Oklahoma State University

Stillwater, Oklahoma

Facilities Management - Energy Services

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Distribution Systems
Utilities Distribution

Natural Gas System

Operations & Maintenance Manual

Revised November 2025

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INTRODUCTION

The purpose of this OSU Natural Gas O&M Manual is to establish policies and procedures that conform to federal and state safety regulations for the installation, construction, maintenance, and operation of natural gas distribution facilities on the Oklahoma State University, Stillwater campus (OSU). This Manual contains the guidelines, practices, and procedures that assure OSU operates in compliance with accepted gas distribution and pipeline safety codes.

This manual is compiled from current federal and state regulatory documents for the exclusive use and application by OSU, Facilities Management (FM) personnel. Any use or application to gas operations at other locations will be at self-risk to the user.

The *Natural Gas Pipeline Safety Act of 1968* required the *United States Department of Transportation* (DOT) to develop and enforce minimum safety regulations for the transportation of gases by pipeline. These regulations first became effective in 1970, and the *Research and Special Programs Administration* of DOT is charged with their enforcement. They are published in Title 49 of the *Code of Federal Regulations* (CFR), Parts 190, 191, 192, and 199. On December 4, 2009, the *Pipeline and Hazardous Materials Safety Administration* (PHMSA) published the final *Distribution Integrity Management Programs* (DIMP) rule. The rule required each operator of a natural gas utility, master meter system or propane pipeline system to prepare and follow a written DIMP plan by no later than August 2, 2011. As a designated Master Meter, OSU was required to comply with the requirements of section 192.1015. In Oklahoma, these regulations are enforced by the *Oklahoma Corporation Commission* (OCC) and effective June 2021, per notification by OCC, Master Meters in OK are no longer required to use the DIMP process.

NOTE: The Simple Handy Rule based Integrity Management Plan (SHRIMP) is a software platform for developing and managing a DIMP plan.

The *pipeline safety code* applies to:

- gas utilities (private, public, and municipal),
- operators of housing developments and mobile home parks served by natural gas master meters,
- liquefied petroleum gas (LP-Gas) systems that supply 10 or more customers from a single source; and
- any portion of an LP-Gas system located in a public place, such as a highway.

The determination was made that OSU meets the definition of a Master Meter system and is required to follow the code. The pipeline safety code says that operators of all gas systems must:

- deliver gas safely and reliably to customers,
- provide training and written instruction for personnel,
- establish written procedures to minimize hazards resulting from gas pipeline emergencies, and
- keep records of inspection and testing.

Part 192.619 of CFR Title 49 requires that a *Maximum Allowable Operating Pressure* (MAOP) for the OSU system be established. With the aid of documentation from *Oklahoma Natural Gas Co.* (ONG), the MAOPs (Chapter 14) for seven OSU metering stations have been established as follows:

LOCATION	PSIG	EFFECTIVE APPROVAL DATE
Hall of Fame, West of Monroe Street	35 psig	05/08/1996
1300 Block of North-Western Road	35 psig	05/08/1996
Small Grains Complex	21 psig	05/23/1996
North Side of Power Plant	35 psig	04/13/2020
Beef Cattle Station, north side HWY 51	5.4 psig	
East side of Knoblock - south of McElroy	20 psig	
North side of 4th St. south of OSU McKnight Performing Arts Center	15 psig	01/26/2018
McElroy and Ramsey	30 psig	02/2023

All gas piping installed after the dates stated in the table shall be based on a pressure test as described in Chapter 13, Leak Repairs - Construction.

It is imperative that OSU routinely meets its responsibilities under the Code because operators who do not comply may be subject to civil penalties, compliance orders, or both. If the hazards warrant, a "Hazardous Facility Order" may be issued that could shut down the OSU gas distribution system.

DEFINITIONS, TERMS, and ABBREVIATIONS

To understand this O&M Plan, one must know the meaning of some commonly used terms in the natural gas and LP- Gas industry. The following terms are commonly used in this arena.

CFR - Code of Federal Regulations include Title 49 a document that contains the actual regulations a natural gas operator must follow. The title number refers to a particular CFR volume.

CATHODIC PROTECTION - A procedure by which underground metallic pipe is protected against corrosion. It is a method for controlling the corrosion or deterioration of steel pipe and connected metallic equipment through the use of electrolysis.

CORROSION - The rusting of a metal pipe. This is caused by an electrochemical reaction that takes place between metallic pipe and its surroundings. As a result, the pipe deteriorates and will eventually leak. Underground corrosion can be retarded with cathodic protection.

CTS – copper tubing size

CUSTOMER METER - A device that measures the volume of gas transferred from an operator to the consumer.

DIMP - Distribution Integrity Management Programs

GAS OPERATOR - A person who engages in the transportation of gas. A gas operator may be a gas utility company, a municipality, or an individual operating a housing project, apartment complex, condominium, or a mobile home park served by a master meter. OSU is considered a gas operator.

IPS – iron pipe size

KEY VALVES - Are the valves needed to shut down the system, or part of the system, in case of an emergency.

LIQUIFIED PETROLEUM GAS (LP-GAS OR LPG) - Gas in a liquid state in the supply tank but vaporized at the tank's outlet then distributed in a gaseous state. LP gas expands when the temperature rises, and it is heavier than air.

MAIN - A gas distribution line that serves as a common source of supply for more than one service line.

MAOP - An abbreviation for maximum allowable operating pressure. This is established by design, past operating history, pressure testing, and pressure ratings.

MASTER METER SYSTEM - A pipeline system for distributing gas within, but not limited to, a definable area, such as a mobile home park, housing project, or apartment complex, where the operator (OSU) purchases metered gas from an outside source for resale through a gas distribution pipeline system. The gas distribution pipeline system supplies the ultimate consumer who either purchases the gas directly through a meter or by other means such as by rent. OSU's system has been determined to be a Master Meter System.

NATURAL GAS - A non-toxic, colorless fuel, about one third lighter than air. Gas burns only when mixed with air in the right proportion and ignited by a spark or flame. Gas in its natural state may not have an odor.

OPERATING and MAINTENANCE PLAN (O&M PLAN) - A plan required by the federal government and created by the system owner that outlines the procedures to be followed in operating and maintaining a safe system.

OVERPRESSURE PROTECTION EQUIPMENT - Equipment installed to prevent pressure in a system. from exceeding the maximum allowed limit for operating the system safely.

PIPELINE - All parts of those physical facilities through which gas moves in transportation. This includes pipes, valves, and other items attached to pipe, meter stations, regulator stations, delivery stations, holders, or fabricated assemblies.

PRESSURE REGULATING/RELIEF STATION - Automatically reduces and controls the gas pressure downstream from a high-pressure source of gas into a system running at a lower pressure. It includes any enclosures, relief devices, and ventilating equipment, and any piping and auxiliary equipment (such as valves, regulators, control instruments, and control lines.)

PSIG - An abbreviation for pounds per square inch gage pressure.

SERVICE LINE - A gas distribution line that transports gas from a common source of supply to a customer's meter, or to the connection to a customer's piping if the piping is farther downstream, or if there is no meter.

SERVICE REGULATOR - A device designed to reduce and limit the gas pressure to the consumer.

SERVICE RISER - The section of a service line which extends out of the ground and is often near the wall of a building. This usually includes a shut-off valve and a regulator.

SHRIMP - Simple Handy Rule based Integrity Management Plan - a software platform for developing and managing a DIMP plan.

SHUT-OFF VALVE - A valve installed to shut off the gas supply to a building. The valve may be located ahead of the service regulator or below ground at the property line or where the service line connects to the main.

