnel to avoid dilution from surrounding air.
9. Odor level rating must be based on the first sniff or two because the olfactory senses fatigue rapidly with continued exposure to an odor.
10. Between sniffs the observer should breathe deeply but slowly through his nose to "regenerate" his perception.
11. When you smell a detectable (readily perceptible odor), take reading on upper glass when both floats are within range of measurement; take readings on the metal float when the glass float reaches the top of the tube.

Float	Range
Glass	.04 to .4%
Metal	0.2 to 1.1%

12. When taking reading, use the line number at the bottom or below the float.
13. To determine the gas concentration from the reading, consult the percent gas chart furnished by the manufacturer.
14. Close gas supply outlet valve.
15. Disconnect **Sample Hose** from the gas outlet and the instrument.
16. Fully open **Flow Adjustment Valve** and leave instrument on for approximately 1 minute after the test to purge the instrument.
17. Document findings using appropriate form(s).
18. Immediately report any deviation from normal odorant level.
19. Store with **Sample Hose** disconnected.
20. Ensure tubes and floats are clean to prevent sticking. The tube and floats may be cleaned with alcohol.

PROCEDURES
PRESSURE GAUGES

7.0 PURPOSE

To provide standardized intervals and the required maintenance for the inspection and calibration of pressure gauges used for pressure stand up tests on distribution facilities.

7.1 APPLICATIONS

A. Pressure gauges should be selected for their specific application.

B. The desired pressure to be gauged should fall within the mid range of the selected gauge. (i.e. operating pressure at 50 psig, appropriate gauge should be 0 to 100)

7.2 APPROVED STANDARDS AND ACCURACY

A. Pressure gauges shall have a minimum accuracy of ±1.0 percent full scale or full range for standards.

7.3 CALIBRATION SCHEDULES

A. Pressure gauges shall be inspected and calibrated every twelve (12) months or replaced as necessary.

B. Pressure gauges should be sent the manufacturer or an independent agency for calibration.

7.4 OPERATING REQUIREMENTS

A. Do not transport Field gauges in vehicle cabs or bins unless stored in an approved carrying case.

B. Check and adjust zeros before using at each location.

C. Install vertically all bourdon or spring-type pressure gauges.

D. Tap bourdon or spring-type pressure gauges at each pressure setting to overcome minor binds. Replace gauges when heavy tapping is required to obtain desired setting, or jumping of the pointer is observed during pressure setting changes.

E. Have all pressure gauges inspected and calibrated when it has received damage, suspected to have received damage, or does not operate properly.

F. Do not disassemble or attempt field repairs of pressure gauges.

G. For the most accurate reads, use pressure gauges which correspond to stand up test pressures below.

1. Bourdon or spring-type gauges:

Test Pressure (PSIG)	Maximum Gauge Range (PSIG)
1-24	0-30 or 0-60
25-50	0-60 or 0-100
50-90	0-100 or 0-200
90-180	0-200 or 0-400

7.5 CALIBRATION REQUIREMENTS AND TOLERANCE

A. Pressure gauges shall be calibrated using the following number of pressure settings during the calibration process. Pressure settings established for the calibration will ensure that the full range for the gauges is covered.

NOTE: The standard being used for calibrating a device has to have a higher accuracy than the accuracy to which the device is being calibrated to. For example, a pressure gauge with a manufacturer's stated accuracy of ±1.0 percent of full scale cannot be calibrated to that accuracy with a Primary Standard having the same ±1.0 percent of full scale accuracy.

1. Gauges shall be calibrated at four (4) different pressure settings.

NOTE: Gauges that measure both inches of water column and psig shall require separate calibration in both modes.

B. Repair or replace standards that are found outside the manufacturer's stated accuracy for the specific device and cannot be calibrated to tolerances.

7.6 RECORD KEEPING REQUIREMENTS

PROCEDURES
PRESSURE GAUGES

The Operator shall maintain a record of the calibration and maintenance performed on pressure gauges. The serial number and/or ID number shall be recorded. Maintain a record of calibration and maintenance history for each pressure gauge on appropriate form.

PROCEDURES
MANOMETER / OUNCES GAUGE

8.0 PURPOSE

The purpose of this section is to establish procedures for using the manometer or ounces gauge for pressure checks involving low pressure gas downstream of the meter at less than 1 psig.

8.1 MANOMETER PROCEDURE

A. Uncap tubes on manometer

B. Check fluid levels. Use only approved Manometer Fluid or water.
Do not use antifreeze.

C. Adjust to zero range with manometer in the vertical position using both sides of U Tube.

D. Connect tubing and manometer downstream of regulator on customers piping.

E. Keeping manometer in vertical position, introduce gas pressure into the manometer.

F. Allow fluid to settle and total readings above and below zero.

G. Make necessary adjustments to regulator to achieve proper water column inches.

H. Disconnect manometer and cap.

I. Always transport manometer in upright position.

8.2 LOW PRESSURE GAUGES

A. Low pressure gauges measuring gas pressure in ounces may be substituted for the manometer.

B. Always transport ounces gauges in appropriate, protective caring case.

PROCEDURES
CARBON MONOXIDE (CO) TESTING

9.0 PURPOSE

The purpose of this section is to establish procedures for investigating and testing for the presence of carbon monoxide in the environment.

9.1 SCOPE

Carbon Monoxide (CO) poisoning results in flue like symptoms, and prolonged exposure or exposure to high levels of CO may result in death.

A. As little as 10ppm needs to have the source identified and corrected.

B. 50ppm (0.005%) is the maximum allowable concentration for continuous exposure in any eight (8) hour period.

C. 800ppm (0.08%) may cause unconsciousness or death within two (2) hours.

9.2 CO PROCEDURE

A. Verify with customer / occupants the presence of any CO symptoms. Refer to emergency plan Section B.1 for additional information.

B. Is CO suspected from a specific appliance or for other reason?

C. Request Fire Dept. to respond and test for presence of carbon monoxide. If CO is found, assist Fire Dept. with ventilating structure and removing occupants. Fire Dept. will determine if any treatment is needed for occupants.

D. If the cause of the CO can be eliminated, make repairs and retest for presence of CO. If CO is eliminated then service can be restored.

F. If the cause of the CO cannot be eliminated, shut off the natural gas supply and issue Notice of Unsatisfactory Condition. Advise occupant to have faulty equipment repaired by a licensed contractor before service can be restored.

PROCEDURES
Future Use

This Section Is Held For Future Use

PROCEDURES
LEAKAGE / GENERAL

1.0 PURPOSE

It is the purpose of this section to provide minimum requirements and information on leakage detection equipment, leakage classification, leakage locating, and centering of leaks.

1.1 SCOPE

This section covers the following:

A. J-2 Flame Ionization Unit
B. J-2 Leakage Survey
C. J-3 Combustible Gas Indicator
D. J-4 Determining Leak Spread
E. J-5 Leakage Grading
F. J-6 Centering Leaks
G. J-7 Marking Leaks
H. J-8 Purging Bar Holes
I. J-9 Leakage Investigation
J. J-10 Soap Test

1.2 GENERAL

Two primary types of detection equipment are utilized for the determination of underground gas leakage.

1. The flame ionization unit is used to detect the presence of hydrocarbons and is calibrated to register the particular gas in parts per million.
2. The combustible gas indicator is used to classify gas leaks. The CGI is calibrated to register percent of the L.E.L. and percent gas.

PROCEDURES
FLAME IONIZATION (FI) / LEAK SURVEY

2.0 PURPOSE

The flame ionization unit (FI) is designed to detect the presence of hydrocarbons in concentrations ranging from 1 PPM to 100,000 PPM. The unit is used for scheduled, random, and miscellaneous gas leakage surveys. The FI unit is **not used** for gas leakage classification.

2.1 FLAME IONIZATION UNITS

A. Each of the following FI units is approved for use by the Operator and its contractors, for use in conducting leakage surveys.
1. Southern Cross 400
2. Heath Detecto-Pac II and III
3. GMI FI2000

B. FI units shall **Not** be used in closed environments where a potential explosive atmosphere may exist. The FI unit, because of its internal flame, is a potential source of ignition.

C. The reference gas utilized by the FI units shall be certified 40% Hydrogen and 60% Nitrogen.

D. Always turn on and zero FI in a nonflammable atmosphere (clean air).

E. Always check for physical damage and/or missing parts before beginning.

F. **Southern Cross Flamepak 400:**
1. Check Batteries and replace if necessary (Refer to operation manual for more information).
2. Check reference gas and fill if necessary (min. 800 psig, max. 1800 psig) (Refer to operation manual for filling procedure).
3. Install the fuel cylinder cap in place after filling (do not over-tighten).
4. Check for clean inlet filter (Change daily or more frequently if necessary).
5. Attach probe.
6. Open reference fuel valve (listen for hissing sound to indicate fuel flow).
7. With zero adjust fully counterclockwise, turn power switch on.
8. The LED and alarm should come on and stay on.
9. Press the ignitor switch, alarm and LED should go off within 3 seconds.
10. If not wait 5 seconds and try again.
11. If LED and alarm stay on, FI unit is in need of further repair.

12. If the LED and alarm both go off, slowly rotate the zero adjust knob clockwise to 100 and then counterclockwise to zero.
13. Adjust alarm point (should be between 40 and 50%).
14. Anytime you note that the alarm point has dropped for 4-8%, the batteries need to be replaced.
15. Extinguish the flame by placing your thumb over the intake. LED and alarm should come on within 3 seconds. Reignite the unit.
16. Check for leaks in the sample system by removing the probe. LED and alarm should come on within 3 seconds. Reinstall the probe.
17. Turn zero knob fully counterclockwise, wait 5 seconds and reignite the unit
18. If any of these tests fail further repair is required.
19. Perform calibration test with known gas sample (50ppm gas).
20. Set unit to search range and set meter slightly below alarm point to begin survey.
21. To shut down, place thumb over intake cone. LED and alarm should come on.
22. Turn power switch off. Allow fuel to flow for 10 to 15 minutes then close fuel valve.

2.2 LEAKAGE SURVEY (192.723)

A. The operator shall conduct a gas detector leakage survey of all exterior pipeline facilities of the operator's system at the following intervals:

1. Business District: Once each calendar year not to exceed 15 months.
2. Outside of Business Districts: As frequently as necessary but at intervals not exceeding 5 years not to exceed 63 months. It is recommended that the operator survey a minimum of 20% of its system each year with the entire system to be completed within 5 years. However, for cathodically unprotected distribution lines subject to § 192.465(e) on which electrical surveys for corrosion are impractical, a leakage survey must be conducted at least once every 3 calendar years at intervals not exceeding 39 months.

B. Leakage surveys and leakage grading shall be performed by qualified personnel.

Grade 1 leak: Requires immediate and continuous action until corrected.

Grade 2 leak: Shall be scheduled for repair as soon as practical and shall be reevaluated at a minimum of every 30 days.

Grade 3 leak: Shall be scheduled for repair as soon as practical and shall be reevaluated at a minimum of every 12 months.

(Refer to Section J-5)

C. Operator and contract personnel conducting leakage surveys shall check calibration on the F.I. units (according to the operator's manual) each day they are used and document the results.

D. Proper use of the instrument to conduct a leakage survey should be as follows:

1. When surveying, the range switch should be on its most sensitive range.

2. The technician should be looking for gas vent points and not necessarily limited to the area directly over the main. In many cases the main is located in a paved street where no gas vent points are nearby. The technician should search out all adjacent cracks and other surface structures, such as water meter boxes adjacent to the gas main or service to be inspected. The technician should look for any signs of excavation activity.

3. On lawns or unpaved areas, the operator will survey directly over the main to get best results. On testing around exposed piping, such as gas meters, the operator should not specifically test each fitting, but slowly wave the test probe over the meter set.

4. Paved areas and areas with water puddles will not vent freely. A meter movement indicates the presence of hydrocarbons, especially one that activates the audio signals by exceeding a preset threshold level. When this occurs, the operator must backtrack several feet and re-inspect the area (being careful to reproduce the previous inspection exactly) in order to define the actual venting point of the leakage indication. The magnitude of the meter response may suggest a temporary reduction in sensitivity so that more accurate centering may be accomplished. At this point, the soil atmosphere shall be tested with a conventional, combustible gas indicator. It must be kept in mind that both the paving and surface opening are apt to greatly influence the amount of gas in the atmosphere. Although paving will reduce the concentration, street openings will tend to increase it beyond that level, which normal venting through the soil would produce.

5. In other areas where motor vehicle traffic is prevalent, or where other exhaust producers are present, the possibility exists of meter indications

occurring which have no relationship to the hydrocarbon-carrying lines being inspected; however, since contaminants are rarely found in detectable concentrations at the surface when an inspection is being done, false indications have not been a problem. The retracing procedure will quickly confirm the existence of hydrocarbons.

6. Indications of the presence of hydrocarbons detected by the F.I. unit will cause the technician to place bar holes so that the presence of hydrocarbons can be confirmed by the use of the Combustible Gas Indicator (CGI). Enough bar holes shall be placed to determine the amount of leakage and the extent of the area in which leakage is present and to determine the grade of leak found.

7. Refer to the equipment manufacturers operating instruction manual for further detail in operating and maintaining this equipment.

2.2 SAMPLING PRECAUTIONS

A. The flame ionization unit is not to be used as a measuring device and is not to be used in manholes or confined areas to measure for explosive gas. A combustible gas indicator (CGI) should be used for this purpose. The readings obtained with a flame ionization unit are not accurate above 400 parts per million. It may flame out, at or near the lower explosive limit.

B. The flame ionization unit is designed as a surface sampling instrument.

C. When a scheduled leakage survey is conducted using the handheld portable flame ionization unit, the technician of this unit shall record the wind velocity every 2 hours using an appropriate wind velocity gauge. The wind velocity readings shall be taken within 3 ft. of ground level. Leakage survey may become ineffective in wet or windy conditions. The technician's good judgment should be used to determine an adequate survey. Whenever the wind velocity is in excess of 20 miles per hour, the scheduled leakage survey shall be discontinued and restarted when weather conditions improve.

D. When a scheduled leakage survey is conducted by the mobile unit, the technician of this unit shall record the wind velocity every 2 hours using an appropriate wind velocity gauge. The wind velocity readings shall be taken within 3 ft. of ground level. Whenever the wind velocity is in excess of 10 miles per hour, the scheduled leakage survey shall be discontinued and restarted when weather conditions improve.

E. Whenever an unscheduled leakage survey is conducted by the handheld portable flame ionization unit and the wind speed exceeds 20 miles per hour, the survey may continue but at a slower pace. A follow up survey shall be conducted as soon as possible when weather conditions improve. In addition to heavy winds, the unit should not be used in heavy rains or where there is standing surface water on the pavement or areas to be surveyed. Water may damage the unit and will tend to temporarily seal the gas vent points. The unit can, however, be used in light rain and where this buildup has not occurred.

PROCEDURES
COMBUSTIBLE GAS INDICATORS (CGI)

3.0 PURPOSE

The combustible gas indicator unit (CGI) is utilized to center, determine leakage spread and to classify gas leakage. The unit may be used for gas leakage investigations and leakage surveys.

Operator and contract personnel using CGI's shall check and record calibration regularly.

3.1 SCOPE

The combustible gas indicators are designed to:

A. Determine whether gas is present in a manhole, basement, underground or other confined space.
B. Provide means for classifying leaks.
C. Check for completion of a purge.
D. Center leaks.
E. Determine leakage spread.

3.2 COMBUSTIBLE GAS INDICATOR

A. The combustible Gas Indicators is a two-scale instrument.
   1. One scale indicates gas from 0% to 5%, or percent of Lower Explosive Level (L.E.L).
   2. The second scale reads gas concentration directly from 0% to 100% gas in air.

B. Technician must check calibration on the CGI units regularly and document the results. **Follow the specific manufacturer's procedures**.

C. Zero the unit prior to each usage.

D. Check bar holes, cracks and other possible vent points.

E. Determine leakage spread **Refer to Section J-4.**

F. Center and classify leakage **Refer to Sections J-5 & J-6.**

G. Should leakage be determined to be potentially hazardous, take appropriate action to protect life and property **Refer to Section B-3 & Section Q.**

H. It is important to clear the unit (pump air through the unit) between each check.

I. When using only the combustible gas indicator unit for leakage survey, good judgment should be used to determine the number of bar holes to provide an adequate survey and perimeter of leakage migration.

J. Combustible gas indicators can be used to differentiate natural gas from condensable hydrocarbons (gasoline) with the installation of a hydrocarbon filter (charcoal) on the instrument.

3.3 MSA GASCOPE

A. Leak, flow and calibration checks shall be made not less frequently than **monthly**.
1. Calibration Check:
    a. Turn unit on and set to LEL range
    b. In fresh air, squeeze the aspirator bulb 8-10 times
    c. Unit must reset to zero on both scales
    d. On LEL scale check reading against know sample of 2.5% methane
    e. On gas scale check reading against 100% gas (pipeline gas may be used)
2. Leak Check:
    a. Seal inlet fitting
    b. Squeeze aspirator bulb
    c. Immediately seal outlet of aspirator with thumb
    d. Bulb should remain deflated for a minimum of 10 seconds
    e. If not, repair is required
3. Flow Check:
    a. Squeeze aspirator
    b. Bulb should re-inflate within 1 to 2 seconds
    c. If not, replace filter
    d. Disconnect aspirator bulb tubing from outlet fitting and remove regulating orifice to verify that it is open
    e. If clogged, insert no. 23 gauge wire through the opening
    f. Reconnect and recheck
    g. If aspirator bulb still does not inflate in 1 to 2 seconds, further repair is required

B. Do not operate on LEL in oxygen deficient (less that 10% oxygen) area as the meter may not give accurate readings.

C. This instrument is not intended for testing mixtures of hydrogen, acetylene, or other combustible gases, in which the oxygen content exceeds that of normal air.

D. Even though the instrument responds to such combustibles gases as propane, acetylene, gasoline or solvents, it provides accurate measurements of only the specific gas for which it is calibrated.

E. The use of a standard cotton filter in the sampling line is recommended to protect the instruments for possible damage caused by sampling leaded petroleum products. Change the cotton filter when dirty or damaged.

F. An activated charcoal filter may be installed in place of the cotton filter to separate petroleum products being sampled. If the readings are less than those indicated without the charcoal filter, then the sample contains petroleum.

G. **CGI Model 62S Operation** (Manually aspirated unit)

1. Set range switch to LEL.
2. Set on/off switch to on.
    - BATT indicator should be well into white
    - READY should turn on within approximately 4 seconds. If not, replace batteries
3. Squeeze aspirator bulb 8 to 10 times in fresh air to purge the instrument. Bulb should fully re-inflate within 2 seconds.
4. Lift and turn outer sleeve and adjust LEL control to zero indication on meter.
5. Attach sampling line, probe and filter cartridge if necessary
6. Set RANGE switch to GAS.
7. When READY indicator turns on, Lift and adjust GAS ZERO control to obtain zero indication on meter.
8. In area(s) to be tested, squeeze aspirator bulb nine or ten times to draw adequate sample into instrument.
    - When the needle stabilizes, the meter indicates the concentration of gas in air in percent by volume.
    - Meter indications are valid only when READY indicator is on.
9. When wet weather conditions exist, caution should be taken to prevent

liquids from being drawn into the instrument.
- Do not allow end of probe or sampling line to touch liquids
- Use closed end probe
- Install line trap

10. If meter indication is less than 5, set range to LEL. The meter now indicates the percent LEL.
11. If indications of gas leakage are present:
    - Center leak **Refer to Section J-6**
    - Grade Leak **Refer to Section J-5**
12. Take appropriate action to protect the general public **Refer to Section B-3 & Section Q.**
13. Record all readings and findings on appropriate forms and maps.

H. Refer to the equipment manufacturers operating instruction manual for further detail in operating and maintaining this equipment.

PROCEDURES
DETERMINING LEAK SPREAD

4.0 PURPOSE

This section provides minimum requirements for determining leak spread and placement of bar holes.

4.1 SCOPE

A. FI unit may be used to determine the general area of leakage spread at the surface.

B. A CGI shall be used to:

- Determine the amount of leakage.
- Determine the extent of area involved.
- Determine the class of leak found.

4.2 FIELD PROCEDURE

The placement of bar holes and observing of readings with a CGI will continue until the perimeter of the leak has been well defined as rapidly and thoroughly as possible.

Indication of the presence of hydrocarbons shall cause the technician to place bar holes so that the presence of hydrocarbons can be confirmed by use of a combustible gas indicator (CGI). Bar holes should be approximately 18 inches deep.

Good judgment shall be used to determine the number of bar holes to provide an adequate survey. The absolute minimum number of bar holes placed will be determined by the following:

A. Bar holes shall be placed along the pipeline at a maximum of 20-foot intervals until gas readings are zeroed (2 consecutive readings of 0) using a CGI.

B. Any service line within the leakage area shall be bar holed at a maximum of 20-foot intervals until gas readings are zeroed (2 consecutive readings of 0) using a CGI.

C. Against structure foundations and around the perimeter of affected structures until gas readings are zeroed (2 consecutive readings of 0) using a CGI.

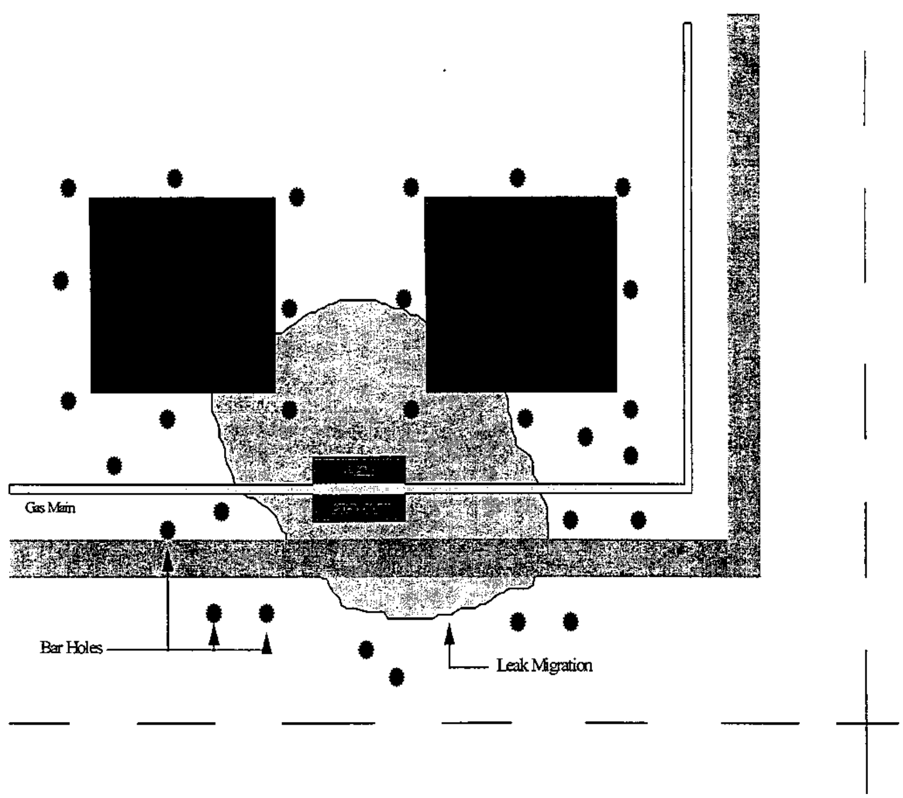
PROCEDURES
DETERMINING LEAK SPREAD

D. When evaluating any gas leak indication and the leak area extends to a building wall, the leak investigation shall continue into the building whenever possible, using a CGI.

E. The placement of bar holes and taking of samples with a CGI will continue until the perimeter of the leak spread is well defined.

F. Readings should be documented on appropriate forms.

FIGURE 1



G. When evaluating gas leak indication and the leak area extends to a building wall or substructure where persons may enter, the leak investigation shall continue inside whenever possible.

H. Record all findings on appropriate form(s)

PROCEDURES
LEAKAGE GRADING

5.0 PURPOSE

The purpose of this section is to establish the most appropriate procedures to be undertaken in response to any indication of gas leakage.

5.1 SCOPE

All leaks on Operator facilities are assigned priority classification according to the following:

A. Location
B. Spread
C. Gas concentration
D. Possibility of gas accumulation
E. Possible sources of ignition
F. Imminent hazard to the public or property

5.2 LEAKAGE PRIORITY

A. Each leak priority code has a maximum time limit for corrective action. Priority classification is based on relative degree of hazard and the examples are listed for each Leakage Grade.

B. The person evaluating the leak, after considering the primary criteria listed, will determine the grade of the leak. The leak Grade shall be documented on the appropriate form(s).

C. All leak repairs will have a follow-up inspection to ensure that all leakage has been repaired. This should be done while the excavation is open.

D. In the case of residual gas, a follow-up survey should be made no later than 30 days following a repair.

5.3 GRADE I

A grade I leak is any leak that has conditions that pose an immediate or imminent hazard to people or property**. Immediate action shall be taken to repair Grade I leaks** and Dispatch shall be contacted immediately. **Continuous Action** shall be taken until the leak source is accurately located and the hazard has been eliminated. Continuous action includes monitoring area of leakage for possible gas migration. Examples may be, but are not limited to:

A. Leaks blowing at the surface.

B. Gas in or under any building.

C. Gas indications underground adjacent to any buildings:

1. Within 5' when not paved;
2. Within 10' when paved;
3. Within 50' of a school, hospital, theater or other places of public assembly.

D. Concentrations of 1% gas (20% LEL) or greater in excavations, substructures, confined spaces or enclosures which personnel can enter.

E. 1% gas (20% LEL) or greater confined space containing electric connections or other sources of ignition.

F. Leakage which, because of public concern or location, may be considered hazardous to persons or property.

5.4 GRADE II

A Grade II leak is one that has conditions that may be considered a potential problem, but is obviously not an immediate or imminent hazard. These conditions shall be reported at the end of the working day in which they were encountered**. Grade II leaks shall be repaired within 30 days of discovery or re-evaluated every 30 days after detection until repaired, reclassified or no longer results in a reading.** The re-evaluations may continue for a maximum of 12 months from the reported date. Examples may be, but are not limited to:

A. Concentrations below 1% gas (20% LEL) in excavations, substructures or enclosures which personnel can enter.

B. Gas indications underground adjacent to any building:

1. Between 5' and 25' when not paved.

2. Between 10' and 50' when paved.

3. Between 50' and 100' of a school, hospital, theater or other place of public assembly.

C. Leaks requiring elimination prior to construction or reconstruction of streets, highways, buildings or underground construction.

D. Leaks affecting vegetation.

5.5 GRADE III

A Grade III leak is one that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous. **A grade III leak must be repaired, or re-evaluated during the next scheduled survey, or within 15 months of the reported date, whichever occurs first.** All leaks not classified as a Grade I or Grade II will be classified as Grade III. Examples may be, but are not limited to:

A. Any reading of less than 3% gas (60% LEL) in small, gas-associated substructures.

B. Any reading under a street in areas without wall-to-wall paving where it is unlikely the gas could migrate to the outside wall of a building.

C. Any reading of less than 1% gas (20% LEL) in a confined space.

PROCEDURES
CENTERING LEAKS

6.0 PURPOSE

The purpose of this section is to establish procedures for centering a gas leak to determine the safest way to locate and repair the leakage source.

6.1 SCOPE

A Centering
B. Marking
C. Recording

6.2 CENTERING LEAKS

A. Locate and mark the gas main, gas services and other substructures in the area.

1. Drill or punch offset bar holes at approximately 6' intervals along and on alternate sides of the main both ways from the leak indication. Where lateral connections to the main are located, drill on the lateral side.

2. Sample bar holes and record findings immediately after drilling until 2 consecutive readings of 5% gas or less are obtained in both directions.

3. Determine extent of leak spread.

4. Recheck bar holes to establish center area.

5. Grade leakage.

6. Mark the point of highest reading for excavation and repair.

B. Where definite peak area cannot be established, purge each bar hole to reduce gas concentration.

1. Suction bar holes.

2. Recheck bar holes to establish approximate center area.

3. Grade leakage.

PROCEDURES
CENTERING LEAKS

4. Mark the point of highest reading for excavation and repair.

C. If a definite peak still can not be established:

1. Drill or punch bar holes on alternate sides along main or service at 2' intervals for a distance of 12' in each direction from the approximate center.

2. Check each bar hole within the 24' distance and record readings.

3. Establish approximate center area.

4. Grade leakage.

5. Mark the point of highest reading for excavation and repair.

D. Record findings, including all gas test readings, on appropriate form(s).

PROCEDURES
MARKING LEAKS

7.0 PURPOSE

This section provides the minimum requirements regarding the marking of leakage on site and documentation of the event.

7.1 SCOPE

A. Marking maps
B. Field markings

7.2 MARKING LEAKS

A. The survey technician will mark maps and appropriate forms to show the location of all leaks found.

B. The survey technician will clearly mark the site at which the leaks were found:

- Paved Areas - Paint
- Unpaved Areas – Paint, feather nails, or stakes

C. Field markings will also include indications of readings at each bar hole location.

PROCEDURES
PURGING BAR HOLES

8.0 PURPOSE

Purging is an efficient method of centering. The 2 methods used to purge bar holes of the leak centering patterns are by suction, or venting.

8.1 SCOPE

A. Bar hole suction method

B. Venting

8.2 SUCTION METHOD

A. The suction method should be used on each bar hole for a minimum of 30 seconds. The maximum time will depend on the amount of gas concentration and soil conditions.

B. The aerators have a 9/64" hole drilled in the gate of the 1/2" valve.

C. With the valve closed, this 9/64" orifice allows the proper amount of air to pass for maximum vacuum with direct pressure from the compressor.

D. After the aerator is installed in the bar hole, it may be necessary to clear the 1/4" pipe inlet.

E. On high-pressure mains, this may be done by simply plugging the outlet of the aerator and turning on the air for an instant.

F. On Low-pressure mains, the soil sampling device may be used to clear the bar hole before inserting the aerator to prevent clogging.

8.3 VENTING

A. The amount of time the bar holes are left open is dependent on
- Location of the bar holes,
- Gas concentration
- Work routine of the crew

PROCEDURES
PURGING BAR HOLES

B. Air Mover

This practice covers the use of the venturi-type air mover when used for aerating gas concentrations from the ground.

- When a gas leak occurs, it will migrate away from the leakage area in the path of least resistance. Therefore, the placement of the air mover is very important to reverse this migration of gas back to the point of origin and to release gas concentration into the atmosphere.
- Before starting air mover, plug all bar holes in the ground and around the buildings with soil or cold-mix asphalt (where required).

NOTE: The only hole in the ground or escape route for the gas should be at the excavation where the repair was made.

C. 0% Gas Read

- Aerate with the air mover on, with all the bar holes plugged, until 0% gas reads are obtained with a combustible gas indicator adjacent to any structures.
- When a 0% read is achieved, continue aerating, open the bar holes and take reads with a CGI. If the reads are 0% gas, stop aerating and wait approximately one hour and recheck bar holes to determine if additional aeration is required. If additional aeration is required, re-plug the bar holes and continue running the air mover.
- When it has been determined that all leakage is controlled, and hazardous concentrations adjacent to structures have been eliminated, the area can be declared safe. Recheck the next day for buildup of gas concentrations. If buildup is found, repeat aeration procedure.

PROCEDURES
LEAKAGE INVESTIGATION

9.0 PURPOSE

When gas odor/leak calls are received, time is of the essence. Answer the call as quickly as possible. Gas odor/leak calls have **Top Priority** over all other work.

9.1 SCOPE

A. Odor Investigation

B. Linebreak Procedure

C. Fire / Explosion

D. No Gas / Low Pressure

E. Gas Outage

9.2 GENERAL

A. Upon arrival, always park/stage upwind, uphill or upstream of the situation.

B. **Reference Emergency Response Plan**

9.3 LEAK / ODOR CALL

A. General Response Guidelines

1. Gas leaks may be located, or determined to be present, by sight, hearing, smell, application of liquid leak detector (**Soap Test**), use of appropriate leakage detection equipment, meter clock tests, or pressure tests.
2. When responding to a Leak/Odor Call and arriving at the scene:
   a. Park at a safe distance away from the reported leak location
   b. If possible, contact the person reporting the leak/odor for any additional information that may be available/provided.
   c. Determine the location of mains and services in the area:
   If unable to determine the location of mains and services, request additional assistance.
3. Leak investigation shall not be terminated until the point of origin of the uncontained gas has been located or the source of odor has been identified

or positively determined not to be natural gas. If NO leakage is found and NO odor is present, the leak investigation must include the following:
a. Conduct leak investigation inside structures, if indicated by initial leak report or contact with person reporting the leak.
b. Leak survey of Operator-owned underground facilities.
c. Soap test MSA.

4. If a strong odor a gas is detected inside a building, the meter should be shut off immediately.
5. If the source of the gas leak is found to be inside the building, after repair/clearing of the leak, consideration should be given to using the Turn-On Procedure and the Flow and Lock-Up Procedure contained in O&M Section F-4/Meter Turn-On & Regulator Flow and Lockup.

B. Inside Leak Investigation, use CGI. (Minimum Guidelines)

1. Clear the unit outside in uncontaminated air before entering.
   a. Do not use FI inside of any structure until it has been demonstrated that no explosive mixture of natural gas exists.
2. Check for the presence of gas at the entrance to the building and periodically throughout the structure including gas appliances, heat registers and in each room
3. If a structure consists of multiple units, check the affected premises inside for the presence of gas.
4. Gas at 5% LEL inside a structure is generally considered a hazardous atmosphere.
5. If a reading of 5% LEL or higher is determined, the VMUS First Responder shall implement the Emergency Response Procedure as contained in Section C of the Emergency Response Plan.
6. If other units in a multiple premise structure indicate the presence of gas, evacuate those premises, and continue the investigation until no presence of gas is detected.
7. If no definitive leak source is determined, conduct an Outside Gas Leak Investigation, as noted below.

C. If in the judgment of the utility personnel, a hazardous atmosphere exists:

1. Ask all occupants to leave the building.
   Assure that occupants do not touch any switches, unplug any devices, turn off any electrical equipment, etc.

2. Turn off gas at the MSA.
3. Notify Dispatch if assistance is required.
4. Eliminate possibility of ignition.
5. Ventilate the building, if possible.
6. Notify the Fire Department for ventilation, if necessary.
7. Notify the Police Department if area access control is necessary.

D. If, in the judgment of the Utility Personnel, <u>no hazardous atmosphere</u> exists**,** proceed with leak investigation:

1. Perform a CGI leak check at the following locations:
   - At the point of entry of all underground utility services (gas, water, etc.).
   - All drains.
   - At the top of all exterior walls, basement and or building walls from inside the building.
   - All cracks in the floor or exterior basement walls.
   - In crawl spaces or other openings below the floor in basement less buildings.
   - Outside, over the service line, and around the building walls, within one foot of the building wall.
   - All down spouts which are connected to underground drains.
   - Soap test visible customer gas piping, appliance shut-offs and appliance connectors.
2. If leakage is found, make repairs as appropriate.
3. If repairs cannot be made:
   - Isolate (shut off) appliance.
   - If unable to isolate the leak, shut off the gas meter.
   - Red tag the appliance or other deficiency.
4. Eliminate potential sources of ignition.
5. Open windows and doors to ventilate the building.

E. If unable to complete a leak investigation because you are unable to or denied access to the site, take the following actions:

1. Contact office for management assistance.
2. Lock off meter.
3. Conduct a leak survey around the perimeter of the incident scene as close as possible to the site.