SDR - STANDARD DIMENSION RATIO is the ratio of pipe diameter to wall thickness.

COMMONLY ABBREVIATED ORGANIZATIONS

AGA American Gas Association

ANSI American National Standards Institute, formerly the United States of America Standards Institute (USASI). All USASI issued standards and current standards issued by ASA have been re-designated as American National Standards (ANS) and continue in effect.

API American Petroleum Institute

ASME American Society of Mechanical Engineers

ASTM American Society for Testing and Materials

DOT U. S. Department of Transportation

EHS Environmental Health and Safety - OSU

FM Facilities Management - OSU

ONG Oklahoma Natural Gas Co.

OSU Oklahoma State University, Stillwater campus

OQ Operator Qualified

MSS Manufacturers Standardization Society of the Valve and Fittings Industry

NACE National Association of Corrosion Engineers

NFPA National Fire Protection Association

RSPA Research and Special Programs Administration. This is the federal agency in DOT which is responsible for development and enforcement of the pipeline safety code.

CHAPTER 1 - Methods of Gas Leak Detection

Listed below are eight warning signs of a gas leak with descriptions of leak detection equipment and recommended methods for conducting surface and subsurface leak detection surveys.

WARNING SIGNS OF A LEAK

1. Odor. Gas is intentionally odorized so that the average person can perceive it at a concentration well below the explosive range--between ½ to 1% by volume or as local applicable codes dictate. Gas odor is the most common and effective indication of a leak. A report of gas odor should be investigated immediately, and the leak found and repaired. However, the odor of gas may be filtered out as the odorized gas passes through certain types of soil. It may be modified by passing through soil and into a sewage system containing vapors or fumes from other combustibles as well as the sewage odor itself. Therefore, odor is not always totally dependable as an indicator of the presence or absence of gas leaks.

2. Vegetation. Vegetation in an area of gas leakage may improve or deteriorate, depending on the soil, the type of vegetation, the environment, the climate, and the volume and duration of the leak. Vegetation surveys of changes in vegetation may indicate slow sub-soil leaks. Vegetation surveys should be supplemented with instrumentation.

3. Insects, (flies, roaches, spiders). Insects migrate to points or areas of leakage due to microbial breakdown of some components of gas. Some insects seem to like the smell of the gas odorant. Be aware of heavy insect activity, particularly near the riser, the gas meter, and regulator.

4. Fungus-Like Growth. Such growth in valve boxes, manholes, etc., indicates gas leakage. The color of the growth is generally white or grayish-white and looks like a coating of frost.

5. Sound. Listen for leaks. A hissing sound at a bad connection, a fractured pipe, or a corrosion pit hole is the usual indication of a gas leak.

6. Unaccounted for Gas. A possible leak is indicated when an off-peak reading of a master meter, with a known average seasonal utilization rate, shows an unaccountably high usage rate. Periodic off-peak checks (preferably the summer months from midnight to three or four o'clock in the morning) can be averaged to provide data for comparison in future checks. Gas leaks served by a master meter system can be detected by comparing the total consumption registered on the customer meters with that registered on the master meter. If the master meter reading is greater than that recorded by adding all the unit meter readings, then a leak probably exists in the distribution system. This condition may also indicate a gas theft problem or a malfunctioning meter problem.

7. Soap Bubbles. A soap solution can pinpoint the location of a leak on an exposed pipe, on the riser, or the meter. The solution is sprayed onto the area in question and the location of bubbling indicates leakage.

8. Leak Detection Instruments. Gas leak indicators are sophisticated instruments that require regular care, maintenance, and calibration, and should be used only by trained personnel. OSU uses qualified outside vendors who are familiar with this equipment to perform annual leak surveys as noted in Appendix C of this document.

CHAPTER 2 - Reports and Plans Required by the Federal Government

The federal government requires every gas operator to report any incident and to follow and maintain records according to established Operating and Maintenance (O&M) and Emergency plans. This section provides an overview of these plans.

INCIDENT REPORT
See Emergency Plan

OPERATING & MAINTENANCE (O&M) PLAN for OSU
An O&M plan is required of all gas operators by the Pipeline and Hazardous Materials Safety Administration (PHMSA) 49 CFR 192.603. The O&M plan contains the steps that must be followed to accomplish the required operational and maintenance procedures.

DISTRIBUTION INTEGRITY MANAGEMENT PLAN
On December 4, 2009, PHMSA published the final DIMP rule. The rule required each operator of a natural gas utility, master meter system or propane pipeline system to prepare and follow a written DIMP plan by no later than August 2, 2011. This rule required each operator to demonstrate:

- Knowledge of system infrastructure
- Identify threats.
- Evaluate and prioritize risk.
- Identify and implement measures to mitigate risks.
- Measure performance, monitor results, and evaluate effectiveness.
- Periodic Evaluation and Improvement
- Report results

Five years of data was entered into a database utilizing the SHRIMP tool, developed by the APGA Security and Integrity Foundation. Based on OSU's historical data, we identified no threats or risks to prioritize. This was an indication that the steps we defined in our O&M Manual were adequate and sufficient to maintain the integrity of and mitigate the potential for accidents in our jurisdictional gas system. OSU's intent is to continue to operate according to this manual and continue to evaluate any potential threats as additional information is compiled on a regular basis. Consistent with the exclusions in 49 CFR §191.9 (incident reports) and §191.11 (annual reports), operators of master meter and small LPG distribution systems need not report performance measures. Master meter systems in OK are no longer required to utilize the DIMP tool, as per OCC effective Summer 2021.

CHAPTER 3 – Materials Qualified for Use in Gas Systems

The federal regulations contained in 49 CFR Part 192 list many varied materials qualified for gas service. The materials and specifications listed in this manual are those that are most commonly used in gas distribution systems installed in the early 1980's. Not all qualified materials or specifications listed in Part 192 are included in this chapter.

When purchasing material used in a gas system, it is extremely important to check the *marking* of the material. The marking on the material will help identify whether the material is qualified for gas service. An operator must select materials that are compatible with each other. This chapter covers the most common specifications and standards used by manufacturers for pipes, valves, flanges, regulators, and other equipment commonly used in gas distribution systems.

PIPE

Only steel and plastic pipe specifications are included in this chapter. (For other qualified pipe specs see Appendix A of 49 CFR - Part 192.)

STEEL PIPE

API 5L - Steel Pipe
ASTM A53 - Steel Pipe
ASTM A381 - Steel Pipe
ASTM Specification A671 - Steel Pipe
ASTM D2513 - Thermoplastic Pipe and Tubing

Guide for selecting the proper nominal wall thickness for steel pipes used in a gas distribution system. Measurement is in INCHES.

Nominal Pipe Size	Outside Diameter	Standard (Schedule 40) Wall Thickness	Minimum Wall Thickness after Threading
1/8	0.405	0.068	0.065
1/4	0.540	0.088	0.065
3/8	0.675	0.091	0.065
1/2	0.084	0.109	0.065
3/4	1.050	0.113	0.065
1	1.315	0.133	0.065
1 ¼	1.660	0.140	0.065
1 ½	1.900	0.145	0.065
2	2.375	0.154	0.075
3	3.500	0.216	0.098
3 ½	4.000	0.226	0.108
4	4.500	0.237	0.116
5	5.563	0.258	0.125
6	6.625	0.280	0.156
8	8.625	0.322	0.172
10	10.750	0.365	0.188
12	12.750	0.406	0.203

All new steel pipes manufactured under the above specifications with the above wall thickness have design pressure up to at least 152 psig. Operators are cautioned that the actual MAOP of a new or replacement pipe in a gas system is dependent upon the pressure test performed on the pipeline system before it is put in service. It is recommended that threaded pipes not be installed underground.