4. Periodically check with the authority in charge of the site until access can be gained.

F. If there is positive indication of underground leakage which cannot be controlled by turning off the meter, request appropriate assistance from dispatch.
Immediate action is required for all Grade I leaks

G. Outside Gas Leak Investigation

1. Survey perimeter of structure, MSA, service and 250 ft. of main each direction with F.I. unit. If positive indications are found then continue investigation with CGI.
2. Check for the presence of gas at:
   - The point of entry of all underground utility services (gas, water, wastewater, etc.)
   - At nearby buildings
     - All drains
     - The top of all exterior basement and/or building walls from outside of the building
     - All cracks in the pavement or exterior basement walls
3. Continue away from the structure to check:
   - Gas, electrical, water, telephone and sewer manholes,
   - at cracks in the pavement and sidewalks, and at other locations providing an opportunity for finding gas leaks
4. Determine the extent and migration pattern of the leak then take the necessary actions to make the situation safe.
5. Center and locate the source of the leak. If construction and excavation activities are required contact Dig Alert and monitor the situation until excavation can commence.
6. Excavate near the foundation of involved structures to ventilate gas.
7. Maintain communications with office.
8. Continue actions until natural gas is eliminated and repairs made.
9. It is good practice to make a final leak check at or near the service riser or structure before leaving regardless if leakage has been found elsewhere.

9.4 LINEBREAKS

A. Take the necessary actions to make the situation safe. Protect life first, then property and the environment.

B. Advise the dispatcher of the actual field situation and request necessary assistance and equipment as may be required.

C. If fire or police are present on site, report to the Incident Command Post and provide all necessary assistance.

D. Follow approved procedures for the control of the gas flow.

E. If a gas service outage will result. **Refer to Section J-9.6.**

F. Follow approved procedures to locate and repair the damaged facilities.

G. Document all corrective actions on appropriate forms.

H. Maintain communications with Dispatch and report all appropriate information.

I. Leak survey all natural gas facilities within 250 feet of the incident damage. **Refer to Section J-2.**

J. Leak survey all natural gas facilities within 250 feet of any blasting, before and after. **Refer to Section K-3 3.2 D.**

9.5 FIRE / EXPLOSION

Each fire or explosion occurrence shall be investigated to determine to what extent gas may have been involved if at all.

A. Take the necessary actions to make the situation safe.

B. Advise the Dispatcher of the actual field situation and request assistance when necessary.

C. If Fire or Police are on site, report to the Incident Command Post and provide necessary assistance.

D. Shutoff gas supply.

E. Shutoff service valves to building(s).

F. When required, shutoff gas supply at main.

G. If natural gas is suspected, check for underground gas leaks.

H. Evacuate personnel if gas concentrations exceed 1 % gas in air (10,000 PPM) in the general atmosphere.

I Locate and repair the leak.

J. Collect and retain any evidence.

K Record corrective actions taken.

L. Maintain communication with Dispatch and report all appropriate information.

9.6 NO GAS / LOW PRESSURE

No gas and or low pressure may be as a result of gas leakage or the malfunction of a pipeline facility component. Each such occurrence shall be investigated to determine the cause of the no gas or low pressure and to take the necessary corrective action.

A. Customer call
1. Determine cause of no gas/low pressure:
2. Verify meter is on
3. Check meter and regulator functions, flow and lock up pressures
4. Check individual appliances and shut off valves
5. Check for restricted houseline
6. Check for leakage
7. Rectify situation as may be appropriate

B. If situation cannot be rectified:
1. Isolate appliance, tag deficiency
2. Shut off and lock and blind meter, tag deficiency
3. Request assistance as may be necessary

C. If gas outage is suspected, **refer to Section 9.7.**

9.7 GAS OUTAGE

An outage call shall be considered an emergency and a priority.

A. Determine the boundaries of the outage and the number of meters involved.

B. Conduct investigation as necessary to determine the cause of the outage. Investigation shall include but not be limited to:
1. Valves in proper positive
2. Pressure reducing station malfunctions
3. Significant leakage
4. Damaged facilities

C. Repair or correct the situation.

D. Determine manpower requirements and call for assistance as necessary.

E If gas outage is involved:

1. Turn off gas service valves at each service in the affected area.
2. Advise appropriate civil authorities of the emergency when necessary.
3. Initiate re-light procedures.

PROCEDURES
SOAP TEST

10.0 PURPOSE

It is the purpose of this section to provide standard procedure for performing a soap test to determine if gas leakage is present.

10.1 SCOPE

This section covers the following:

A. Liquid leak detector
B. Soap test procedure
C. Applications

10.2 LIQUID LEAK DETECTOR

A. Liquid leak detector specifically designed for natural gas leakage investigation is commercially available.

B. In the absence of LLD, a mixture of liquid soap (dish soap or other) may be mixed with water for use as the LLD. (12 to 1 mixture is sufficient).

10.3 SOAP TEST PROCEDURE

A. Apply sufficient amount of liquid leak detector (soap).

B. Ensure complete coverage all around the fitting or component be checked.

C. Cupping you hand under and behind the component may help to ensure compete coverage.

D. Visually inspect the component for the presence of bubbles indicating leakage.

E. The use of a small mirror may help to see under and behind the component being checked.

10.4 APPLICATIONS

A. MSA

B. Visible customer owned facilities (i.e. pipe, appliance shut off, appliance connector and appliance burner tubing).

C. Tie-in connections.

D. Fittings under pressure.

E. Welds under pressure.

F. Regulator vents.

G. Squeeze points.

PROCEDURES
PIPE LOCATING / GENERAL

1.0 PURPOSE (192.614)

It is the purpose of this section to provide safe and appropriate procedures for locating and marking pipelines.

1.1 SCOPE

This practice covers the following:

A. K-1 Locating Requirements
B. K-2 Pipe Locators
C. K-3 Marking Pipeline Locations
D. K-4 Marking Pipelines

1.2 RESPONDING TO LOCATION REQUESTS

A. State law requires that the Operator of buried gas facilities actively participate in a "One Call System" where available.

B. Federal Standards have been adopted establishing the appropriate color for marking each utility location. The standard for natural gas is **YELLOW**.

C. The gas utility and other utility operators are responsible under the line location law to make every reasonable attempt to identify excavators within the area and to notify them annually of the law and services available.

D. The excavators are responsible to provide reasonable advance notice of their planned excavations, usually 48 hrs, to allow for the utilities to locate their facilities.

1.3 REQUESTING LOCATION SERVICES

A. When planning excavation(s), the Operator shall call the "One Call Center" prior to any excavation.

B. The area of planned excavation(s) shall be marked using white paint prior to placing request for line location services.

C. Every effort shall be made by the Operator to allow adequate time (48 hrs notice) for other utilities to respond to line location requests.

D. The Operator shall make all reasonable effort to identify the presence of any buried structures including utilities prior to excavation.

E. In all cases, potential conflicts shall be hand exposed prior to excavation

F. When emergencies exist and the Operator does not have sufficient time to allow for 48 hr notice, every precaution shall be exercised to safely protect against damage to other utilities and substructures.

PROCEDURES
PIPE LOCATORS

2.0 PURPOSE

The purpose of this section is to establish appropriate and safe procedures for the location of Operator's existing buried facilities.

2.1 SCOPE

Covered in this section is the following:

A. Locating Methods
B. How to Use the Pipe Locator
C. Locator Operation
D. Care of Locator

2.2 LOCATING METHODS

There are three primary methods for locating buried pipelines. These methods are:

A. Using map sheets, As-built drawings, and other appropriate records.

B. Use of pipe locators.

C. Pot holing.

When locating pipelines from map sheets, measurements, etc., the pipeline should also be located with pipe locators, whenever possible. This is necessary to verify that the measurements taken from the drawings are accurate.

Potholing buried pipelines is required whenever the pipeline cannot be located by methods A or B above.

2.3 PIPE LOCATOR

A. The pipe locator is an electronic instrument used for detecting and locating buried pipes, conduits and miscellaneous metal objects.

B. The instrument consists of two principal component parts:

- Directional, radio-type transmitter assembly.

- Directional, radio-type receiver assembly.

C. The function of the transmitter is to generate an electromagnetic field that surrounds the buried metal object or propagates along it in the case of a pipe. The instrument may be operated in either of two ways:

- Inductive: The electromagnetic field inductively coupled through the surrounding air and ground to the buried pipe, locator wire, or other metal object
- Conductive: coupling using a direct connection between the transmitter-induced electromagnetic field.

This determination of the principal direction(s) and strongest points of propagation of the electromagnetic field establishes the orientation and location of the pipe or other object.

The conductive mode is the most common and most reliable method to use and refers to the direct-wire connection between the transmitter-induced electromagnetic field.

In addition to locating pipelines, the pipe finder may be used to find the depth of a pipeline and to locate valves, pipe stubs, etc. It is however sound policy not to provide depths to contractors or other excavators.

2.4 CARE OF LOCATORS

A. The pipe locator is a precision instrument; treat it accordingly. The locator shall, when not in use, be stored in the padded storage box. Bouncing it about the body of the truck on rough streets may seriously damage the unit.

B. Keep the instrument dry.

C. Locators are equipped with battery testers and permit the testing of the batteries. This should be done each day to avoid failure of the instrument on the job. Spare batteries should be readily available.

D. Do not remove tubes or attempt field maintenance other than routine battery change. All maintenance and adjustments should be performed by qualified personnel.

E. Follow manufactures recommendations for routine maintenance.

2.5 <u>METROTECH 9890 XT</u>

A. Check Batteries – Turn Transmitter to “L”. If the battery status is low (less than5 bars) replace or recharge the battery. Turn Transmitter “ON”. Check battery status. If low (less than 1 bar) replace or recharge batteries. **CAUTION:** Do ***NOT*** attempt to recharge non-rechargeable D-cell batteries. Damage to the transmitter will occur.

B. Connect Transmitter to Conductor **-** Turn Transmitter “OFF”. Plug the Conductive Attachment into Transmitter. Clamp red lead to target conductor. Stretch black lead 90 degrees away from conductor. Push ground rod into the earth. Clamp black lead to grounding rod. Turn Transmitter “ON”. Select power output and frequency.

C. Adjust Receiver Controls **-** Turn Receiver “ON” and select frequency. By default, the unit will operate in “Auto” gain mode.

D. Sweep Area Around Transmitter – Circle Transmitter with Receiver at a distance of 10 feet (3 m). Left/Right display and Receiver signal strength will indicate location of buried conductors.

E. Locate Line - Follow your target conductor, sweeping left and right as you walk away from the Transmitter. Mark the centerline on the ground.

F. Measure Depth **-** Hold the Receiver over the centerline and push the depth button. The LCD will display the depth and current measurement.

PROCEDURES
PIPE LOCATORS

4.6 Receiver: Controls and Indicators, Features

4.6.1 Receiver Controls and Indicators
See Figure 4.3 for the location of the controls and indicators described below:

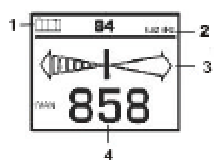
ON/OFF VOLUME KNOB - Turn clockwise to turn unit "ON". Also controls volume of audio sound.

FREQUENCY SETTING KNOB - Your frequency choice depends on which 9800XT model you have purchased.

"RF" Locates carriers of reradiated radio frequencies.
ϟ Detects 50/60Hz
82K Radio frequency
9.8K Audio frequency
982 Low audio (Model 9890XT only)

LCD DISPLAY (Liquid Crystal Display) - Displays the battery status, operating frequency, Distance Sensitive Left/Right Guidance™, gain setting, and signal strength.

Figure 4-4: 9800XT Receiver LCD Display



1 Battery Status
2 Operating Frequency
3 Distance Sensitive Left/Right Guidance
4 Signal Strength

In the Depth Measurement mode it displays the battery status, current measurement, and depth measurement.

PROCEDURES
MARKING PIPELINE LOCATIONS

3.0 PURPOSE

To provide minimum requirements and information in regard to marking gas pipeline locations.

3.1 SCOPE

Identify the following actions:

A. Mark with yellow paint, stakes, or other appropriate markings.
B. Potential damage to facilities.

3.2 LINE LOCATION

The operator shall mark its buried pipelines ahead of construction. Field markings indicate the approximate location of the gas piping are made with yellow paint, feather nails, stakes, or other appropriate markers, adjacent to the area to be excavated as follows:

A. In paved areas, a line approximately 18" long and 1" wide indicating the general direction and location of the pipe directly above the pipe or at a designated offset. The spacing should not exceed 25 ft. The locate shall include the member name "VICGAS" and the size and type of the facility. Abandoned facilities shall be marked if known.

B. In areas of no paving, stake(s) painted yellow, or stake(s) with an approved yellow sticker, or with a feather nail driven into the earth either directly above the pipe or at a designated offset as shown on the stake(s).

C. The Operator will perform inspections of its facilities when damage to those facilities is suspected. This includes following natural occurrences such as earthquake, flooding, landslide or other.

D. When the locator determines that blasting is involved, he shall notify the gas supervisor. If the blasting is to take place within 250 feet of the Operator's gas facilities, a leak survey of the facilities shall be scheduled for the area where the blasting is to take place before the blasting and again upon completion of the blasting to determine if any damage may have occurred. **Refer to Section J-9 9.4 J.**

PROCEDURES
MARKING PIPELINES

4.0 PURPOSE

The purpose of this section is to identify the safety requirements and appropriate procedures for marking gas pipelines in remote locations.

4.1 SCOPE

Pipeline markers are required to be placed:

A. As close as practical over pipelines in class 1 and 2 locations.

B. Within reasonable line of sight.

C. Public roads and railroad crossings.

4.2 PIPELINE MARKERS

A. Line markers must be placed and maintained wherever necessary to identify the location of the distribution and transmission pipelines to reduce the possibility of damage or interference.

B. Line markers are not required for buried pipelines in Class Three and Class Four locations where placement of a marker is impractical, or where a program preventing interference with underground pipelines is in effect or where one should reasonably expect to find buried utilities.

C. Markers must be placed and maintained along each section of a main that is located **above ground** in an area accessible to the public.

D. Line markers may be installed in Class Three or Class four locations or to identify valves as deemed necessary by VMUS.

4.3 PLACEMENT OF MARKERS

A. Locations and spacing for markers shall include, but are not limited to:
   1. Each crossing of a public road or railroad, spans, stream crossings, hilltops, major pipeline angle points, section lines (as necessary to mark pipeline location), etc.
   2. Spacing varies upon conditions, but normally is not greater than line-of-

sight distances, particularly in overgrown rights-of-way.

B. Markers shall be placed so as to achieve the following:
1. They do not present any hazard to traffic.
2. They will be placed directly over the pipeline whenever possible.
3. Face in the direction of expected activity or traffic. If travel of traffic is from more than one direction, place signs as necessary. Where activity is unpredictable, signs and markers face in the longitudinal direction of the pipeline.

C. Pipeline markers should be checked to ensure they are in good condition as a normal course of business as part of the operator's continuing surveillance program. The information on the marker shall be legible with correct contact information.

4.4 STANDARD MARKERS

Markers for surface use shall incorporate:

A. The words, "CAUTION - GAS PIPELINE" in letters at least 1 inch high with ¼ inch stroke and "BEFORE DIGGING, CALL," in an appropriate size and font.

B. The name and address of the operating utility company.

C. The local telephone number(s) to call in case of emergency, or for questions relative to the pipeline. The emergency number shall be available 24 hrs. a day.

D. A toll free (800) number where appropriate.

PROCEDURES
CATHODIC PROTECTION / GENERAL

1.0 PURPOSE (Part 192, Subpart I)

Corrosion is the tendency of metal to return to its natural state caused by a chemical reaction between the pipe and its surrounding elements.

It is the purpose of this section to provide the activities, methods and installation requirements necessary for corrosion control of the metallic gas piping system.

1.1 SCOPE

This section covers the following:

A. L-1 CP and CP Requirements
B. L-2 Pipeline Facilities Inspection
C. L-3 Anode & Test Station Installation
D. L-4 Rectifiers
E. L-5 Pipe-to-Soil Readings
F. L-6 Coating/Wrapping
G. L-7 C. P. Monitoring

1.2 GENERAL

Corrosion of buried metal structures occurs where electrical currents flow from the pipe to the surrounding soil, in the case of submerged pipe to the surrounding body of water or in the case of above ground structures to the surrounding atmosphere. These currents cause molecules of the metal to disband from the pipe. This corrosion may eventually result in the loss of sufficient metal to weaken the pipe or pipeline facility causing adverse effects on the MAOP or even in the complete pipe penetration with a resulting gas leak.

Corrosion control is an essential component in the safe operation of gas pipeline and pipeline facilities containing steel and / or other metallic components. Adequate cathodic protection is an important component of maintaining pipeline integrity.

There are two primary components of Cathodic Protection (CP):

1. Protective Coating: Coating applied to the pipe prior to installation and maintained during the life of the pipeline facilities. The protective coating must meet the requirements of 49 CFR Part 192.461.
2. CP System: CP systems are an electrical means of mitigating corrosion on buried

metallic structures, primarily steel; sacrificial anodes or impressed current. Each method employs galvanic anode cathodic protection; current is obtained from a metal of a higher energy level. A CP system must be installed and placed in operation within 1 year after completion of construction. **192.455**

1.3 CORROSION

A. A corrosion cell consists of:
1. Anode
2. Cathode
3. Electrolyte
4. Electrical Connection

B. Causes of corrosion:
1. Dissimilar metals
2. Dissimilar fabrication
3. Dissimilar soil environments
4. Dissimilar pipe ages
5. Dissimilar surface conditions
6. Stray DC ground voltage

1.4 GENERAL REQUIREMENTS

The purpose of cathodic protection is to force the entire metal surface to be cathodic to the environment. Metal piping shall be protected against the effects of corrosion.

A. Each piping system or casing with separate CP systems shall be electrically separated (isolated) by the use of insulators. Pipelines shall also be electrically isolated from other underground metallic structures, unless the pipeline and the other structures are electrically interconnected and cathodically protected as a single unit. **192.467**

B. When electrical isolation is required, inspection and electrical tests must be made to assure that it is in fact isolated adequately.

C. The corrosion control procedures required by 192.605 (b) (2), including those for the design, installation, operation and maintenance of cathodic protection systems, must be carried out by, or under the direction of, a person qualified in pipeline corrosion control methods. **192.453**

D. Aboveground (exposed) piping shall be protected by the use of coating specifically designed for aboveground use (UV protective). The most commonly used method is paint. This will place a barrier between the pipe and the outside elements (moisture).

- Aboveground piping shall be evaluated once every 3 years for atmospheric corrosion.

- Aboveground coatings should **not** be utilized for underground installations.

E. Underground (buried) piping shall be coated or wrapped and protected from the effects of rust and corrosion.

- Underground coating shall not be used on aboveground installations unless it contains ultraviolet inhibitors to prevent the deterioration of the coating when exposed to sunlight.

F. Pipe-to-soil readings shall be taken on all underground piping once each calendar year not to exceed 15 months. Reading is measured with the use of a voltmeter and a reference half-cell (copper-copper sulfate cell). **192.465**

G. CP readings shall be a minimum of – 0.85 volts (negative 850 millivolts) to demonstrate adequate cathodic protection for the underground pipeline facilities. Readings shall be taken at a sufficient number of locations and near the midpoints between anodes to assure that the steel piping is being adequately protected.

H. When a rectifier is in use, the rectifier shall be inspected 6 times each calendar year at intervals not to exceed 2 ½ months.

I. Whenever VMUS has knowledge that a portion of a buried metal pipeline is exposed, whether exposed by VMUS or a third party, it shall be inspected for external corrosion and coating deterioration. If external corrosion requiring remedial action under 192.483 through 192.489 is found, the entire pipe shall be examined beyond the exposed portion (by visual examination, indirect method, or both) to determine whether additional corrosion requiring remedial action exists in the vicinity of the exposed portion. **192.459** Each segment of metallic pipe that replaces or repairs pipe from a buried pipeline because of external corrosion must be cathodically protected. **192.483**

J. Whenever a pipe is cut and removed, the interior surface of the pipe shall be inspected for the effects of internal corrosion. **192.475**

K. Records or maps showing the location of cathodically protected piping, cathodic protection facilities, galvanic anodes, and neighboring structures bonded to the cathodic protection system shall be maintained for as long as the pipeline remains in service. **192.491**

L. C.P. test stations shall be sufficiently spaced to adequately determine C.P. protection. **192.469**

M. All electrically isolated metal fittings installed after January 22, 2019 must be cathodically protected and maintained according to the DIMP plan. **192.455 (g)**

PROCEDURES
PIPELINE FACILITIES INSPECTION

2.0 PURPOSE

Regular inspection of gas pipeline and pipeline facilities is an essential means of maintaining pipeline integrity.

The purpose of this section is to identify the inspection requirements and methods to be implemented.

2.1 EXTERNAL INSPECTION

A. Existing Facilities
1. Any time steel or other metallic pipe and or fittings are exposed and the protective coating is removed, inspection shall be conducted for signs of defects or damage. If the pipe coating is removed or the pipe is bare, a pipe to soil potential reading will be taken and recorded.
   a. Acceptable range: - 0.85 volts to - 2.50 volts
   b. **EXCEPTION:** When vacuum-extraction excavation method is used, opening only a small diameter excavation and the protective coating is not removed or damaged. Exceptions to recording a pipe to soil reading should be documented.
2. Recorded pipe to soil readings for steel or other metallic pipe activity on the appropriate form.
3. Contractors are responsible for taking and documenting pipe to soil readings whenever exposing and removing protective coating from steel or other metallic pipe.
4. Gas Operator personnel are responsible for the review of pipe to soil data and initiating any appropriate remedial action in accordance with operator's procedures.
5. Pipe-to-Soil readings that fall outside of the acceptable range, -0.85 to - 2.50 volts, shall be immediately forwarded along with the appropriate documentation to the Gas Supervisor or designee to ensure prompt remedial action.
6. The condition found for the pipe, fitting, and/or coating shall be recorded on the appropriate form(s).

B. New or Replacement Installation
1. Just prior to lowering coated steel pipe into the excavation, all pipe coating shall be visually inspected for damage or defects. Any damage or defects discovered which are detrimental to effective corrosion control must be

repaired. **192.461**

2. All welds that are field wrapped shall be visually inspected prior to installation.
3. Electronic holiday inspection shall be preformed prior to initial installation of any steel pipeline.
4. All holidays in the coating shall be repaired and re-inspected prior to installation.
5. During inspection, ensure that the entire circumference of pipe has been checked.
6. The condition found for the pipe, fitting, and/or coating shall be recorded on the appropriate form(s).

C. Use only approved underground coatings for pipe to be buried, and approved above ground coating or paint (UV Protective) for pipe to be suspended or otherwise installed above ground.

2.2 INTERNAL INSPECTION (192.475)

A. Any time steel pipe is removed from the system or the pipe is tapped and a coupon is captured, the interior surface of the pipe shall be examined and all information about the location and condition shall be recorded on the appropriate form.

B. Coupons that do not show any signs of corrosion may be discarded only after the appropriate operator personnel have reviewed the facility and documentation.

C. Discarded coupons shall not be left in the trench.

D. Coupons exhibiting signs of corrosion shall be immediately forwarded along with the appropriate documentation to the Gas Supervisor or designee to ensure prompt remedial action.

2.3 ATMOSPHERIC CORROSION

A. The Operator will evaluate one third (1/3) of the system annually, and shall cover the entire system once every three years, inspecting for signs of atmospheric corrosion. This inspection shall include all above ground metallic facilities (MSA's, suspended crossings, pressure reducing stations, etc.). Particular attention should be given to pipe at soil-to-air interfaces. **192.481**

B. Signs of atmospheric corrosion include discolored and/or peeling paint, evidence of rust or oxidation of the metal surface, and any other condition that the operator believes may require remedial action.

C. If any evidence of atmospheric corrosion is identified, that portion of metallic pipe and/or appurtenance shall be thoroughly cleaned and painted or coated with approved-for above the ground, ultraviolet light resistant, paint or coating. **192.483**

Note: Most paints and wraps work best within a defined temperature range. Follow manufacturer's directions for application.

D. Surveys, along with appropriate remedial action shall be documented.

E. Above ground facilities showing signs of light rust and/or flaking, shall be reported immediately along with the appropriate documentation to the Gas Supervisor or designee to ensure prompt remedial action. Repair or replace as soon as practical. **192.487**

F. Use only approved for above ground, UV protective, coating or paint for pipe to be suspended or otherwise installed above ground.

G. The condition found for the pipe, fitting, and/or coating shall be recorded on the appropriate form(s).

PROCEDURES
ANODE / TEST STATION INSTALLATION

3.0 PURPOSE

The purpose of this section is to establish safe procedures for the installation of sacrificial anodes.

3.1 SCOPE

This section covers proper procedures for the installation of:

A. Anodes Installation
B. Test Lead and Test Station Installation
C. Bonding
D. Braze / Silver Solder / Thermit Weld / Pin Weld

3.2 TYPICAL MAGNESIUM ANODE INSTALLATION

A. Installation with or without Cathodic Protection Test Station

B. Remove coating

C. Clean pipe with file and/or wire brush

D. Strip insulation from wire

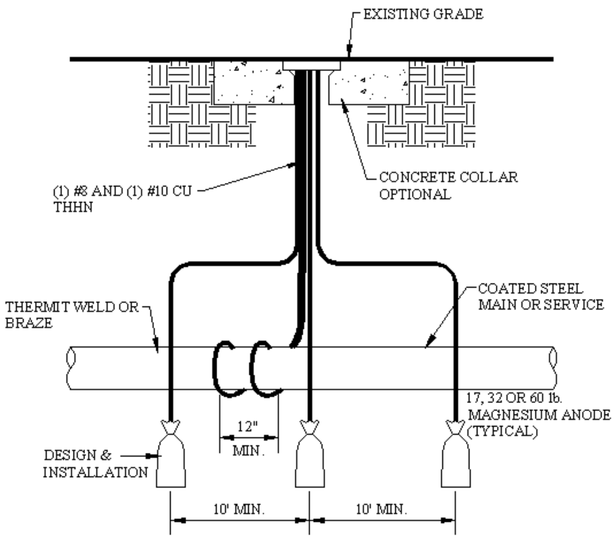
E. Install copper sleeve on wire (12 gauge or less)

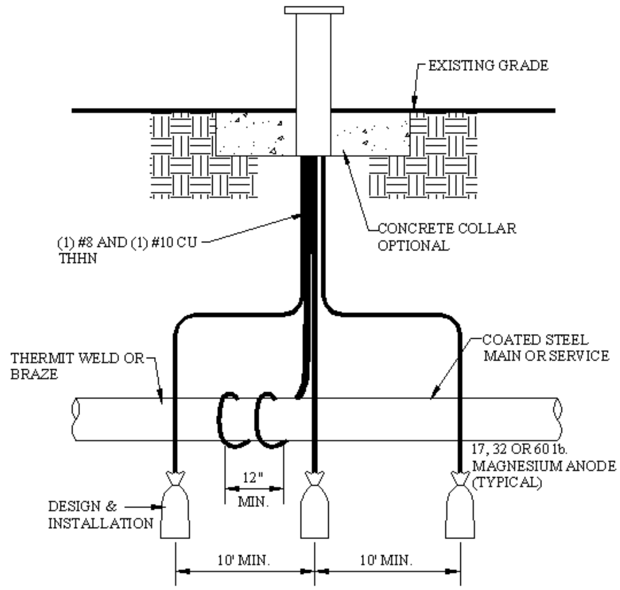
F. Follow appropriate field wrap procedure when complete

(Single or Multiple)

PROCEDURES

ANODE / TEST STATION INSTALLATION





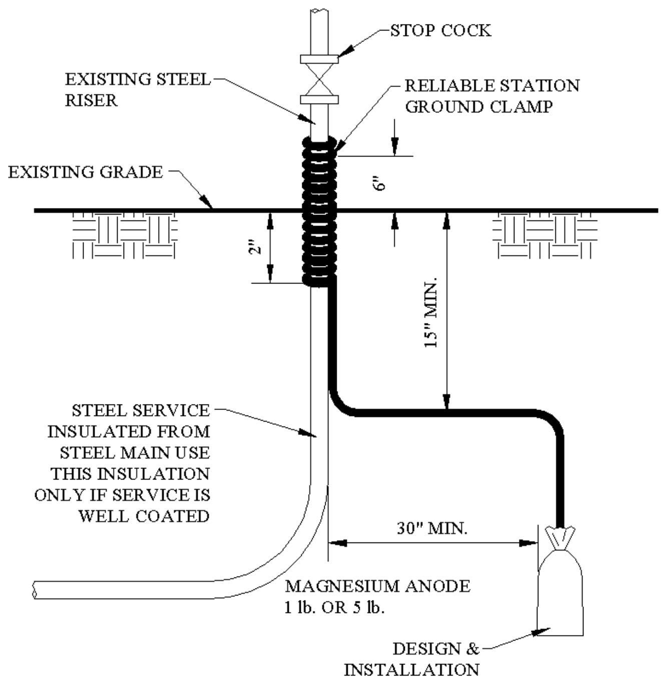
Procedure:

1. Look to place anodes in locations where soil is moist.
2. Place anode(s) in upright position whenever possible.
3. On newly installed or replacement pipe, anodes should be installed at a minimum of 30” from the pipe (service riser), 5' to 10’ (Mains) horizontally from the pipe.
4. Install top of anode at not less than pipe depth.
5. Do not lift or handle anode by its wire as this may damage its connection.
6. If CP test station is used, all wires shall be terminated with sufficient slack (approximately 18").
7. Prior to placing anode, soak hole with water allowing sufficient time for absorption into soil.
8. When back filling anode, cover with native material, rock free. Carefully compact soil and pour 5 gallons or more of water into the hole after anode is covered by 1 ft or more of native soil then complete backfill per operator standard.
9. If there is no permanent moisture in soil, install a means to water anodes (PVC pipe).

PROCEDURES

ANODE / TEST STATION INSTALLATION

B. Service riser anode installation

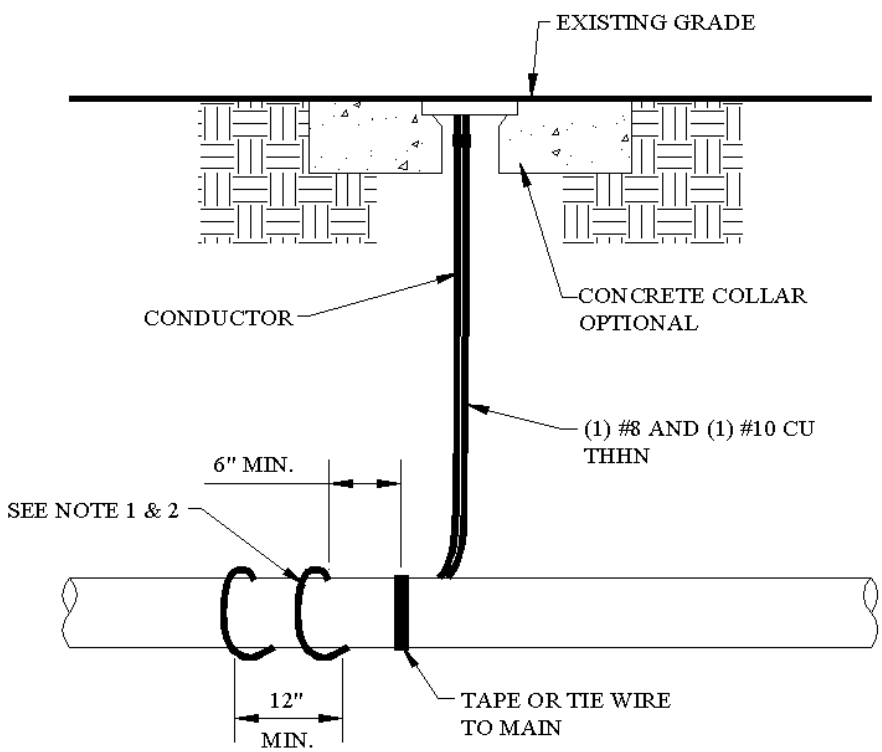


Procedure:

1. Clean a 1" section to bare metal around the entire circumference of the pipe 6" above ground level.
2. Install ground clamp on pipe at cleaned area (6" above ground level) and tighten set screw to secure clamp to pipe.
3. Install anode vertically whenever possible.
4. Install anode and wire a minimum of 15 inches below existing grade.
5. Do not lift or handle anode by its wire.
6. Install anode wire to clamp and tighten nut until wire is secure.
7. Wrap pipe with plastic tape (see section L-6).
8. When back filling 1-5 lbs. anode, cover with approximately 6" of native material, rock-free. Carefully compact soil and pour about 5 gallons of water over and around anode and then complete backfill.

3.3 TYPICAL TEST STATION INSTALLATION (192.471)

PROCEDURES
ANODE / TEST STATION INSTALLATION

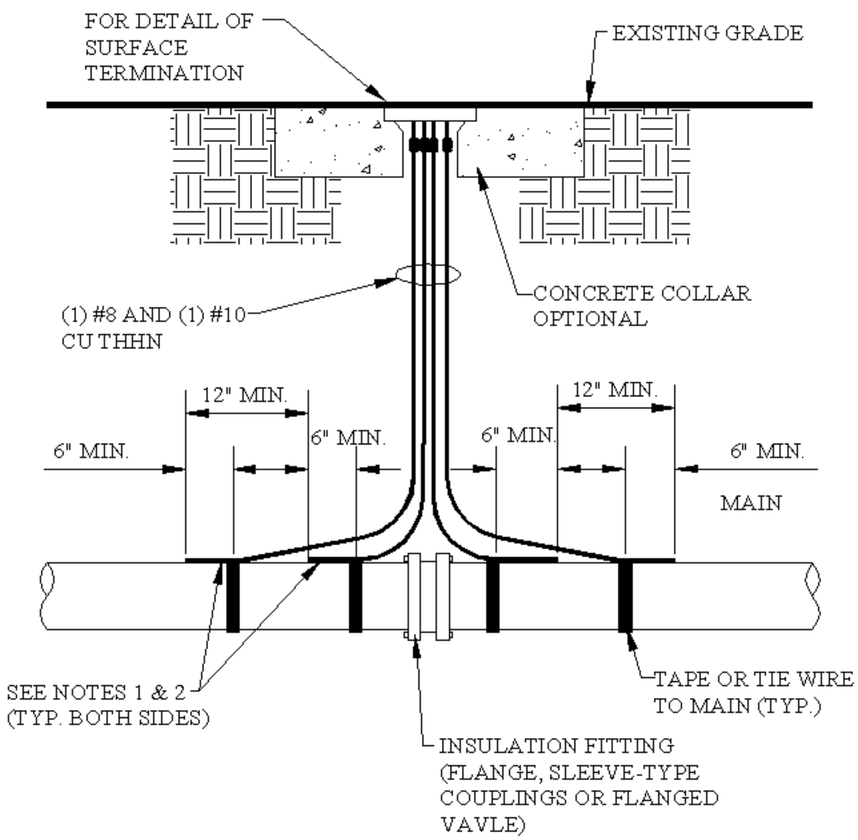


Procedure:

1. Attach wires and cables using Thermit weld, silver solder, brazing or pin brazing.
2. Wrap or coil wire around pipe (Minimum one time and twist) to prevent tugging/pulling from detaching the wire.
3. Minimum distance between Thermit weld or braze is 12”.
4. Attach minimum of two wires to the main (one # 10 and one # 8).
5. Field coat main at points of wire attachment using approved primer and wrap.
6. Wires should be long enough to extend a minimum of 18” above ground level if surface level test station and 18” above test station riser height if raised test station installation.
7. Wires may be offset to any convenient location.
8. Backfill per operator standard.