POLYETHYLENE (PE) PLASTIC PIPE

When purchasing polyethylene (PE) plastic pipe, it is required that the pipe be marked ASTM D2513. Plastic pipe with this marking is suitable for gas service. Fiberglass epoxy plastic pipe marked ASTM D2517 is also qualified for gas service.

At no time should the loading of the pipe cause the pipe section to lose its round shape. Plastic pipes and tubing should be stored and protected from damage by crushing, piercing, or extended exposure to direct sunlight.

As a rule of thumb, never store plastic pipe outdoors for more than 6-months. It should be placed inside or covered to protect it from exposure to direct sunlight. It is a good idea to obtain the manufacturer's recommendation as to how long the pipe can be exposed to sunlight before it loses some of its physical strength. In recent years, the vast majority of natural gas companies have been installing ASTM D2513 PE pipe. Benefits of PE pipe are flexibility, good joining characteristics, durability, ease of installation, and cost. The PE designations most often used are PE 2306, PE 3306, PE 3406, and PE 3408.

Most PE pipe manufacturers subscribe to the *Standard Dimension Ratio* (SDR) method of rating pressure piping. The SDR is the ratio of pipe diameter to wall thickness. An SDR 11 means the outside diameter (OD) of the pipe is eleven times the thickness of the wall.

For high SDR ratios the pipe wall is thin in comparison to the pipe OD. Given two pipes of the same OD, the pipe with the thicker wall will be stronger than the one with the thinner wall. High SDRs have low pressure ratings; low SDRs have high pressure ratings because of the relative wall thickness.

This table below is intended to be a guideline. Personnel should check the manufacturer's specific pressure rating for each specific pipe.

PRESSURE RATING for PE PIPE (2406 and 3406) LISTED by ASTM D2513
STANDARD DIMENSION RATIO (SDR)

HYDROSTATIC DESIGN BASIS (HDB)										D2513
PSI	**6.0**	**7.3**	**9.0**	**11**	**13.5**	**17**	**21**	**26**	**32.5**	**Letter Code**
1600	200	160	125	100	80	64	50	40	32	G
1250	160	125	100	80	64	50	40	32	25	F
1000	125	100	80	64	50	40	32	25	20	E
800	100	80	64	50	40	32	25	20	16	D
630	80	64	50	40	32	25	20	16	12.5	C
500	64	50	40	32	25	20	16	12.5	10	B
400	50	40	32	25	20	16	12.5	10	8	A

Plastic pipe is purchased according to the *iron pipe size* (IPS) or the *copper tubing size* (CTS).

Be aware that the actual MAOP of new extension or replacement pipe in a gas system is dependent upon design pressure of the pipe and components in the system, and the pressure test performed by the operator or their contractor on the piping system.

Before placing in service, OSU must test each disconnected service line in the same manner as a new service line (49 CFR 192.725). The pressure testing requirements for plastic and metallic service lines are listed under "Plastic Pipe Installation - Rule 9" and "Metallic Pipe Installation" found in Chapter 16.

PE pipe may be joined by either the heat fusion method (butt, socket, or electrofusion) or by a mechanical coupling. Personnel performing the joining procedure must be properly qualified for heat fusion, for each pipe material, or combination of materials being joined.

PE pipe that is not encased must have a minimum wall thickness of 0.090 inches. However, pipe with an OD of 0.875 (¾" nominal size) or less may have a minimum wall thickness of 0.062. Acrylonitrile-butadiene-styrene (ABS), Cellulose acetate butyrate (CAB), Polybutylene (PB), and Poly vinyl chloride (PVC) are also types of plastic pipe qualified for natural - NOT LP - gas service if the pipe has the ASTM D2513 marking on it. However, most natural gas companies no longer install these types of plastic pipes in their gas systems because they believe that PE pipe has superior characteristics.

VALVES

Each valve must meet the minimum requirements or the equivalent API 6D. A valve may not be used under operating conditions that exceed the applicable pressure-temperature rating contained in the standard. The valve will be stamped with either the class (ANSI) or the maximum working pressure rating (PSIG). Never operate valves at pressures that exceed their rating.

The class of ANSI ratings on steel valves are ratings which specify the maximum working pressure for flanged-end and weld-end gate, plug, ball, and check valves.

Class Rating (ANSI) Maximum Working Pressure Rating (PSIG)

ANSI	150	300	400	600	900	1500	2500
PSIG	275	720	960	1440	2160	3600	6000

The maximum working pressure ratings are applicable at temperatures from -20°F > 100°F.

Metal valves will often be stamped with the symbols WOG. This means that they are suitable for service for water, oil, or gas. Sometimes just the letter G (for gas) appears.

The manufacturer's name or trademark will also be included on a valve. OSU installation personnel should maintain manufacturers' manuals that include installation, operation, and maintenance procedures for each different type of valve in the gas system. These manuals and procedures are to be always maintained and accessible to system maintenance personnel.

There are plastic valves that are suitable for gas service. Plastic valves purchased for gas service should comply with industry standard ANSI B16.40. *Manually Operated Thermoplastic Valves in Gas Distribution Systems*. The valves must be compatible with the plastic pipe used in gas systems. When buying plastic valves, record specifications and information on suppliers who are knowledgeable in the gas piping field.

FLANGES and FLANGE ACCESSORIES

Each flange or flange accessory (other than cast iron) must meet the minimum requirements of ANSI B16.5, MSS SP-44, or the equivalent. For cast iron, refer to 49 CFR 192.147 (c). For plastic fittings made of PVC or ABS plastic, refer to 49 CFR 192.91.

Installation personnel should verify that metal flanges purchased for the OSU system meet the above requirements. This can be done by checking the markings on the flange. The markings are similar to those on the valves.

REGULATORS and OVER PRESSURE PROTECTION EQUIPMENT

There are many different manufacturer models of gas regulators and over pressure equipment (relief valves) available for gas systems. Regulators and over-pressure protection equipment must be properly sized so that over pressure or low-pressure conditions do not occur on the gas system. Manufacturers of gas regulators and relief valves have manuals which contain formulas and charts for each of their specific models or types of equipment. These formulas and charts are necessary to size regulators and relief valves properly.

Obtain manufacturer operation and maintenance instructions for each individual type of regulator and relief valve in the OSU system. Normally, the manufacturer publishes a manual containing these instructions. These manuals are to always be accessible to system maintenance personnel.

CHAPTER 4 – Personnel Instructions

The following instructions cover operating and maintenance procedures which must be followed during normal operations and while making repairs (49 CFR 192.605(c)).

Normal Operations

1. Personnel shall observe caution when utilizing power equipment in and around aboveground gas distribution devices such as meters and regulators.

2. Welding and heat sources shall not be used adjacent to above ground gas distribution devices unless approved by the OSU EHS Director, and appropriate permitting is obtained.

3. Prior to working around natural gas devices, personnel shall make certain that there is adequate ventilation, and no leaks. Operator Qualified (OQ) OSU personnel shall check for gas and O_2 content of work site air and confirm safety of atmosphere. Installation personnel shall check for leaks. For added safety, fire extinguisher(s) shall be readily available during all work on gas lines.

4. Lock-out/tag-out procedures shall be used on all gas fired equipment and/or isolation valves when maintenance work being performed could result in an unintentional release of gas.

5. Any personnel who smell gas or observes problems with any gas distribution device or equipment shall report it immediately to their supervisor.