3.4 TYPICAL CONNECTION / BOND AT AN INSULATING FITTING

PROCEDURES
ANODE / TEST STATION INSTALLATION

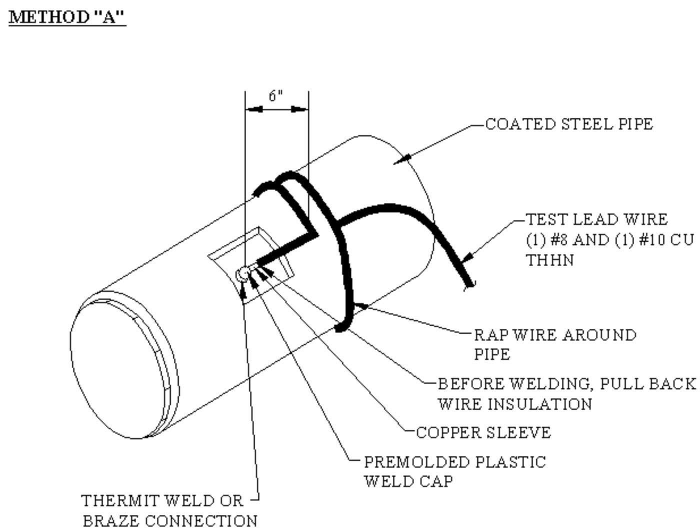


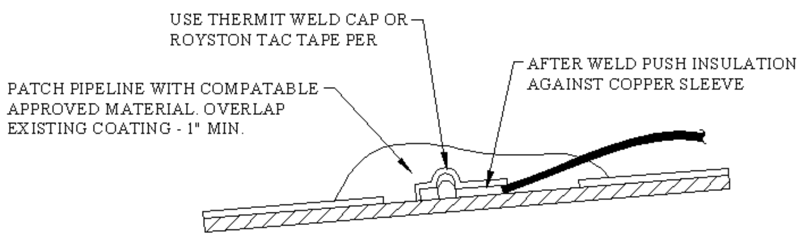
<u>Procedure:</u>

1. Attach wires and cables using Thermit weld, silver solder, brazing or pin brazing.
2. Wrap or coil wire around pipe (Minimum one time and Twist) to prevent tugging/pulling from detaching the wire.
3. Minimum distance between Thermit weld or braze is 12”.
4. Attach minimum of two wires to the main on either side of the insulator (# 10 and # 8).
5. Wires should be long enough to extend at least 18” above ground level or top of test station riser.
6. Field coat main at points of wire attachment using proper primer and wrap.
7. Wires may be offset to any convenient location.
8. Do not attach wires to valves, fitting or components.
9. Backfill to operator standard.

3.5 <u>BRAZE / SILVER SOLDER / THERMIT WELD / PIN BRAZE</u>

PROCEDURES
ANODE / TEST STATION INSTALLATION





Thermit Weld:

1. Limited to pipe operating at less than 20% SMYS.
2. The Thermit weld cartridge shall not exceed a No. 15 charge (15 grams).
3. Limit to no. 8 and smaller diameter cables.
4. Remove pipe coating and clean pipe surface of all foreign material.
5. Strip wire insulation and install appropriate copper sleeve over wire; crimp lightly.
6. The connection may be made on vertical or horizontal piping.
7. Make sure correct size weld mold is used for pipe size.
8. Insert charge and ignite with appropriate spark igniter.
9. Hold mold steady until ignition is complete, several seconds.
10. Remove mold.

PROCEDURES
ANODE / TEST STATION INSTALLATION

11. Lightly tap connection to ensure good connection.
12. Chip away excess material and jagged edges using a file to ensure smooth weld surface.
13. Soap test
14. When connection is to be buried, the connection is to be adequately coated with rubber filler and plastic tape.
15. Clean, dry and wrap pipe and connection. If tape is to be used, wrap tape completely around pipe.
16. Minimum of 12” between 2 or more welds.
17. Do not attach wires to valves, fitting or components.
18. Backfill to operator standard.

Braze weld:

1. The Brazing process may not be used on steel pipe operating at greater than 20% SMYS.
2. Remove coating and clean pipe (should be shiny metal).
3. Strip wire insulation and install appropriate copper sleeve over wire; crimp lightly.
4. The connection may be made on vertical or horizontal piping.
5. Use appropriate flux coated brazing rod.
6. Preheat to dull red.
7. Touch rod to heated pipe and allow flux to melt.
8. Place wire on pipe.
9. Continue to melt rod and flux on wire.
10. Add sufficient rod to build a bead.
11. Allow cooling time of 2 to 3 minutes.
12. Lightly tap connection to ensure good connection.
13. Soap test.
14. Clean, dry and wrap pipe and connection.
15. Do not attach wires to valves, fitting or components.
16. Backfill to operator standard.

Silver Solder:

1. The silver solder method has no limitations as to % SMYS.
2. Remove coating and clean pipe (should be shiny metal).
3. Strip wire insulation and install appropriate copper sleeve over wire; crimp lightly.
4. Apply thin coat of flux to pipe.
5. Heat pipe, approximately 400^0 F prior to adding solder (use pyrometer or temp stick) **do not contaminate connection.**
6. “Tin” pipe and wire.
7. While pipe is hot, place wire on pipe.
8. Melt sufficient puddle to attach wire.

9. Neutralize flux with baking soda & water.
10. Lightly tap connection.
11. Clean, dry and wrap pipe and connection.
12. Do not attach wires to valves, fitting or components.
13. Backfill to operator standard.

Pin Braze:

Application

1. The pin brazing method may be utilized with no limitations as to % SMYS or pressure due to its low temperature application.

Preparation

1. Ensure that the batteries are fully charged.
2. Wear appropriate personal protective equipment.
3. Prepare pipe surface, remove pipe coating and clean pipe of all foreign material (should be shiny metal).
4. Caution should be exercised whenever using approved grinder on metal pipe surface to avoid removing any significant pipe wall thickness.
5. Light rain or snow will not adversely affect the pin braze however heavy rain or snow may cause the pin fuse to burn out prematurely resulting in faulty or no bond.
6. It is possible to pin braze in sub zero weather.

Procedure

1. Maintain a minimum 12 inches separation from any weld or fitting on the pipeline.
2. Attach magnetic earth lead to clean surface of pipe.
3. Select appropriate brazing pin and ceramic ferrule (Keep stored in delivery tins and do not mix part numbers).
4. If using wire lug to pin braze wire directly to the pipe, strip wire insulation and install appropriate copper sleeve over wire; crimp lightly. Locate the brazing pin so the pin is in the center of the hole.
5. Load the gun with brazing pin and ferrule ensuring that they are both back fully home and tight. (Do not straighten the kinked end of the pin fuse wire).
6. The legs of the pin holder must be adjusted as necessary to ensure a firm grip of the pin while maintaining concentricity with the ferrule holder.
7. Apply sustained pressure on the brazing gun so that full contact is made.
8. When ready to braze it is best to look away to one side.
9. Hold the gun firmly and close the circuit by squeezing the trigger (Keep the trigger depressed until the braze is complete).

PROCEDURES
ANODE / TEST STATION INSTALLATION

10. After approximately 2 seconds the fuse wire should rupture disconnecting the circuit. The arc will extinguish and the pin or stud will be shot forward into the molten filler (If this does not occur after the normal time (2 sec) the gun must be removed keeping the trigger depressed. Start the process over).
11. After the fuse has ruptured the gun must be held in place for an additional 3 seconds to allow braze to set.
12. When complete attach wire if necessary (using bolt style pin) and recoat/ rewrap pipe surface using approved coating procedure **(Refer to Section L-6).**

Care and handling

1. Unit should be stored in dry room or cabinet with electrical supply and adequate ventilation.
2. After each day's use, examine battery to ensure that the electrolyte is 3/16" above plates. Top off with **distilled water** if necessary.
3. Check each battery cell with hydrometer. Specific gravity should be approximately 1.28. If less than 1.20 do not use and replace battery.
4. Replace cell tops and battery box door.
5. Take care to not tilt equipment.
6. Check battery connections for tightness and wipe clean and dry.
7. Unit must be plugged in on charge whenever not in use.
8. Store brazing pins and ceramic ferrules in delivery tins and **do not** mix part numbers.

PROCEDURES
RECTIFIERS

4.0 PURPOSE

The purpose of this section is to identify appropriate procedures for installation and testing of impressed current cathodic protection systems, or rectifiers.

4.1 IMPRESSED CURRENT / RECTIFIER INSTALLATION

A. Impressed current / rectifier systems are designed and installed to provide cathodic protection for steel and other metallic gas piping systems.

B. The rectifier converts AC to DC power and is installed in conjunction with a groundbed of anodes in either a deep well or horizontal trench.

C. Impressed current / rectifier cathodic protection systems will be designed by the engineer for the specific situation.

4.2 RECTIFIER TESTING

Each cathodic protection rectifier must be inspected to ensure that it is operating properly. The following steps should be followed:

Rectifiers shall be tested six times each calendar year at intervals not exceeding two and one half months. **192.465**

A. Check rectifier using appropriate tic tracer to ensure it is not shorted before beginning.

B. Turn off power at the breaker.

C. Feel each stack for temperature variations which may indicate necessary replacement.

D. Turn power back on.

E. Read the direct current (DC) voltage and the DC amperage on the output of the rectifier. These reads can be measured using either the meter on the rectifier or an external meter.

F. Read both ON and OFF to verify proper meter operation.

G. Check for correct polarity.

H. Adjust as necessary to achieve desired DC amp output.

I. Measure the pipe-to-soil potential at structure and nearest test point.

J. Read and record the kilowatt-hour meter, if one is present.

K. Note any repairs, replacement parts and necessary remedial action on appropriate form.

L. Ensure rectifier is reconnected and working properly before leaving.

4.3 <u>INSTALLING CURRENT INTERRUPTER</u>

A. Turn off the rectifier using the rectifier circuit breaker.
   1. <u>Method A</u>
      To install in the AC Circuit, disconnect the tap bar on the coarse side. Remember to note what setting the tap is connected to.
      a) Connect one side of the current interrupter to the coarse setting and the other connection to the tap bar center connection.
      b) Set the interrupter for the proper time you wish the interrupter to turn "on" and "off".
      c) Turn on the interrupter.
      d) Turn on the rectifier using the rectifier circuit breaker.
   2. <u>Method B (alternate method)</u>
      To install in the D.C. Circuit, disconnect the D.C. fuse or anode cable.
      a) Connect one lead wire of the current interrupter to the anode cable and the other connections to the positive rectifier terminal.
      b) Set the interrupter for the proper time you wish the interrupter to turn "on" and "off".
      c) Turn on the interrupter.
      d) Turn on the rectifier using the rectifier circuit breaker.

PROCEDURES
PIPE TO SOIL READINGS

5.0 PURPOSE

The purpose of this section is to establish the appropriate procedure associated with taking pipe to soil potential readings.

5.1 SCOPE

This section covers the following:

A. Pipe to soil readings.
B. Testing half cell.
C. Pipe to soil procedure.
D. Remedial action.
E. IR Drop / Millivolt Shift.

5.2 PIPE TO SOIL READING (192.463)

A. Pipe-to-Soils readings shall be taken anytime that buried or submerged pipe coating is exposed:
   1. Coating is removed or damaged.
   2. Not required when vacuum excavated.

B. Adequate Cathodic Protection:
   1. The level of cathodic protection shall be considered adequate when the minimum pipe to soil potential is at least a **-0.85 volts (Negative 850 millivolts)** with reference to a saturated copper-copper sulfate half cell for metallic pipelines. This is the level at which metallic pipe no longer corrodes.
   2. A 100 milivolt shift is accomplished after the CP has been turned off (may require 2 minutes to 24 hours).

C. Inadequate Cathodic Protection:
   1. Reading less than – 0.85 volts (more positive than) may indicate inadequate CP requiring remedial action to correct the situation

D. Excessive Cathodic Protection:
   1. The amount of cathodic protection must be controlled so as not to damage the protective coating or the pipe. This is accomplished by limiting the maximum "on" pipe-to soil potential to **negative (-) 2.5 volts.**
   2. Any reading greater than - 2.5 volts, indicates excessive CP requiring

PROCEDURES
PIPE TO SOIL READINGS

<u>remedial action</u> to correct the situation.

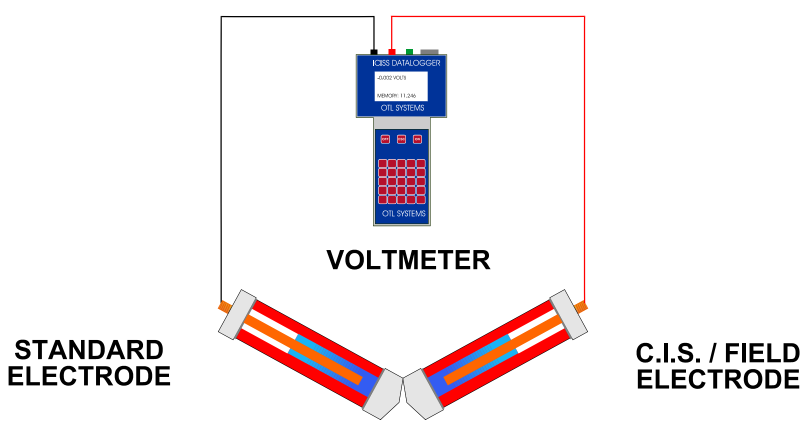
E. CP records shall be maintained for no less than 5 years. It is recommended that these CP records be maintained for the life of the pipeline. **192.491**

5.3 <u>TESTING HALF CELLS</u>

Prior to taking any pipe to soils readings it is important to check or calibrate the reference electrodes being used. This can be undertaken as shown in Fig 1. The test is simply to place the porous plugs of a standard (unused) electrode and the field electrodes end to end and measure the millivolt difference. Generally, if the difference is less than 4 to 6 millivolts, no maintenance of the electrodes will be required.

Testing of the field reference electrodes should be undertaken each morning prior to the start of the survey. The millivolt difference and polarity between the working electrodes and the standard should be recorded.

TESTING REFERENCE ELECTRODES
PRIOR TO FIELD USE



<u>Fig 1</u>

Note: The special calibrated reference electrode or standard reference electrode is <u>not</u> to be used in the field, except for the above test. Any Half-cell testing deficient shall be repaired or replaced.

5.4 PIPE TO SOIL PROCEDURE (STRUCTURE TO SOIL POTENTIAL)

A. Pipe to soil readings are taken utilizing a copper- copper sulfate half-cell and a voltmeter.

B. To ensure a proper pipe to soil potential reading, remove the cap and place the porous plug of the copper/copper sulfate reference electrode in firm contact with earth over the pipeline or close to it.

C. This may require "digging in" where the earth's surface is dry. In dry areas, it is necessary to moisten the earth around the electrode with fresh water to obtain good contact.

D. The red lead/wire from the digital voltage meter is connected to the structure/pipeline (via test point terminals or direct contact with pipeline); the black lead from the digital voltage meter is connected to the half cell; and the pipe to soil potential is read and recorded.

E. Some Half-cells utilize the voltmeter attached directly to the top if the half-cell and require only on lead to be attached to the pipeline facilities or test lead to be tested.

F. The voltmeter must be of high input impedance to ensure accuracy.

PROCEDURES
PIPE TO SOIL READINGS

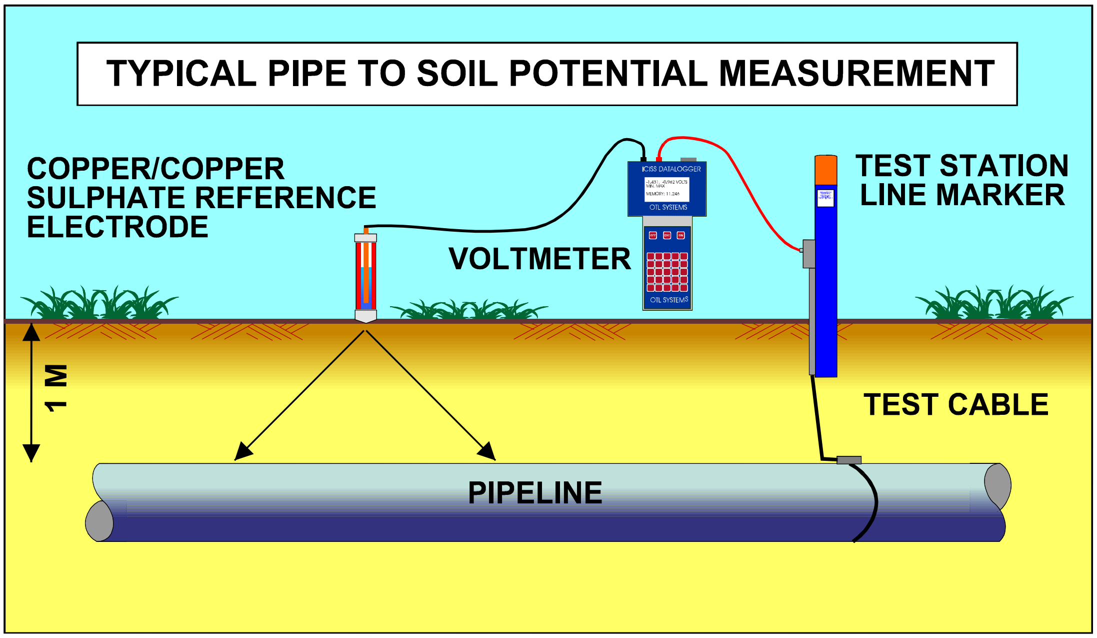


Fig 2

Figure 2 shows the typical arrangement at a test station when a pipe to soil potential is being measured.

The positive terminal of the voltmeter is connected, by a test lead (red), to the pipeline through the test cable in the test station. The negative (black) lead is connected to the half cell. The pipe to soil potential will be displayed on the meter. The magnitude of this potential will depend on the Cathodic Protection system status, but may be in the range of -1000 mV to -1500 mV.

This potential represents the average potential of the pipeline at this location.

5.6 REMEDIAL ACTION

A cathodic voltage of a minimum of (-) 0.85 volts for steel pipelines with reference to a saturated copper-copper sulfate half-cell is the desired reading indicating an adequate level of cathodic protection.

A. If an area does not meet the above criteria, either a null survey using an appropriate faultfinder or Current Mapper or P/S survey shall be conducted to locate the shorted area within 90 working days after determination that the area does not meet the above criteria.

B. The repair of the area shall be started within 90 working days of the discovery of shorted services or underground contacts.

C. The same shall apply to long service areas where current is supplied by an anode or anode bank. Isolated short services or valves shall be repaired within 90 working days after discovery of noncompliance with the above criteria.

D. If a part has to be ordered, repairs shall be completed within 90 working days of receipt of repair materials or parts.

1. The voltmeter has 2 test leads. The red lead is positive and the black lead is common. The red lead is attached to the pipe or test lead, and the black lead is attached to the copper sulfate half cell (corrosion cell) for the purpose of taking CP readings. The voltmeter must be set to read Direct Current Volts.

2. Other uses include a meter designed for and attached directly to the half cell with <u>one lead.</u> This lead is attachment to the pipe or test lead for the purpose of taking CP readings.

5.7 <u>IR DROP</u>

A. IR DROP / IR ERROR

1. IR drop is a product of current and resistance (Voltage drop). Voltage drop is negligible in the measuring circuit under the following conditions:
   - Metallic path lengths are short.
   - Good contact between reference cell and electrolyte (moist soil).
   - Good connection points (clean metal to metal contact).
   - High-input impedance meter is used.
   - Resistivity is low.
2. All the voltage drops in the measuring circuit are controllable except for the drop across the electrolyte (surrounding soil or other medium). To reduce the IR drop:
   - Place the electrode near the structure coating holiday.
   - Or, interrupt the current flow.
   - Calculations can also be made to subtract the IR drop.

3 When current is interrupted, the potential should be measured at "instant off" which refers to the potential after IR drop is eliminated but before polarization begins to dissipate.

5.8 MILLIVOLT SHIFT

A. 100 Millivolt Shift

1. The criterion is based on the difference between the two potentials, corrosion potential and polarized potential. (100 mV shift)
    - Momentarily interrupt the current flow to read the polarization potential.
    - With the current remaining off, the polarization will dissipate, and polarization is the measurement of interest.
    - When no further drop is recorded this is the depolarized potential.
    - If this is greater than 100mV difference, the pipe is protected regardless of the half cell reading.
    - The same is true in measuring the polarized potential after the current is reestablished and no further rise is recorded.

PROCEDURES
COATING / WRAPPING

6.0 PURPOSE (192.461, 192.479)

It is the purpose of this section to provide minimum requirements and information on the equipment, material and methods utilized for protective coatings and field wrapping of steel and other metallic pipe and fittings.

Each segment of metallic pipe, new or replacement shall have a protective coating.

6.1 SCOPE

This section covers the following:

A. Field Wrapping Steel Pipe
B. Shrink Sleeve
C. Protective Coating of Valves and Irregular Fittings
D. Painting

6.2 FIELD WRAPPING

The cleaning and application of plastic tape for use in the gas piping system is essential for corrosion protection.

The following products are acceptable for field-installed:

A. For pipe and transition fittings, Polyken 1027 primer and 930 cold tape or approved equivalent products may be utilized.

B. For weld joints the application, appropriately sized and thickness, of heat shrink sleeve may applied.

C. For irregular shaped fittings and valves, Trenton Temcoat grease and Trenton polyply wrap or approved equivalent products may be utilized.

Each product shall be applied in accordance with the manufacturer’s instructions.

6.3 PLASTIC TAPE METHOD

A. A holiday will be considered sufficiently cleaned if:

PROCEDURES
COATING / WRAPPING

1. All loose coating has been removed.
2. The edges of shop coating are tapered.
3. Exposed metal area has approximate diameter of not less than 1/2" on any size pipe.
4. The exposed area and immediate surroundings shall be cleaned of dirt, loose coating loose rust. **192.461**

B. All steel surfaces to which plastic tape is to be applied shall be clean and free of sharp points or foreign substances so that coating will adhere and not be damaged.

C. Primer must be thoroughly mixed before applying to steel surfaces.

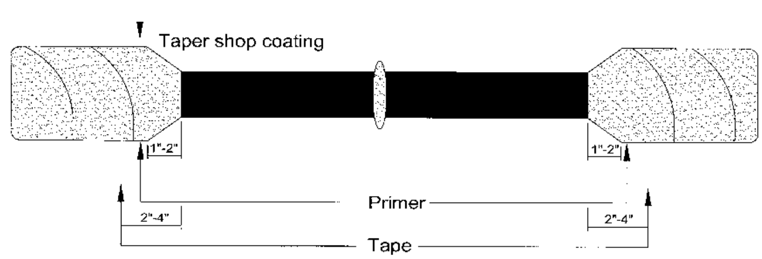
D. Tape shall be applied to the primed surface when the primer is tacky to touch. The wrapping shall be in spiral with an overlap equal to 1/2 the width of the tape, extending 2" to 4" beyond bare metal or within 1" of a stopcock on a riser.

The following figures give the requirements for wrapping joints, damaged factory wrap, bends or prefab risers.

FIGURE 1

Extrusion and Fusion-Type Coatings

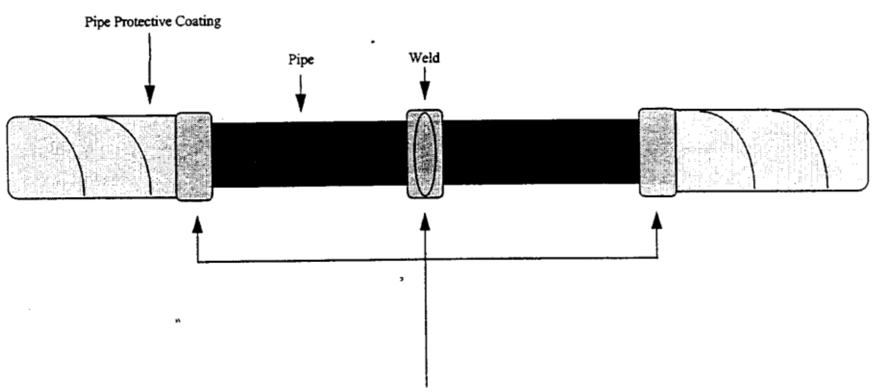
Extrusion or Fusion Coated Plastic



PROCEDURES
COATING / WRAPPING

NOTE: When field wrapping a transition to PE, neither primer nor tape should be applied within ¼" of the PE. Electrical tape should be applied to the remainder of the fitting. All transition fittings after welding will have the entire steel portion wrapped.

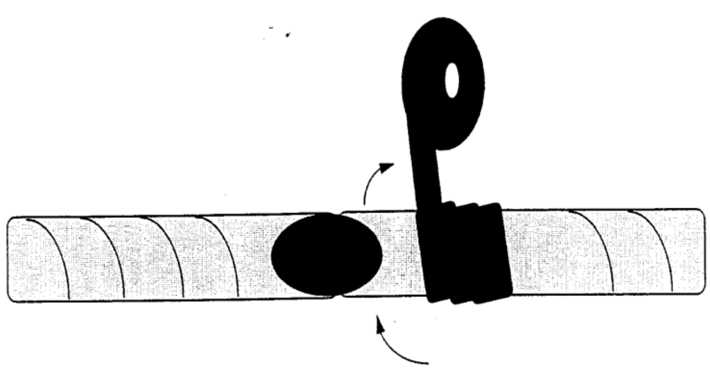
FIGURE 2



Wrap tape on end of pipe coating and on weld, making at least 1 1/4 turns, keeping tape under tension, and then 1/2 turn with no tension on tape. This coating of tape will minimize effect of rough edges.

FIGURE 3

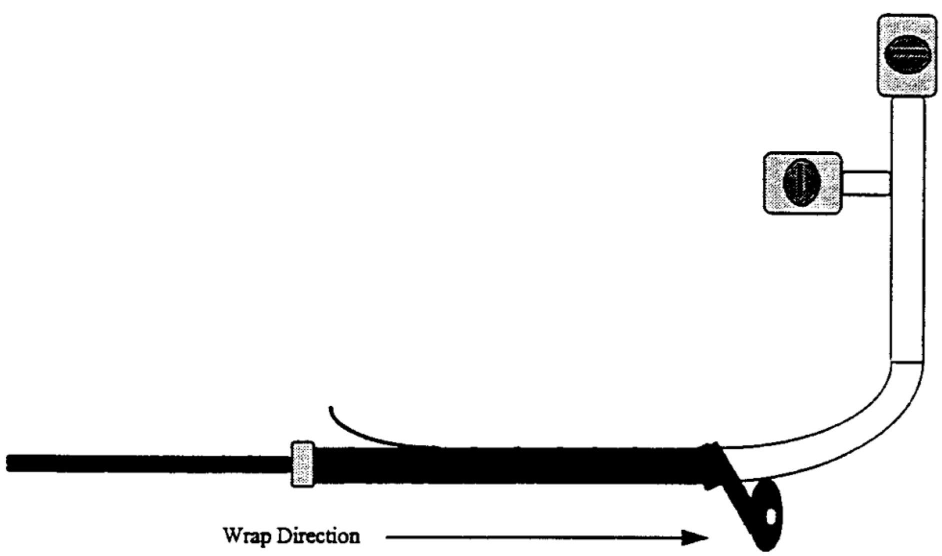
Installation on Damaged Factory Wrap



PROCEDURES
COATING / WRAPPING

FIGURE 4

Installation on Shopbuilt Rise or Bends



6.4 VALVES AND OTHER IRREGULAR SHAPED FITTINGS

PROCEDURES
COATING / WRAPPING

A. Wax Tape:
1. Prepare surface to be coated by cleaning with wire brush and wiping clean so that it is free from loose coating, rust, scale and other foreign matter. Surface should be wiped as dry as possible.
2. Apply wax tape primer to surface by brush or hand (gloved). Only a thin film of primer is necessary and no cure time is required.
3. If fill putty is necessary, apply directly by hand working the putty material onto the metal surface insuring that the putty is “wetting” and adhering to the surface. Apply the putty material in and around the voids contours and crevices to build up an even surface.
4. Apply Trenton #1 Wax Wrap, or other engineers approved equal material, allowing for at least a 1” overlap. The wax wrap should overlap at 3” to 6” over any existing coating.
5. Visually inspect tape application for deficiencies such as overlap voids and air pockets. If present, correct by manually smoothing out seams and air pockets.
6. Backfill may take place immediately after application. No drying or cure time is required.

B. Grease Wrap:
1. Prepare surface to be coated by cleaning with wire brush and wiping clean so that it is free from loose coating, rust, scale and other foreign matter. Surface should be wiped as dry as possible.
2. Coat pipe and fitting with grease (minimum 1/8” thick).
3. Wrap fitting with glass mat. Apply a second coat of grease.
4. Apply polyply wrap around entire surface coated with grease.
5. Use sufficient electrical tape to secure polyply wrap.
6. Visually inspect tape application for deficiencies such as voids and air pockets. If present, correct by manually smoothing out seams and air pockets.
7. Backfill may take place immediately after application. No drying or cure time is required.

6.5 PAINTING

A. Store paint in cool dry place in manufactures container only.

B. Do not use after expiration date.

C. Prepare surface by removing excess rust, scale, dirt, oil soap and other contaminants.

D. Use 120 grit sandpaper and/or wire brush.

E. Clean and dry.

F. Primer and Paint Application:
1. Touch up factory paint only (Do Not paint entire surface)
2. Paint bare metal and rusted areas
3. Apply two layers of primer ensuring each is dry / tack free
4. Apply two layers of approved paint
5. Finish coat should be uniform
6. Prevent overspray
7. Do not paint index glass, gauges, instruments, etc…

G. When painting in enclosed spaces always check and eliminate possible ignition sources, leave doors and windows open and ensure adequate ventilation.

PROCEDURES
C. P. MONITORING

7.0 PURPOSE

The purpose of this section is to establish procedures for the monitoring necessary to maintain appropriate cathodic protection (CP) levels on existing pipelines as an integral component of maintaining pipeline integrity.

7.1 SCOPE

The following surveys requirements are covered:

A. Pipe Coating Inspection
B. Atmospheric Corrosion Inspection
C. CP Surveys
D. Close Interval Survey
E. Isolated Steel Section Survey
F. Null / Short Survey
G. Stray Current / Bonding / Insulating / Electrical Isolation

7.2 PIPE COATING INSPECTION

A. Each time a buried or submerged pipe or pipeline facility is exposed the coating shall be visually inspected for:
   1. Deterioration and/or damage
   2. Cracking and/or disbondment
   3. Signs of external corrosion
   4. Document findings on appropriate form(s)
   5. Issue any appropriate work order(s)

B. Each time the pipe coating is removed or missing:
   1. A pipe-to-soil reading shall be taken
   2. Check for signs of external corrosion
   3. Perform remedial action as may be necessary including utilizing a holiday detector
   4. Re-wrap the section of pipe using appropriate procedure
   5. Document findings and actions on appropriate form(s)
   6. Issue any appropriate work order(s)

7.3 ATMOSPHERIC CORROSION INSPECTION

A. A survey for the signs of atmospheric corrosion shall be conducted once every three years, but with intervals not exceeding 39 months. **192.481**

B Atmospheric corrosion of iron/steel facilities may appear on above ground facilities in the form of:
1. Flaking or bubbling paint
2. Metal loss with rust
3. Scaling of the pipe
4. Pitting of the pipe

C. Atmospheric corrosion of aluminum facilities, meters and regulators, may appear on the surface as a build up of a grayish powdery substance.

D. Perform appropriate remedial action(s) as necessary.

E. Document findings and actions on appropriate form(s).

7.4 CATHODIC PROTECTION (CP) SURVEY (192.465)

A. An annual (once each calendar year not exceeding 15 months) survey involving pipe to soil readings of each test station or otherwise identified location within the gas piping system shall be undertaken.

B. Documentation of the annual survey records shall be maintained for a minimum of 10 years.

C. Each reverse current switch, diode, and interference bond shall be inspected six times each year at intervals not exceeding two and one half months.

D. Readings outside of the acceptable range or other abnormal operating conditions shall be forwarded immediately to the gas supervisor or designee.

E. Promptly perform appropriate remedial action(s) as necessary to correct any deficiencies.

F. Unprotected pipelines shall be reevaluated not less than every 3 years at intervals not exceeding 39 months. Cathodic protection shall be implemented in areas where active corrosion is found using electrical survey.

PROCEDURES
C. P. MONITORING

7.5 CLOSE INTERVAL SURVEY (C.I.S.)

A. CIS is an accepted method of indirect assessment. CIS is most often conducted on transmission facilities located in High Consequence Areas (HCA).

B When required, a close interval C.P. survey of the gas system shall be conducted. This involves pipe to soil readings taken at close intervals (every 1 to 3 meters) for the entire length of the pipeline.

A connection is made to the pipe test lead in a test station, and the reference electrode is moved down the line as shown in *Fig 1*, the pipe to soil potential can be measured

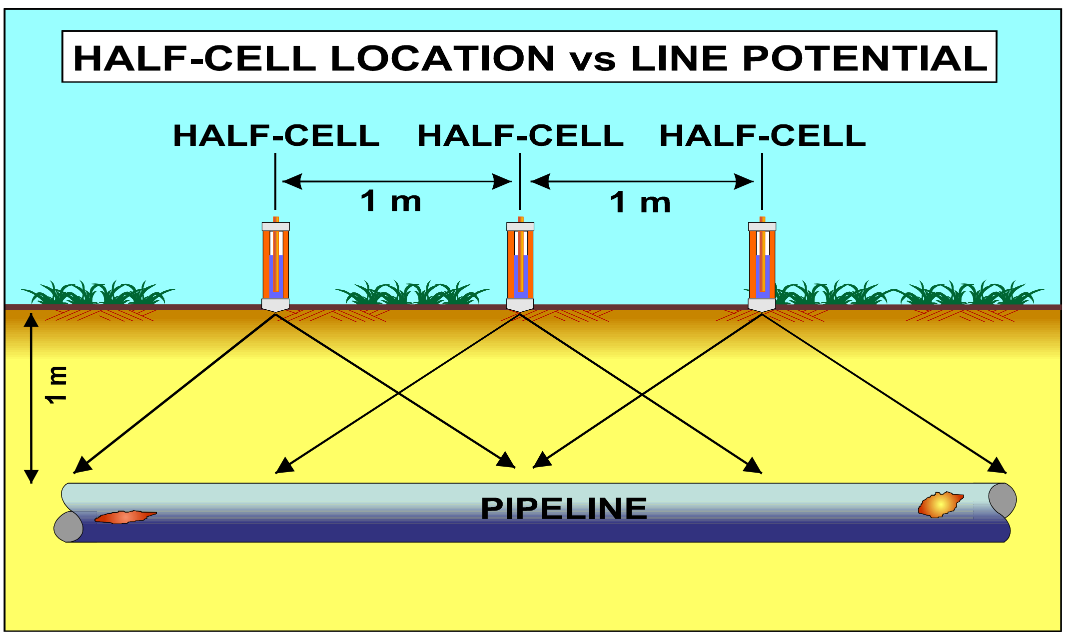


Fig 1

at numerous sequential locations. This is the basis of the C.I.S. The reference electrode spacing is usually either 1 m or 3 m, and by taking pipe to soil potential measurements over a fixed distance, a graph plot of potential vs. distance can be produced.

In cases where direct current is flowing, the pipe to soil potential that is measured, will include the actual pipe to soil potential, the voltage gradient in the ground, the voltage drop across the coating and the voltage drop **(IR Drop)** in the pipeline.

In this case, the pipe to soil potential is not the true pipeline potential. If the true pipe to soil potential is to be measured, the direct current flow causing the voltage gradients and pipe **IR Drop** must be removed.

This can be accomplished by temporary interruption of the Cathodic Protection rectifier current outputs, which will remove the direct current flowing in the system.

Therefore, there are two pipe-to-soil potentials that may be measured and recorded at each location when direct current flow in the ground is a factor.

The potential recorded with current flowing is called the "on" potential, and the potential recorded while the current flow is interrupted, is called the "off" or "polarized off" potential. Some surveys require both "on" and "off" potentials to be recorded. Other types of survey, e.g. on sacrificial anode systems, require only "on" potentials. Note that in sacrificial anode systems, the magnitude of current flow is generally less than for rectifier systems, and the current flow is more localized due to anode distribution.

7.6 ISOLATED STEEL SECTION SURVEY

A. An isolated steel section is a section of gas pipe not in excess of 100 linear feet in total length that is in some way isolated from other metallic piping and / or from the CP system.