6. After hours problems shall be reported according to the NG OUTAGE COMMUNICATION TREE.

7. Any planned work in and around gas pipelines or devices where OSU owned ground needs to be opened requires an OSU Excavation Permit and confirmation that all relevant OSU and outside agencies have marked all known underground lines in the area. In addition, if work being performed is within 5-ft of a NG line, at least one approved OSU personnel must be available to witness work being performed. Locate requests begin by calling Oklahoma One-Call (OKIE) at 811. OKIE notifications are received by Energy Services personnel who then inform FM Work Control to process an Excavation Permit.

While making repairs

1. Any repair work on the gas distribution system that could result in the unintentional release of gas will require lock-out and tag-out of the line at the meter or nearest upstream valve.

2. All OSHA Safety Requirements shall be met when opening the ground to work on pipelines.

3. Only material qualified for use in gas systems may be used for repair purposes. Materials must meet requirements noted in Chapter 3 of this manual.

4. When a line is opened there must be no sources of ignition operating in the area. OQ OSU personnel shall monitor atmospheric conditions.

5. If any unsafe conditions develop, personnel shall vacate the area immediately and contact the appropriate supervisor or emergency response personnel as dictated by the situation.

6. Work areas shall be responsibly safeguarded in order to keep students, staff, faculty, and all others at a safe distance from the work being performed.

7. All repairs are pressure tested to ascertain if they will hold up under operating pressures.

8. No person shall work on any part of the gas pipeline system unless such person is deemed qualified by OSU ES Utilities Distribution training records.

CHAPTER 5 – Line Marking Process

LINE MARKERS

1. All PE gas pipes installed underground shall be buried with a metal tracer wire to facilitate location when necessary.
2. Wire shall be No. 12 AWG copper clad steel wire or Copperhead brand or approved equal rated for direct burial application.
3. The insulation shall be yellow.
4. Wire shall be directly above and within 2" to 3" of the line but shall not contact the line at any point.
5. All gas pipes, regardless of material, are to be buried with a yellow marker tape approximately 12" above the line.

CHAPTER 6 – Patrolling and Continuing Surveillance

OSU patrols mains located in places or on structures where anticipated physical movement or external loading (weight, traffic) could cause failure or leakage (49 CFR 192.721). These places or structures include areas susceptible to earth subsidence (cave ins), or areas of construction activity. Patrolling can be done by walking along the pipeline and observing factors affecting safe operation. Patrolling of these mains is done annually and recorded on the Surveillance/Patrolling Form.

Patrolling also includes the annual inspection of regulators. Inspection assures proper operation of regulators, checks installation, and assures that vent screens are in place with no obstructions. Inspections are documented on the Surveillance/Patrolling Form.

Continuing surveillance is an ongoing process, and all personnel are instructed to constantly be vigilant for abnormal situations. If a threat is identified, OSU personnel must take appropriate action and ensure that necessary documentation is completed.

CHAPTER 7 – Gas Leak Surveys

A leakage survey of OSU's NG distribution system must be made as frequently as necessary, at intervals not exceeding 15-months, and at least once each calendar year (49 CFR 192.723). The survey shall be conducted on all exterior natural gas piping under OSU's authority.

Any leak that is found should be classified as soon as it is located. When a leak is discovered, it must be investigated to determine if a hazard exists. If a leak is deemed hazardous it must be repaired immediately, and OSU must protect life and property until conditions related to the leak are no longer hazardous. All leak repairs – whether hazardous or not, are documented through the FM work order system.

NG system surveys are conducted annually during the growing season and may be conducted by meter readers or other maintenance personnel. All leaks discovered must be recorded. Document survey results on the appropriate form, whether or not leaks are found.

Specifications for the OSU STW NG Survey.

1. SURVEY SCHEDULE

The annual gas leak survey is performed by a qualified NG piping system leak testing business and coordinated by ES Utilities Engineering. The survey is scheduled to begin mid-June each year with a six-week allowed performance time ending July 31.

2. PROJECT DELIVERABLES

1. Daily Report - A summary of the day's survey result shall be provided to the accompanying OSU ES staff at the end of each day.

2. Annual Report – Due at completion of annual survey delivered to the ES Utilities Engineering Manager – *Includes results & findings from leak survey and odorant test.*
    a. Field Report
        i. A copy of the completed field report.
    b. Final Bound Report
        i. A bound final report for the NG system campus manager for their records.
    c. A final report in electronic format (on a thumb drive)

CHAPTER 8 – Shutdown and Abandonment of Facilities

SHUTDOWN

When it is necessary to shut down any area in the OSU natural gas system, personnel should go to the first available zone valve. If the area is looped, all lines serving the loop must be valved off. Steps are to be taken to minimize the number of affected buildings. Follow established tag-out procedures.

Once the need for the shutdown is past, reopen valves. When the system is back on-line, blow off any air that has accumulated in the pipeline and perform a sniff test.

ABANDONMENT

When an OSU gas main or service line is abandoned, it must be physically disconnected from the piping system and the open ends effectively sealed. In addition, personnel must determine the necessity of purging the line. All pipe 4" and larger shall be purged as follows.

a) When a pipeline or main full of air is placed in service, the air in it can be safely displaced with gas provided that a moderately rapid and continuous flow of gas is introduced at one end of the line and the

air is vented out the other end. The gas flow should be continued without interruption until the vented gas is free from the air. The vent should then be closed.

b) In cases where gas in a pipeline or main is to be displaced with air and the rate at which air can be supplied to the line is too slow to feasibly perform a procedure similar to, but the reverse of (a), then a slug of inert gas should be introduced to prevent the formation of an explosive mixture at the interface between gas and air. Nitrogen or carbon dioxide can be used for this purpose.

c) If a pipeline or main containing gas is to be removed, the operation may be carried out in accordance with (b), or the line may first be disconnected from all sources of gas and then thoroughly purged with air, water or with inert gas before any further cutting or welding is done.

In cases where the main and all the service lines connected to it are abandoned, the service line(s) must be capped at the customer's end. The abandoned main must be sealed at both ends.

Records must be kept on all abandoned facilities. This includes location, date, and method of discontinuing service (abandoning the facility). All information on any abandoned lines is reported as soon as possible to FM Energy Services, Utilities Distribution, and incorporated into the ES record of abandoned gas lines available in GIS.

When service to an OSU facility is temporarily or permanently discontinued, one of the following must be done:

a) The valve must be closed to prevent the flow of gas to the customer, and the valve must be secured with a lock or some other device to prevent opening of the valve by unauthorized people.

b) A mechanical device or fitting that will prevent the flow of gas must be installed in the service line or in the meter assembly.

c) The customer's piping must be physically disconnected from the gas supply and the open ends sealed (49 CFR 192.727).

For pipeline shutdowns, go to the first available workable zone valve to shut down the problem area. Isolate so as to minimize the number of buildings affected, making sure the entire loop (if applicable) is isolated. Use tag-outs on all valves used. After the shutdown work is completed, open all valves in the reverse order in which they were closed. Blow off any air that has accumulated in the line and do an odorant sniff test.

CHAPTER 9 – Preventing Accidental Ignition of Gas

Gas alone is not explosive but when it is mixed with air, it can ignite or explode with tremendous force. OSU personnel should take every precaution to prevent unintentional ignition of gas.

When venting gas into air, a fire extinguisher must be available (49 CFR 192.751), and all heat or ignition sources kept far away from the source of the venting.

CHAPTER 10 – Key Valves Maintenance

The key valves must be checked and serviced at intervals not exceeding 15-months, but at least once each calendar year. Records of this inspection must be maintained (49 CFR 192.747). Key valves are indicated on the Campus Jurisdictional Gas Map available in GIS.