B. Monitoring and testing of the level of CP shall be conducted testing a minimum of 10% per each calendar year and a different segment(s) tested each year so that the entire system is tested over a ten year period.

C. Pipe to soil readings shall be taken at each location and the readings recorded.

D. Documentation shall be maintained for a minimum of ten years.

E. Be aware of the potential that the locator wire may be attached affecting the pipe-to-soil readings. If in the judgment of the technician, a problem may exist, remedial action would be warranted and should be documented.

7.7 NULL / SHORT SURVEY

Null surveys are conducted to determine where shorts may exist along the Operator's pipeline facilities. Shorts or loss of CP protection from the facilities of the Operator to other facilities including underground and / or aboveground facilities other utilities and / or privately owned or customer facilities.

1. A null survey is conducted using a Tinker Razor fault finder, or approved pipe locator
2. Connect fault finder in accordance with manufacturer's directions. (Refer to Section K-2)
3. Refer to system maps and follow pipe accordingly. Watch for indications that the pipe is not following the path indicated on the system maps.
4. Note where indications exist that the pipe is possibly shorted.
5. Take pipe to soil reading that may further indicate that a short exists at the suspected location.
6. Take corrective action to eliminate all shorts:
    a. Dig up and isolate buried shorts
    b. Repair or replace, or install insulators where necessary
    c. Disconnect attached locator wire if a problem
7. Record all findings and necessary remedial action.

The following surveys requirements are covered:

7.8 STRAY CURRENTS (192.473)

A. Stray AC and or DC electrical current may adversely affect the Operator's Cathodic Protection. Current will stray from one source to another along the path of least resistance. Samples of stray current sources may include:
    1. Other cathodically protected structures
    2. Electric lines
    3. Railroads or electric rail transportation systems

B. The following means of managing stray currents shall be followed where feasible. They include:
    1. Insulating, installing insulated fittings at connection points such as meters and taps to prevent the flow of current from one structure to another.
    2. Bonding, from one source of current to another to create a path for the current to flow without damaging one or the other structure.
    3. Electrical isolation, of one structure from another where a short may exist.

PROCEDURES
TAPPING AND LINE STOP / STEEL

1.0 PURPOSE (192.627)

The purpose of this section is to provide minimum requirements and information regarding steel pipe tapping and line stop operations.

1.1 SCOPE

A. Equipment
B. Fittings
C. Tapping
D. Stopping
E. Completion

1.2 EQUIPMENT AND FITTING

A. The proper fitting and pressure rating shall be verified before fitting is installed on the pipeline. Only fittings that meet or exceed the MAOP of the pipeline shall be utilized. Only approved fittings and line stop equipment shall be used.

B. The pressure rating for the line stop equipment shall be verified to meet or exceed the working pressure of the pipeline before the tapping procedure begins. Exceeding the rated pressure may result in serious injury.

C. Only those fittings designed for a specific manufacturer of line stop equipment should be used with that equipment.

D. “O” rings and gasket materials should be maintained in good working order at all times. Damaged “O” rings or gasket materials shall be discarded and replaced. Lubricate “O” rings as required. Pipe thread sealant should be used to create a pressure seal on threaded connections that do not require an “O” ring or gasket.

E. Use only the manufacturer’s stopper lubricant on rubber stoppers or on the rubber seal of steel wedge stoppers when required per manufacturers operating manual. Do not use any other lubricant or cleaner.

F. At no time shall fittings or equipment be used for anything other than its designed use.

G. Repair of equipment shall be performed only by individuals knowledgeable of their operation and repair and using only factory supplied parts and equipment. At no time shall equipment be repaired or re-manufactured in any way other than their intended design.

H. Line Stop equipment shall not be subjected to welding, cutting, drilling, honing or any other type of action that would decrease its operability or designed pressure rating.

I. The operator shall follow the manufacturer's procedures for tapping and completion of Line Stop fittings.

J. Do not use line stop equipment that is broken, damaged, missing parts or in the opinion of qualified personnel is in need of repair.

K. In gaseous atmospheres, ground cables shall be used in order to avoid static electricity.

1.3 TAPPING

A. Each tap made on a pipeline under pressure shall be performed by a crew qualified to make Hot Taps **192.627**.

B. Verify that the fitting to be used and that the tapping, stopping and completion equipment is the correct type, size and pressure rating for the work to be performed and that the equipment is in good working order.

C. Install and pressure test the fitting before tapping. Select and install the correct valve and adapters as necessary.

Note: Insert and remove the completion plug using the completion equipment at this time, to verify proper alignment and operation of the equipment and completion plug.

D. Verify that the correct type and size of shell cutter and adapters are installed in the tapping machine. Also verify that the detents or coupon retaining device is in good working order.

E. When tapping steel pipelines, lubricate the shell cutter with the proper cutter lubricant. Apply cutter lubricant to the pilot drill tip and to the shell cutter teeth with care. Too much lubricant can interfere with the normal operation of the tapping equipment and if used in excess, can restrict the flow of gas through the pipeline during the tapping procedure.

F. Measure and mark the correct tapping distance for the type of fitting being used and the diameter of the pipeline.

G. Verify travel distance of the tapping machine.

H. Install the tapping equipment and the complete the tap per the manufacturers operating manual.

1.4 STOPPING

A. Verify that the correct type and size of stopper is installed in the stopping equipment.

B. Verify that the stopper is installed correctly in the stopping equipment.

C. Do not use stoppers that are badly cut, ripped or damaged.

D. Lubricate the stopper using the manufacturers recommended stopper lube when applicable.

E. Verify, by measurement, stopper travel.

F. Install the stopping equipment and complete the stopping procedure per the manufacturers operating manual. Use only enough pressure as may be required to shut off the gas flow. Over tightening the stopper could damage the equipment and result in an unsafe condition.

G. Upon completion of the stop-off, purge remaining gas from the pipeline and complete required work.

Note: During welding operations, do not allow the stopper to become overheated. By applying wet rags at the base of the stopper fitting and maintaining them will reduce the amount of heat transferred to the stopper.

H. Upon completion of the required work, lift the stopper and remove it.

Note: In order to prevent damage to the stopper, the unpressurized section may need to be equalized before the stopper is removed. This can be accomplished by installing a fitting on the unpressurized section and by-passing gas from the pressurized side to the unpressurized side.

1.5 COMPLETION

A. Select the proper type and size of completion equipment and verify that the completion tool is in good working condition.

B. Verify that the completion plug is installed in the completion tool correctly.

C. If the completion plug is equipped with an “O” ring, ensure that it is in good working condition and lube the “O” ring.

D. Install the completion plug to the required depth, verified by measurement (when applicable). Count the turns required to ensure complete shut off, when necessary.

Note: It is necessary to perform the alignment procedure prior to tapping the fitting in order to ensure that the completion plug can be successfully installed.

E. Once the completion plug has been installed, soap test for leakage.

F. Install the completion cap per manufacturer’s procedure.

PROCEDURES

TAPPING AND LINE STOP / PLASTIC

2.0 PURPOSE (192.627)

The purpose of this section is to provide minimum requirements and information regarding plastic pipe tapping and stopping.

2.1 SCOPE

Tapping tees must be protected from shear and bending loads. Protection is provided by properly installed, compacted embedment and may use a protective sleeve installed over the tap tee connection with the service line.

WARNING: Gas leakage (blow-by). When tapping a pressurized main, gas can leak past the cutter when the cutter is retracted from the pipe wall. Take all necessary personal safety precautions. Do not remove the cutter.

2.2 TAPPING

1. Each tap made on a pipeline under pressure shall be performed by a crew qualified to make Hot Taps **192.627**.

2. Prior to tapping the main, the service line should be connected to the tapping tee in accordance with the manufacturer's procedures. Before connecting the service line to the tapping tee, slide the protective sleeve (if provided, optional) over the free end of the service line. Then connect the service line to the tapping tee outlet and connect the opposite end of the service line to the meter riser or service connection in accordance with the manufacturer's procedures.

3. Pressure test all connections in accordance with **Section H-3**.

4. Saddle fusions must be completely cooled before tapping the main.

5. Remove and inspect the cap and o-ring, place tapping tee wrench in hex opening of cutter at top of tee. Turn wrench clockwise until the fixed stop of the wrench makes contact with the tower top of the tapping tee-this will make the tap. The section cut from the pipe wall (coupon) will remain in the cutter.

6. Turn wrench counterclockwise until top of cutter is even with the top of tapping tee tower. Remove the wrench.

7. Install the tapping tee cap.

   a. Check to be sure the o-ring is in place at the top of the body, and the threads and sealing surfaces are free of dirt and contaminants.

8. Soap test fitting and cap to ensure no leakage is present before completion and backfill.

9. Slide protective sleeve (if provided) over outlet end of the tapping tee and secure with plastic tape to avoid slippage of sleeve during backfill operation.

PROCEDURES
QUALIFICATION TESTING / GENERAL

1.0 PURPOSE

It is the purpose of this section to provide the requirements and procedures for qualifying operator and contractor personnel in the joining of various pipe materials. This section is separate from the Operator Qualification Written Plan.

1.1 SCOPE

This section covers the following:

A. Qualification test for plastic pipe and fittings.
B. Qualification test for SMAW and GMAW welding of pipe and fittings.

1.2 GENERAL

A. Initial qualification of all personnel who will join plastic pipe or weld within the Operator's system should be conducted by a **Qualified Third Party.**

B. Re-qualification of operator and contractor personnel may be conducted by qualified operator personnel who, are qualified by training and/or experience, or have been qualified by a qualified third party.

C. Contract Inspectors who are qualified by training and/or experience may re-qualify contractor personnel.

Note: Initial testing requirements will apply to all individuals who are qualifying for the first time, or for any individual whose qualification has lapsed, (become invalid).

1.3 PLASTIC PIPE JOINERS

A. All personnel qualified in plastic pipe joining procedures will be given an annual requalification test (Time not to exceed 15 months) **192.285 (c)**.

B. All tests shall be documented on the appropriate form and maintained in accordance with the Operator's procedures. (It is recommended that records be maintained for a minimum of five years) All test coupons shall be inspected and evaluated by a qualified individual.

PROCEDURES
QUALIFICATION TESTING / GENERAL

C. Operator plastic pipe joiners who fail their pipe joining requalification test may retest within two weeks after failing the test. If the retest is failed, the pipe joiner should be barred from joining for a minimum period of six months.

D. Contract plastic pipe joiners who fail their pipe joining requalification test may be retest within two weeks after failing the test. If the pipe joiner fails the retest, the pipe joiner shall then wait a minimum of six months before being given another pipe joining test.

E. The pipe joiner may work in a classification, which does not have the requirement for that particular pipe joining process.

F. Qualification after six months should be conducted by a qualified third party and should be conducted as if being an initial test.

G. A pipe joiner shall be required to re-qualify if production work does not appear satisfactory.

H. The supervisor shall pull the qualification card of any pipe joiner whose work does not appear satisfactory.

1.4 <u>WELDERS</u>

A. Operator welders who fail their re-qualification test may be retested within two weeks after failing the test. If the retest is failed, the pipe joiner should be barred from welding for a minimum period of six months.

B. Contract welders who fail their requalification test may be retested within two weeks after failing the test. If the retest is failed, the pipe joiner should be barred from welding for a minimum period of six months

C. The contract welder may work in a classification, which does not have the requirement for that particular welding process.

D. Qualification after six months should be conducted by a qualified third party and should be conducted as if being an initial test.

E. No welder may weld with a particular welding procedure unless, within the preceding six calendar months, that welder was engaged in welding with that process or procedure **192.229 (b)**.

PROCEDURES
QUALIFICATION TESTING / POLYETHYLENE

2.0 PURPOSE

This section establishes the specific requirements and procedures by which personnel will be deemed qualified to join polyethylene pipe, tubing and fittings by the heat fusion and mechanical methods. All criteria for initial qualification and annual re-qualification are outlined in this section.

Preliminary training shall be provided for each person attempting to qualify in joining polyethylene pipe and tubing.

Each person attempting to qualify should understand all of the procedures for joining polyethylene pipe, tubing and fittings prior to qualification testing.

2.1 SCOPE

A. Initial test
B. Requalification testing

2.2 INITIAL TEST REQUIREMENTS

A. The qualification test shall consist of:

1. 2” and 6” butt fusion
2. Continental service tee with 1” IPS outlet
3. Continental HVTT with 2” IPS outlet
4. 2” electrofusion coupling
5. 1” IPS Lyco mechanical fitting
6. 2” IPS Lyco mechanical fitting

B. The initial qualification shall be conducted by a **Qualified Third Party**. The individual conducting the tests shall:

1. Observe the construction of the fusion test assembly.

2. Evaluate the fusion heating times, safety practices, and use and care of tools.

3. Check for the double rollback bead in the butt joint. Inspect the joint for a uniform, nonporous, well-aligned bead around its entire circumference.

4. Observe that all aspects of the procedures are adhered to during the qualification test.

C. After joints have cooled to ambient temperature butt fusion and electrofusion joints shall be subjected to a **bend test**. Cut joints into at least 4 longitudinal sections 1" wide and 9" long. One section shall be taken from each quadrant. These sections shall be subjected to 2 root bends and 2 face bends, (4 face bends for electrofusion) Fusions shall be subject to destructive testing as recommended by PLEXCO bulletin #105.

D. Rejection Criteria

The following constitutes the criteria that will result in disqualification of a person to make heat fusion joints with polyethylene:

1. Any defect in the bead. This includes non-fusion, porosity, incomplete rollback, failure of the bend test, etc.

2. Any indication of fusion brittleness.

3. Failure to perform the fusion per qualified joining procedures.

2.3 ANNUAL REQUALIFICATIONS

A. The requalification test shall consist of:
1. 2" and 6” butt fusion
2. 2” electrofusion coupling
3. Continental service tee with 1” IPS outlet
4. Continental HVTT with 2” IPS outlet
5. 1” IPS Lyco mechanical fitting
6. 2” IPS Lyco mechanical fitting

PROCEDURES

QUALIFICATION TESTING / WELDING

3.0 PURPOSE

This section establishes the minimum requirements for qualification in shield metal arc welding (SMAW) procedures by which personnel will be deemed qualified to weld with these electric arc processes.

3.1 SCOPE

A. Before starting the qualification test, the welder shall be allowed a reasonable time to adjust the welding equipment for the test.

B. The welder shall use the same welding technique and proceed with the same speed that he will use if he passes the test and is permitted to do production welding.

3.2 INITIAL TEST REQUIREMENTS

A. Initial testing should be conducted by a **Qualified Third Party.**

B. The qualified representative conducting the test shall visually inspect the process to ensure that the welder follows the qualified welding procedure (API 1104 will be used in the standard).

C. Operator welders shall initially qualify for arc welding under API 1104, Standard on pipe having a diameter of 6.625" and wall thickness of .250".

3.3 REQUALIFICATION

A. Biannual tests are required for all electric arc welders. Test shall be at intervals not to exceed six months from the last date of qualification or requalification.

B. This may be a production weld or a sample weld.

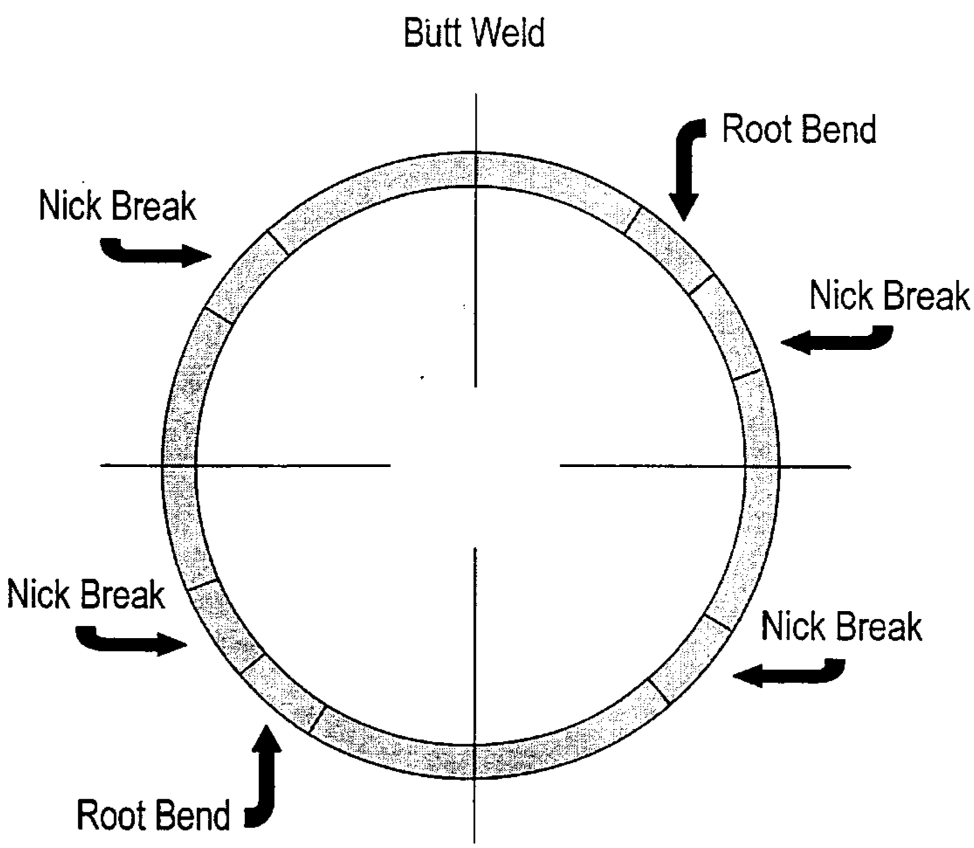
3.4 REJECTION CRITERIA

A. Electric arc welders taking the requalification or initial test shall have the test weld found acceptable if it meets the requirements the API 1104 standard.