Inspect and Service Valve

NOTE: Each distribution line valve that might be required during an emergency must be inspected and partially operated at intervals NOT exceeding 15-months, but at least once each calendar year. During valve inspection, any abnormal condition of valve or pipeline or existence of leakage must be documented and reported.

ABOVE GROUND INSPECTION:
Visually INSPECT for external damage.

1. VERIFY nameplate is visible and legible.
2. INSPECT for leaks:
    a. Flange
    b. Bonnet joints
    c. Packing gland
3. INSPECT for:
    a. General condition
    b. Lubrication
    c. Freedom of movement
4. INSPECT for abnormal operating condition of valve or pipeline:
    d. Unintended pipe movement
    e. Corrosion
    f. Material defect
    g. Physical damage
5. IF ANY abnormal conditions are observed, NOTIFY the Supervisor

IF a leak is found, THEN:

1. IF practical, ATTEMPT to isolate or stop the leak and notify Supervisor.
2. IF a serious leak is detected and presents a hazard to persons, follow NG Emergency Operations Plan procedures.

RECORD all results in AiM as directed.

SERVICING:

1. PERFORM servicing per manufacturer's specification.
    a. For gate and ball valves:
        i. IF possible, WHILE valve is in CLOSED position, BLOW DOWN valve body.
2. INSPECT for block and bleed capabilities.
    a. IF body is capable of being blown down, but does not depressurize, THEN.
        i. Indication is leakage by seats caused by valve not being fully closed.
        ii. Indication is probable damage to seats or seating surfaces.

NOTIFY Supervisor and/or other appropriate personnel.

NOTE: Most ball and gate valves do not require lubrication except when needed to help seal damaged seats, gates, or balls.

LUBRICATION: CHECK manufacturer's specifications for lubrication.

1. LUBRICATE plug valve bodies with appropriate lubricant.
    a. Hand wheel grease fittings
    b. Stem
    c. Packing gland studs
    d. Nuts
2. INSPECT packing glands on valve stems for leakage AND,
3. ADJUST or ADD packing, if required, to stop leaking.

NOTE: Operate valves fully, when possible, otherwise, partial operation is acceptable. When operating the valve, take care to prevent disrupting service or over pressurizing the system

EVALUATE consequences of operating valve AND TAKE necessary precautions to minimize impact.

1. IF bypass piping and valves are present
    a. Unlock and open bypass before operating the main line valve.
2. STROKE main line valve full travel, if possible, AND ensure valve operates freely with NO binding.
3. RETURN main line valve to previous position AND shut and lock bypass valve.
    a. If bypass piping and valves are <u>not present,</u> FOLLOW guidelines in NOTE box above.

INSPECTION: Underground poly valves:

1. Check area for AOC and note on inspection form.
2. Check valve lid for paint and ensure lid is marked GAS.
3. Remove lid from box and check riser for the presence of tracer wire. Remove any trash or dirt in the riser.
4. Place wrench on valve and turn 1/8 of a turn in the shut direction.
5. Re-open valve. Perform sniff test at riser opening to detect possible leakage.
6. Replace valve box lid and re-paint if needed.

<u>RECORD</u> Inspection results in AiM as directed.

CHAPTER 11 – Measuring and Odorization of Gas

OSU must verify that a person with a normal sense of smell can detect gas in air at one-fifth the lower explosive limit, which is approximately 1% gas-in-air.

OSU complies with this requirement by including odorometer testing as part of its annual comprehensive leak survey.

Note: Periodic *sniff tests* can be a guide in determining odorization levels even though they do not replace the need to maintain odorant usage records or perform odorometer tests. OSU maintenance personnel shall smell the gas at an open valve or gas oven burner during meter change-outs or other maintenance work. Records of sniff tests shall be maintained and, when possible, should be run at the ends of the system.

CHAPTER 12 – Corrosion Control

The OSU natural gas distribution system does not have cathodic protection. Records are insufficient to determine whether the remaining metallic pipe in the system was installed before or after August 1, 1971. OSU does not believe that initiating a corrosion control program at this time would be of benefit to the University. This view is based on the following:

- Since 1985, OSU has pursued an aggressive annual natural gas system leak survey program and plans to continue this annual survey, not only to conform with federal and state mandates, but also be initiative-taking in its pursuit of safety in the gas system.

- The decision was made in the late 1980's to embark on a program for the replacement of underground metallic natural gas distribution lines with polyethylene material. Most known underground lines on OSU's Stillwater campus operating at the MAOP have been replaced in this program. It is the view of OSU that replacement of metallic lines with plastic is the best way of combating the corrosion problem that afflicts metallic lines. As underground metallic lines operating at the MAOP are discovered they shall be scheduled for replacement with polyethylene.

Above ground piping and below ground piping must be electrically separated using anodeless risers. Above ground piping is protected by use of coatings (painting) of the pipe. This places a barrier between the pipe and the outside elements. This protection must be suitable to prevent corrosion caused by moisture, i.e., rain, fog, sprinklers, coolers, or any other source of moisture. All metallic above ground facilities must be evaluated for atmospheric corrosion at least once every three years and results documented in AiM as directed.

CHAPTER 13 – Leak Repairs and Construction

Repair, construction, and safety are based upon good common sense and sound engineering concepts. This chapter is designed to increase the safety of OSU's gas system by helping meet the construction and repair standards set by the pipeline safety code.

The manufacturers of pipes, valves, fittings, and other gas system components must design and test them to prescribed industry specifications. The specifications are incorporated into 49 CFR Part 192. Those meeting the requirements are qualified for gas service and marked with the *approved markings*. In addition, manufacturers usually develop procedures for joining their products and joining other materials to their products.
This chapter outlines construction, pipe handling, and pressure testing requirements that should be followed when installing a gas system. Plastic pipe fusion instructions and steel pipe welding and qualification procedures are

included in Chapter 16. These instructions and procedures explain the steps necessary to qualify a person to make pipe joints/welds for either plastic or steel pipe. They give directions for finding qualified people to do the construction and repair work on the system. If a gas contractor is used to work on the system, it is OSU's responsibility to see that the contractor follows all requirements. However, it shall be OSU's policy that OSU trades and utilities personnel will, whenever possible, join all jurisdictional piping on projects involving outside contractors. In the event OSU cannot perform this service, the contractor will be required to follow all procedures and present all necessary documentation as mandated by 49 CFR Part 192 and outlined in OSU's Engineering Guidelines/NG Construction Standard.

PLANNING AHEAD

Before making modification or repair of a piping system, comprehensive plans should be made. It is essential that OSU installation personnel know the type of material and all the parts that make up the present gas piping system. The piping system consists of pipe, valves, fittings, regulators, relief devices, and meters. By knowing the type of material in the system, the proper fittings can be selected.

EXCAVATION

Before digging for gas line installation, repair, or replacement, the pipe network and other underground utility lines must be located on the property. Call OKIE to notify others who may have underground lines in the excavation area. Lines may be located by one or all of the following ways:

- Locate all underground utility lines on *as-built* or *corrected-for-construction* drawings. Maps or drawings of the location of the underground gas lines are particularly important. They can provide information to other utilities that must dig to repair or replace their utility lines. Any changes made in the system must be reported to FM Utilities Distribution so the drawings can be updated.
- Locate underground metallic utility lines with pipe locating instruments. Plastic pipe which was installed with an electrically conductive wire can also be located by this method. Pipe locating instruments are to be used in accordance with manufacturer's operating procedure; OSU personnel primarily use the Radio detection RD 8100 (procedure for this unit located in Chapter 17 of this manual).
- Locate or verify locations of other underground utility lines serving the area. The line marking process is described in Chapter 5.

Be aware that service lines and mains built prior to the enactment of minimum depth requirements may be very shallow. Therefore, digging to expose gas lines for repair or replacement purposes should be carried out with hand tools (preferably made of brass or other non-sparking material) until the gas lines are located. Afterwards, power tools may be used.

When working on a leaking pipe, a stand-by worker should be ready to assist their partner in escaping from the hole in the event of an emergency. A fire extinguisher must be available during all such repairs.

PIPE INSTALLATION, REPAIR, AND REPLACEMENT: GENERAL COMMENTS

Gas service lines and mains are to be installed with a minimum of 24" of earth cover. Purging of new lines shall be accomplished in accordance with Abandonment of Facilities in Chapter 8.

Underground structures may prevent the installation of gas services or mains at minimum depths. The pipeline safety regulations allow a shallower depth of cover if adequate protection is provided (i.e., sufficient to withstand the anticipated external loads - e.g., heavier pipe, casing, concrete, etc.). In such cases, it is recommended that the gas line's location be marked above ground. The area should be inspected frequently to ensure that the ground cover is intact and has not eroded (49 CFR 192.327 & 192.361).

OSU must document all leak repair data. Repairs should be done through the FM AiM work order system. Records must include leak reports received from customers.

METALLIC PIPE INSTALLATION

All the conditions listed below must be met when metallic pipe is installed. Although OSU intends to install PE pipe exclusively in the future, this material is included for reference purposes.

1. Make each joint in accordance with written procedures that have been proven by test or experience to produce strong gas tight joints.
2. Obtain and follow the manufacturer's recommendations for each specific fitting used.
3. Handle pipe properly without damaging the outside coating. Any gouges or scratches should be covered with an appropriate coating. If coating damage is not corrected, accelerated corrosion can occur in that area.
4. Coat or wrap steel pipe at all welded and mechanical joints before backfilling.
5. Pressure test new pipe for leaks before backfilling – as follows:

Mains operated at <1 psig	Test to at least 10 psig
Mains operated at 1 psig or > but < 10 psig	Test to at least 90 psig
Service lines operated at 1 psig but not more than 40 psig	Test at not less than 50 psig

6. Support the pipe along its length with proper backfill.
7. Make certain that backfill material does not contain stones, cinders, bottles, or cans that may damage or scratch pipe coating.
8. Cathodically protect steel pipes.
9. Electrically insulate dissimilar metals.
10. Make certain that compression type fittings that are intended to be electrically conductive have armored gaskets. Bond over insulating fittings to maintain electrical continuity for cathodic protection and for locating steel pipe.

If personnel must weld steel in the pipeline, they should review the pipeline safety requirements covered in Subpart E of 49 CFR Part 192, provide qualified welders to perform the welding, and follow the qualified welding procedures contained in Chapter 16. With the current material available for gas service (repair fittings, clamps, sleeves, tees, etc.), there should be little need to do much welding on a small gas distribution system for operation and maintenance purposes. The important things to remember are that welding must be performed in accordance with established written welding procedures that have been qualified and tested to produce sound ductile welds, and welding must be performed by welders who are qualified for the welding procedure to be used. Both the procedures and the personnel must be qualified for the type of welding performed.

OSU has adopted the qualified welding procedures for metallic pipes which is based on Section IX of the ASME Boiler and Pressure Vessel Code. OSU will qualify its on-staff welders to weld on the OSU steel gas system per provisions of 49 CFR 192.227 (b), Appendix C - Qualification of Welders for Low Stress Level Pipe and using the specifications of the procedure as contained in Chapter 16 of this manual.

PLASTIC PIPE INSTALLATION

Plastic pipes are now commonly used for distribution mains and services by the gas industry. The most common type of plastic pipe presently installed is polyethylene (PE). PE plastic pipe is the only acceptable plastic for LP-Gas piping and is recommended as the most suitable plastic pipe for natural gas piping. PE plastic pipe is manufactured according to ASTM D2513 and is marked with that number.

Plastic pipes may be buried directly in the ground. It may also be used to replace a deteriorated buried metal pipe. In these cases, a slightly smaller plastic pipe is generally inserted into the existing metal pipe.

Each plastic pipe joint must be made in accordance with written procedures that have been proven by test or experience to produce strong gas tight joints. Plastic pipe joining procedures must be qualified according to the requirements contained in 49 CFR 192.283. The personnel who make the joints must meet the requirements contained in 49 CFR 192.285. OSU need not run the tests described in 49 CFR 192.283 themselves because most pipe and fitting manufacturers develop and qualify joining procedures for each specific product. Do not purchase the product if it cannot be certified that the manufacturer or supplier of the pipe or fitting has the joining procedures which meet the requirements of 49 CFR 192.283.

Manufacturers of both pipe and fittings have installation manuals, which describe the specific joining procedures required to make a strong, gas-tight joint. Manufacturers' procedures for each of the pipeline components that are used in the system must be easily accessible for OSU installation personnel.

49 CFR 192.273 requires that each joint be inspected before the gas line is put into service. Per 49 CFR 192.287, those who inspect these joints must be qualified to do so. OSU considers a person as qualified if they are also qualified to make such joints per 49 CFR 192.285. When a joint is inspected, documentation of the inspection is required and must be kept on file.

According to the safety standards (49 CFR 192.285), a person making joints must be qualified. 49 CFR 192.285 provides requirements for qualifying persons to make joints:

1. No person may make a plastic pipe joint unless that person has been qualified under the applicable joining procedure by:
    a. Appropriate training or experience in the use of the procedure; and
    b. Making a specimen joint from pipe sections joined according to the procedure that passes the inspection and test set forth in paragraph (b) of this section.
2. The specimen joint must be:
    a. Visually examined during and after assembly or joining and found to have the same appearance as a joint or photographs of a joint that is acceptable under the procedure; and,
    b. In the case of a heat fusion, solvent cement, or adhesive joint:
        i. Tested under any one of the test methods listed under 49 CFR 192.283(a) applicable to the type of joint and material being tested:
        ii. Examined by ultrasonic inspection and found not to contain flaws that would cause failure; or
        iii. Cut into at least 3-longitudinal straps, each of which is:
            1. Visually examined and found not to contain voids or discontinuities on the cut surfaces of the joint area; and
            2. Deformed by bending, torque, or impact, and if failure occurs, it must be initiated in the joint area.
3. A person must be re-qualified every twelve months by the method indicated in (b) (ii) and (iii) above. Test strips and re-qualification documentation must be maintained on file.

The general rules to follow when installing plastic pipe are listed below:

Rule 1: Install plastic pipe manufactured under the ASTM D2513 specification. The pipe must have ASTM D2513 marked on it.

Rule 2: Make each joint in accordance with written procedures that have been proven by test or experience to produce strong tight joints. The manufacturer of the pipe or fitting should supply the procedures for his specific product in the manufacturer's manual. When installing the pipe, make certain that these procedures are followed (49 CFR 192.283). All joints must be made by a person qualified under 49 CFR 192.285.

Rule 3: Install properly designed valves in a manner which will protect the plastic material. Protect the pipe from excessive torsion (twisting) or shearing (cutting) loads when the valve is operated. Protect from any secondary stresses which might be induced through the valve or its enclosure.

Rule 4: Prevent pullout and joint separation. Plastic pipe must be installed in such a manner that expansion and contraction of the pipe will not cause pullout or separation of the joint. Operators unfamiliar with plastic pipes should have a qualified person perform all these procedures.