PROCEDURES
QUALIFICATION TESTING / WELDING

FIGURE 1

REQUALIFICATION TEST - ELECTRIC ARC WELDING
Biannual



PROCEDURES

REGULATOR STATION INSPECTION AND MAINTENANCE / GENERAL

1.0 <u>PURPOSE (192.195 & 192.739)</u>

It is the purpose of this section to provide minimum requirements and general information on the methods and procedures for inspection and tests to ensure that valves and regulators at worker-monitor type pressure control/pressure reduction/customer meter set assembly (MSA) facilities are:

1. In good mechanical condition.
2. Adequate from the standpoint of capacity and reliability of operation.
3. Set to function at the correct pressure.
4. Properly installed and protected from dirt, liquids or other adverse conditions affecting operation.

NOTE: The minimum procedures included in Section O of this Plan will be performed at each station at the inspection interval established in this section. These procedures are not considered to be all-inclusive. Additional inspections and/or maintenance activities may also be required.

1.1 <u>SCOPE</u>

This section covers the following:

A. O-1 Inspection Frequency
B. O-1 Requirements
C. O-2 Annual Maintenance
D. O-3 Flow & Lock-up
E. O-4 Station Bypass Procedure

1.2 <u>INSPECTION FREQUECY</u>

A. City Gate Stations and District Regulator Stations facilities shall be inspected, tested, and maintained once each calendar year, not to exceed 15 months.

B. Small volume pressure reducing and metering facilities with the working regulators separate from the overpressure protection devices (i.e., large customer meter sets with worker – monitor pressure control equipment) installed at MSA's shall be maintained biennially. (Pressure gauges are adequate for evaluating the pressure control performance of these types of installation). Small volume pressure reducing and metering facilities with working regulators that incorporate an overpressure protection device in the regulator body (such as a diaphragm regulator with internal relief) installed at MSA's do not require field evaluation subsequent to initial installation or modification to the meter set assembly.

C. At City Gate Stations and District Regulator Stations, pressure shall be monitored at a minimum of once each month. (Pressure recording charts or other actual time monitoring equipment is recommended for large stations)

D. Special inspections shall be conducted whenever there is reason to suspect foreign materials in the gas stream or other operation problems.

E. Confirm that all regulator vents are oriented in a downward position and are screened.

F. Clear any visible cathodic protection faults.

G. Check for signs of atmospheric corrosion. Initiate remedial action, if needed.

H. Verify that pressure display devices (such as pressure charts or gauges) are in good working order.

I. Check for leakage and make any necessary repairs.

J. Document all findings on appropriate forms.

K. Any abnormal operating condition shall be reported to the gas supervisor **immediately.**

1.3 <u>REQUIREMENTS</u>

A. Each pressure control/pressure reducing station shall be designed and installed with adequate capacity and adequate overpressure protection, and to prevent a single incident from affecting both the overpressure device and the primary/district regulator.

B. Each customer MSA will be designed and installed with adequate capacity and adequate overpressure protection to prevent a single incident from impacting metered volumes of gas to the customer and prevent a single incident from affecting both the primary customer regulator and the overpressure protection regulator.

C. Each pressure reducing station shall be inspected and maintained once each calendar year not to exceed 15 months, to include station flow and lock-up.

D. Each large customer MSA (that operates using a working regulator with a separate overpressure protection device, such as a worker – monitor pressure control scheme) shall be inspected and maintained at least biennially, to include MSA flow and lock-up.

E. Pressure regulator facilities that are designed to reduce pressure from high-pressure pipelines to normal distribution pressure (Other than customer MSAs designed for standard delivery pressure) shall require overpressure protection.

F. Pressure reducing stations shall be designed to protect against a single failure.

G. All pressure reducing station equipment shall be inspected and operated to ensure proper operation and overpressure protection.

H. Once each calendar year, not to exceed 15 months the operator shall calculate the capacity and adequacy of pressure relief equipment, if installed.

If review and calculations are used to determine if a device has sufficient capacity, the calculated capacity must be compared with the rated or experimentally determined relieving capacity of the device for the conditions under which it operates. After the initial calculations, subsequent calculations need not be made if the annual review documents of those parameters have not changed to cause the rated or experimentally determined relieving capacity to be insufficient.

If a relief device is of insufficient capacity, a new or additional device must be installed to provide the required capacity.

I. If the maximum allowable operating pressure is greater than 12 PSI but less than 60 PSI the pressure may not exceed the MAOP plus 6 PSI. (**192.201**)

J. If the maximum allowable operating pressure is 60 PSI or greater the pressure may not exceed the MAOP plus 10%. (**192.201**)

K. If the maximum allowable operating pressure is less than 12 PSI the pressure may not exceed the MAOP plus 50 %. (**192.201**)

PROCEDURES

REGULATOR STATION INSPECTION AND MAINTENANCE / ANNUAL MAINTENANCE

2.0 PURPOSE

The purpose of this section is to establish the procedures for Operation and Maintenance or pressure regulating and reducing equipment in the operator's system.

2.1 REGULATORS

A. Each regulator shall be inspected. The following maintenance shall be performed:

1. Check and record inlet pressure as found.
2. Check and record flow pressure as found. (Note that flow pressure cannot be checked without a downstream load. A flowing load can be artificially created by venting gas downstream of the regulator, it necessary.)
3. Check and record as "passed" or "failed".
4. Verify Worker and Monitor regulator operation.
5. Set flow pressure as required and document. (This step is not to be completed unless a downstream load is present. If no downstream load is present, the station should be scheduled for recheck within the allowable inspection window to verify the flow pressure as left).
6. Check lock-up pressure as required and document as "passed" or "failed".
7. Reverse Worker and Monitor regulator configuration.

B. Document all findings and work performed on appropriate forms.

2.4 VALVES

A. All station valves, and the station inlet and outlet isolation valves, shall be inspected, serviced and operated. The following maintenance should be performed for each valve:

1. Inlet and outlet isolation valves: shall be maintained in accordance with **Section G-3**.
2. Station valves:
   - Operate valves. (1/8th turn)
   - Lubricate as may be applicable.

B. Document all findings and work performed on appropriate forms.

PROCEDURES
REGULATOR STATION INSPECTION AND MAINTENANCE / ANNUAL MAINTENANCE

2.5 OTHER EQUIPMENT

A. Check and maintain as necessary all:
  1. Control piping
  2. Filter / Strainer (Follow manufacturer recommendations)
  3. Pilot heater(s)
  4. Safety equipment including relief device if present
  5. Recorder and/or Gauges

B. Document all findings and work performed on appropriate forms.

PROCEDURES
REGULATOR STATION INSPECTION AND MAINTENANCE / FLOW AND LOCK-UP

3.0 PURPOSE

The purpose of this section is to establish procedures for safely setting flow and lock-up pressures.

3.1 SCOPE

A. Flow
B. Lock-up

3.2 REGULATOR FLOW AND LOCK-UP

A. Flow pressure is the pressure the regulator is designed to normally flow gas.

1. Check and record inlet pressure as found
2. Check and record flow pressure as found
3. Set flow pressure as required and document

B. Lock-up is the pressure at which the regulator is designed to stop flowing gas.

1. Lock-up is to be checked, using a test gauge downstream of the device to be tested, by closing the outlet valve and watching the test gauge.
2. Check lock-up pressure as required.
3. The technician must verify that the device stops feeding.

C. Both Worker and Monitor regulators must each be tested.

D. Internal inspection is required when during inspection, any regulator or monitor set fails to lock-up, or the monitor fails to assume control.

1. Repair or replace any damaged or defective equipment
2. All maintenance and parts replacement will be performed in accordance with the manufacturer’s procedures.

E. Ensure that the “as left” pressure does not exceed the MAOP of the downstream system.

F. Document all findings and work performed on appropriate forms.

PROCEDURES

REGULATOR STATION INSPECTION AND MAINTENANCE / STATION BYPASS PROCEDURE

4.0 PURPOSE

The purpose of this section is to establish procedures for safely bypassing regulator stations which typically provide a regulated supply of natural gas into a system providing natural gas supply to multiple customers (See procedure F-6 for meter bypassing procedures).

4.1 SCOPE

A. Site Review
B. Bypass Operations Procedure
C. Approved Bypass Method: Regulated Bypass

4.2 SITE REVIEW

The site is to be evaluated before the start of bypass operations. The minimum items to be evaluated are:

- Capacities of the station metering and regulating equipment to ensure proper sizing of bypass equipment
- Inlet and outlet pressures to ensure that all bypass equipment (including the regulator, fittings, piping, hoses, etc.) have a pressure rating compatible with the regulator station capacity and operating pressure
- A review for any unsafe conditions or hazard

NOTE: Unsafe conditions or hazards may result in the generation of a Safety Related Condition Report or report of unusual operating conditions.

4.3 BYPASS OPERATIONS PROCEDURE

A. BYPASS REQUIREMENTS

1. Bypassing operations will be performed only by personnel qualified by training.

2. All regulators that have been bypassed or taken out of service will be checked for flow and lockup prior to being restored to service.

B UNATTENDED BYPASS OPERATION

1. Any time a bypass is to be left unattended for an extended period of time, the entire bypass assembly will be constructed of steel and rated for the full inlet pressure of the station. The use of hoses for unattended bypass operation is prohibited.

2. Over-pressure protection will be installed on any unattended bypass.

3. Proper precautions will be taken to ensure the safety and protection of the unattended bypass equipment.

NOTE: It is acceptable for a technician to return to his vehicle to obtain parts or tools as long as an acceptable overpressure protection device is installed in the bypass. The intent of this paragraph is to provide the requirements necessary if a technician is required to leave the work site unattended.

C. SAFETY

1. Safety practices during bypass operations will include, but not be limited to the following:

   - Having a fire extinguisher readily available
   - Eliminating all sources of ignition
   - Using all applicable safety equipment as needed

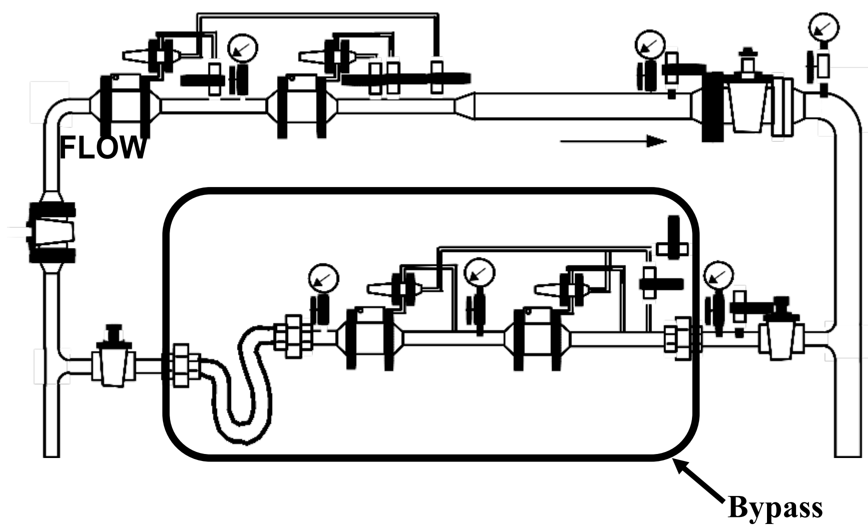
D. GAUGES - LOCATION

1. All temporary bypass assemblies will have gauges installed that will show the bypass inlet pressure and outlet pressure during bypass regulator testing and startup.

2. A gauge will be installed so that it will monitor the delivery pressure of the station while on bypass.

3. All gauges used for pressure verification and setting of station regulators will be in good condition and within their calibration window.

PROCEDURES
REGULATOR STATION INSPECTION AND MAINTENANCE / STATION BYPASS PROCEDURE



Typical Gauge Locations
Figure 1

F. BYPASS DELIVERY PRESSURE

1. The delivery pressure during bypass operations will not be allowed to increase above maximum allowable operating pressure (MAOP), nor decrease more than 10% below the setpoint of the worker regulator without supervisory approval.

G. HOSES AND HOSE COUPLINGS

1. When a temporary hose is used on a bypass, only fittings that have been approved for connecting the hose end to the pipe or valve will be used. Quick connect / disconnect fittings will not be used on temporary bypass hoses. Fittings approved for use on bypass hoses are:

   - Flanged fittings
   - Threaded fittings (including unions)
   - Flare fittings (for control line hose sizes ½ in. and smaller)

2. Hoses used on bypass equipment will be of an appropriate pressure rating for the intended use. Hoses should be rated to a minimum of the station inlet pressure.

H. VALVES

1, Valves must be operated slowly to avoid possible damage to meters, regulators or other equipment.

2. All valves will be checked for smooth operation and be lubricated, as necessary.

3. To allow for quick response to an unintended operating condition, remove locks and plugs from all valves that will be utilized during the bypass procedure.

- Verify that valves are closed prior to removing the outlet plugs
- Re-install all locks and plugs after completion of the job

I. BYPASS REGULATOR SELECTION

1. If the station is flowing at or near capacity, the bypass regulator(s) used should have a flow capacity equal to or greater than those used on the station.

2. If the station is flowing at less than capacity and can be reasonably expected to remain at the lesser flow rate for the duration of the bypass operation, a smaller regulator suitable for the existing flow rate may be utilized. Personal knowledge of the station's operational parameters should be used to implement this method.

3. Any regulator that is currently approved for installation may be used as a bypass regulator.

4. If overpressure protection is used/required in a station bypass, regulators with full capacity internal relief, regulators with internal monitor function and properly sized relief valves are all acceptable as bypass regulation overpressure protection.

J. PURGING

1. This purging procedure applies to regulator stations only.

2. All bleed and / or purge operations will be performed through a valve to ensure positive control by the technician during the purge. A full opening ¼-in. or ½-in. ball valve is preferred for this application so that the valve may be quickly shut off while a sufficient purge velocity is maintained.

3. When to purge:

   - Newly installed sections or components must be purged of air prior to placing into service. This will include bypass assemblies.
   - If the bypassed section has been disassembled for any reason, the bypassed section must be purged prior to placing into service.
   - If pressure has been maintained within the station during the entire bypass operation, purging is not necessary.

4. Determine how much to purge:

   - When possible, purging operations should be performed simultaneously with pressure adjustments on the regulators so that gas loss is kept to a minimum.
   - For bypass assemblies and regulator stations, the following minimum purge times will be used:
     - For pipe sizes 4-inches and less, the minimum purge time is 10 seconds per 10 ft. of length.
     - For pipe sizes over 4-inches nominal diameter up to 8-inches nominal diameter, the minimum purge time is 20 seconds per 10 ft. of length.
     - The minimum purge time is always a minimum of 10 seconds.
   - If special circumstances dictate, purge operations may be verified for completeness by inserting the probe of a combustible gas indicator into the purge gas stream to obtain the gas to air percentage.

K. PURGE METHODS

1. A purge is accomplished one of the methods below:

a. Purge Method 1 - The purge valve is located less than or equal to 6 in. of the outlet block valve.

Step 1 Leave the outlet block valve closed for the entire operation.
Step 2 Open the inlet block valve.
Step 3 Open the purge valve and blow gas to the atmosphere until the purge requirements in paragraph J.4, above, are satisfied.
Step 4 Close the purge valve.

a. Purge Method 2 - The purge valve is located more than 6 in. from the outlet block valve.

Step 1 Open the purge valve.
Step 2 Crack the outlet block valve until a sufficient volume has escaped to purge the area downstream of the purge valve.
Step 3 Close the purge valve.
Step 4 Close the outlet block valve.
Step 5 Open the inlet block valve.
Step 6 Open the purge valve and blow gas to the atmosphere until the purge requirements in paragraph J.4, above, are satisfied.
Step 7 Close the purge valve.

L. OTHER ACTIVITIES

1. If possible, perform any required maintenance activities including pressure verification, meter testing or any other compliance related activity while the station is on bypass.

4.4 APPROVED BYPASS METHOD: REGULATED BYPASS

The only approved method for bypassing a regulator station is to use a regulated bypass.

This method uses a built-in hard piped regulated bypass or temporary regulated bypass regulation, using one or more hoses to connect bypass regulators to bypass valves installed on the station piping to divert flow around the isolated section.

Whenever this method is used to perform a bypass operation and overpressure protection is not installed on the bypass, a technician will maintain a constant watch on the bypass delivery gauges and the equipment used to ensure the delivery pressure is maintained within acceptable limits.

A. PLACE BYPASS IN SERVICE

Step 1 For a hard-piped regulated bypass, skip to Step 5.
Step 2 Install the bypass regulators, hoses, fittings and all necessary gauges.
Step 3 Adjust the bypass regulator to reduce the bypass delivery pressure.
Step 4 Purge the bypass assembly using the appropriate purging method.
Step 5 If not already open from the purge in Step 4, slowly open the inlet bypass valve.
Step 6 Check the bypass regulator flow and lockup pressures.

- Set the bypass worker slightly lower than the station worker setpoint so that after all the bypass valves are opened, pressure may be gradually raised to take over control of the station.

Step 7 Check the bypass assembly for leaks. Repair as necessary.
Step 8 Slowly open the outlet bypass valve.
Step 9 Gradually increase the bypass pressure to take over the feed of the station regulators.

- Observe the downstream system pressure gauge while listening for station regulators to stop feeding

Step 10 Close the appropriate station block valves to isolate the bypassed section as required.
Step 11 Carefully observe the downstream system pressure gauge during, and for a time after, this operation. Be ready to restore service through the station if a pressure problem develops.

B. RESTORE THE STATION TO SERVICE

Step 1 Slowly open the station block valves.
- Verify that all appropriate control / take off valves are open

Step 2 Slowly reduce the bypass pressure until the station regulators take control.
- Do not allow the delivery pressure to drop lower than the minimum allowable pressure during this operation. If the delivery pressure approaches these values, stop reducing the bypass pressure and re-adjust the station delivery regulator to its setpoint.

Step 3 If necessary, after the station regulators are in full control, make a final adjustment to the station worker regulator to setpoint.

Step 4 Slowly close the inlet bypass valve.
- Carefully observe the downstream system pressure gauge during this operation to ensure the delivery pressure remains constant

Step 5 Increase the bypass regulator setpoint to discharge residual pressure trapped in the inlet of the bypass into the downstream system.
- This will reduce the volume of gas required to be blown to the atmosphere

Step 6 Close the outlet bypass valve.

Step 7 Relieve the pressure from the bypass assembly.

Step 8 Remove the bypass components.