Rule 5: When inserting plastic pipe in a metal pipe, make a sufficient allowance for thermal expansion and contraction. Make an allowance at lateral and end connections on inserted plastic pipes, particularly those over 50' in length. End connections must be designed to prevent pullout caused by thermal contraction. It is desirable that fittings used should be able to restrain a force equal to or greater than the strength of the pipe. If not, the pipe should be restrained by anchoring, bracing, offset connection, or straps across the fitting. To minimize the stresses caused by thermal contraction, pipes inserted in the summer should be allowed to cool to ground temperature before tie-ins are made. Inserted pipes, especially those pulled in, should be relaxed, mechanically compressed, or cooled to avoid initial tensile stress.

Rule 6: Repair or replace imperfections or damage before placing the pipe in service.

Rule 7: Install all plastic mains below ground level (buried). Where the pipe is installed in a vault or other below-grade enclosure, it must be completely encased in gas-tight metal pipe with fittings that are protected from corrosion. (For service line, see Rule 8.) The plastic pipe installation must minimize shear and other stresses. Thermoplastic (PE) pipes for direct burial must have a minimum wall thickness of 0.090 inch. (Exception: pipe with an outside diameter of 0.875" (7/8") or less may have a minimum wall thickness of 0.062".) A plastic main that is not encased must have an electrically conductive wire or other means of locating the pipe while it is underground.

Rule 8: Install all plastic service lines below ground. A portion of the plastic service line may terminate above ground if it is protected against deterioration and external damage by a casing. Plastic must not be used to support external loads. There are many different manufacturers of anodeless risers. The primary advantage of an anodeless riser is that it does not have to be cathodically protected because the outside steel casing is not the gas carrier. The plastic inside the steel casing is the gas carrier. If anodeless risers are purchased, make sure they meet all DOT requirements. If steel risers are installed connected to plastic pipe by a transition fitting, make sure the steel riser is coated and cathodically protected.

Rule 9: Test installed plastic pipe at least at a level 150% of the maximum operating pressure or 50 psig, whichever is greater. However, the test pressure may not be more than three times the design pressure of the pipe. When a pipe is received from the vendor, the joints or spools shall be subjected to the test pressures noted above. If the pipe passes the test, it shall be identified by markings as to

date and pressure of test, documented. As pipe is used, it is charged to a work order which indicates the location of use. All testing is to be documented.

Rule 10: Take special care to ensure that plastic pipe is continually supported along its entire length by properly tamped and compacted soil.

Rule 11: If plastic pipe is laid where there has been digging and backfilling below the pipe, reinforce the pipe. To prevent any shear or other stress concentrations, use external stiffeners at connections to main, valves, meter risers, and other places where compression fittings might be used.

Rule 12: In the laying of plastic pipe, ensure adequate slack (snaking) in the pipe to prevent pullout due to thermal contraction.

Rule 13: Lay plastic pipe and backfill with material that does not contain any large or sharp rocks, broken glass, or other objects which could cut or puncture the pipe. Where such conditions exist, suitable bedding (sand) and backfill must be provided.

Rule 14: Take special care to prevent coal tar type coatings or petroleum base tape from contacting the plastic pipe; it can cause plastic pipe to deteriorate.

Rule 15: Static electricity can ignite a flammable gas-air atmosphere. When working with plastic pipe of any kind where there is (or there may be) the possibility of a flammable gas-air atmosphere, take the following precautions:

- Use a grounded wet tape conductor wound around, or laid in contact with, the entire section of the exposed piping.
- If gas is already present, wet the pipe starting from the ground end with a very dilute water and detergent solution. Apply tape immediately and leave it in place.
- Wet the tape occasionally with water. Where temperatures are below freezing (0°C/32°F), add glycol to the water to maintain tape flexibility. Ground the tape with a metal pipe driven into the ground.
- Do not vent gas using an ungrounded plastic pipe or tubing. Even with grounded metal piping, venting gas with high scale or dust content could generate an electric charge in the gas itself and an arc could result from the dusty gas cloud back to the pipe and ignite the gas. Vent gas only at a downwind location remote from people or flammable material.
- Note: Dissipating the static charge buildup with wet rags, a bare copper wire, or other similar techniques may not be as effective as the above procedure. In all cases, use appropriate safety equipment such as flame resistant and static free clothing, breathing apparatus, etc.

REPAIR METHODS - PLASTIC AND METAL

Replacement of gas lines and repair of leaks are highly specialized and potentially hazardous operations, persons with adequate training and certification only should attempt them. Only maintenance personnel with such training, experience, and certification should attempt repair of gas leaks or replacements of gas lines.

Leaks in service lines or mains may be repaired by cutting out a short length of pipe containing the leak and replacing it with a new segment of pipe. The pipe segment is attached to the existing line with couplings at each end. Remember that written procedures are required to be followed for each joint made. The proper procedures can be obtained from the manufacturer of the coupling.

Small leaks in steel service lines or mains, such as those resulting from corrosion pitting, are to be repaired with a steel band clamp applied directly over the leak. All bare metal pipes and fittings that are installed below ground must be properly coated and cathodically protected before backfilling. If several leaks are found and extensive corrosion has taken place, the most effective solution may be to replace the entire length of pipe that has deteriorated. The normal installation practices must be followed when performing more extensive repairs. They include priming and wrapping of all bare metallic piping and fittings, proper grading of lines to the main, cathodic protection, etc.

Leaking metal pipe can often be replaced by inserting PE pipe manufactured according to ASTM D2513 in the old line and making the appropriate connections at both ends. Again, operators are cautioned that allowance for thermal expansion and contraction must be made at lateral and end connections. Some of the PE pipe manufacturer's manuals include details for the proper techniques to install their products by insertion.

The most prevalent cause of breaks or leaks in plastic pipes are third-party damage. This is usually caused by an excavator breaking or cutting the pipe while digging. Plastic pipes are more vulnerable to such breaks than steel pipe. The lower strength of plastic pipe, however, is not necessarily a disadvantage. For example, if digging equipment hooks and pulls a steel pipe it may not break; however, the steel pipe may be pulled loose from a connection at some distance from the digging. The resulting leaks could go undetected for a period of time and may result in a serious incident. Although there is no assurance that the plastic pipe will not pull out, it is more likely to break at the point of digging. Then the break can be easily detected and repaired.

After a leak has been repaired, a soap-bubble test must be conducted. Replaced main and services must be pressure tested for leaks.

Again, it should be emphasized that all sources of ignition should be kept away from the leak repair area. MATCHES SHOULD NEVER BE USED TO DETECT A GAS LEAK or to test the adequacy of a repair job.

PROPER LOCATION AND DESIGN OF CUSTOMER METER AND REGULATOR SETS

Before locating customer meters and regulators, these points must be considered:

1. accessibility,
2. protection of meter sets from damage, and
3. protection of people from release of gas at the meter set.

The next section gives the regulations covering location of meters and regulators. Guidelines are given for compliance with 49 CFR Part 192.

CUSTOMER METERS AND REGULATORS: LOCATION (49 CFR 192.353)

Install meters and service regulators in a readily accessible location. Protect the meters and regulators from corrosion and other damage. Install meters outside wherever possible.

If personnel install a service regulator in a building, put it as close as practical to the point of service entering the building. The regulator must be vented to the outside.

If a meter is installed in a building, it must be located in a ventilated place. It must be more than 3' from any source of ignition or any source of heat which might damage the meter.

It is best to locate the upstream regulator (in a series) outside the building. However, regulators may be located in a separate metering or regulating building.

CUSTOMER METERS AND REGULATORS: PROTECTION FROM DAMAGE (49 CFR 192.355)

Protection from vacuum or backpressure. If any customer's equipment might create either a vacuum or a backpressure, then a device must be installed to protect the gas system.

Service regulator vents & relief vents. The outside terminal of each service regulator vent & relief vent must be:

- rain and insect resistant
- located where gas from the vent can escape freely into the atmosphere. Vent it 3 feet or more away from any opening into the building; and
- protected from water damage in areas where flooding may occur. (Put it where it will not be under water in a flood.)

The meters and regulators must be installed in order to minimize stress upon connecting piping. Each regulator that is designed to release gas in its operation must be vented to the outside atmosphere at least 3' from an opening into a building. Each pit or vault in a road, driveway, or parking area that houses a customer's meter, or regulator must be able to support the vehicle traffic that could use that road, driveway, or parking area.

CUSTOMER METER INSTALLATIONS: OPERATING PRESSURE (49 CFR 192.359)

A meter may not be used at a pressure that is more than 67% of the manufacturer's shell test pressure (0.67 x shell test pressure).

Each newly installed meter manufactured after November 12, 1970, must have been tested to a minimum of 10 psig.

SERVICE LINES: LOCATION OF VALVES (49 CFR 192.365)

- Relation to regulator or meter. Each service-line valve must be installed upstream of the regulator. If there is no regulator, install the valve upstream of the meter.
- Outside valves. Each service line must have a shut-off valve in a readily accessible location that, if feasible, is outside of the building.
- Underground valves. Each underground service line valve must be located in a covered durable curb box or standpipe that allows ready operation of the valve. The box or standpipe must not put stress on the service line.

Services should not be installed under buildings or mobile homes. If a service is installed under a building, it must be encased in a gas-tight conduit. This conduit must vent to the outside to a point where gas would not be a hazard and extend above ground, terminating in a rain and insect resistant fitting.

COMMON PROBLEMS TO WATCH FOR AT SERVICE RISER AND HOUSE REGULATORS

- Regulator vandalism or damage. This can be very hazardous. If the regulator fails to function for any reason, high-pressure gas may enter appliances. Tall flames at the burner or escape of gas could cause a fire or explosion.

- Obstructed vents. The vent on the regulator should be free of any obstructions. A wire screen installed at the vent should prevent the accumulation of dirt, the intentional insertion of foreign objects by children, or the build-up of insect nests (e.g., wasp nests). If the screen is removed, a new one must be inserted in its place. A non-functioning vent could cause regulator failure and thus present a serious fire hazard within the residential unit. The vent should be pointed down and away from windows and air intake.

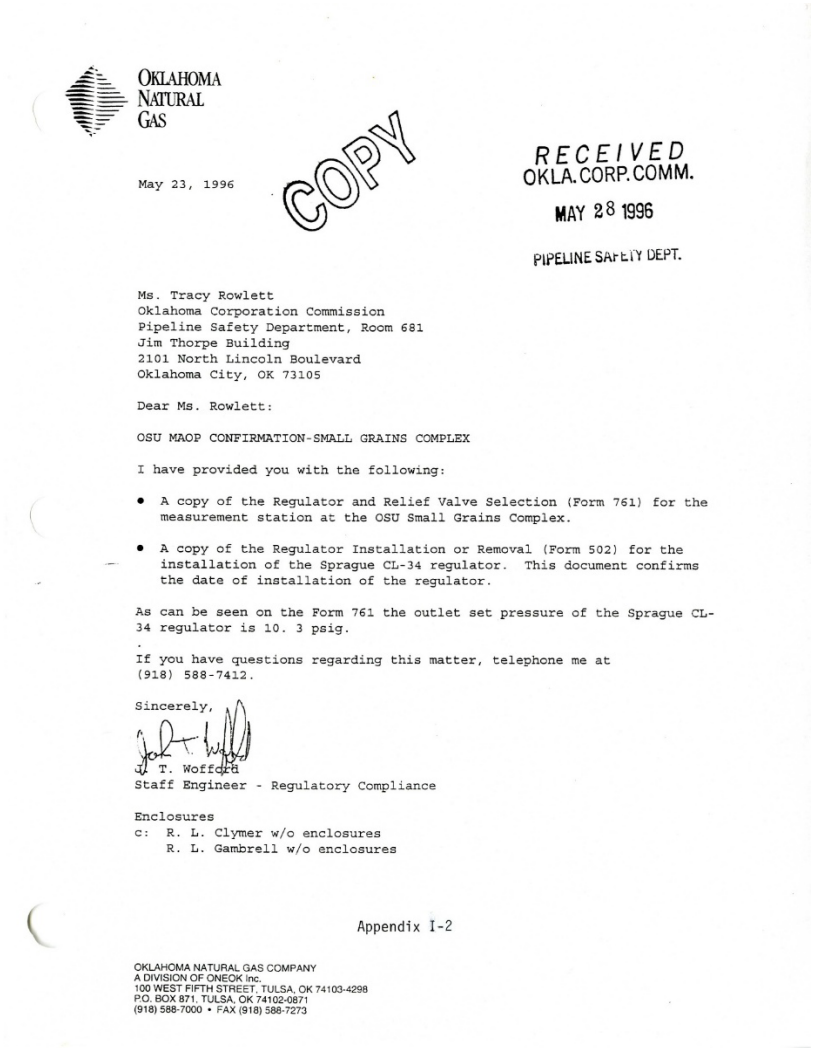
- Tenant move out. The valve on the meter riser should be equipped with a locking device to be controlled by authorized personnel only. When tenants move out, the gas is shut off and locked until new tenants move in. The locking device on the shutoff valve also allows the repair of appliances without fear of the gas being accidentally turned on.

- Riser misuse. The tenants or customers should not be allowed to use the riser and its components for other purposes. Never use as an anchor for laundry lines, plant supports, or bicycle racks.

- Corrosion. Check for corrosion on the service riser at ground level.

CHAPTER 14 – Maximum Allowable Operating Pressure (MAOP)

The following items from ONG serve to document the Maximum Allowable Operating Pressures (MAOPs) of the OSU system.



OKLAHOMA NATURAL GAS

May 23, 1996

COPY

RECEIVED
OKLA. CORP. COMM.
MAY 28 1996
PIPELINE SAFETY DEPT.

Ms. Tracy Rowlett
Oklahoma Corporation Commission
Pipeline Safety Department, Room 681
Jim Thorpe Building
2101 North Lincoln Boulevard
Oklahoma City, OK 73105

Dear Ms. Rowlett:

OSU MAOP CONFIRMATION-SMALL GRAINS COMPLEX

I have provided you with the following:

- A copy of the Regulator and Relief Valve Selection (Form 761) for the measurement station at the OSU Small Grains Complex.
- A copy of the Regulator Installation or Removal (Form 502) for the installation of the Sprague CL-34 regulator. This document confirms the date of installation of the regulator.

As can be seen on the Form 761 the outlet set pressure of the Sprague CL-34 regulator is 10. 3 psig.

If you have questions regarding this matter, telephone me at (918) 588-7412.

Sincerely,

J. T. Woffard
Staff Engineer - Regulatory Compliance

Enclosures
c: R. L. Clymer w/o enclosures
R. L. Gambrell w/o enclosures

Appendix I-2

OKLAHOMA NATURAL GAS COMPANY
A DIVISION OF ONEOK Inc.
100 WEST FIFTH STREET, TULSA, OK 74103-4298
P.O. BOX 871, TULSA, OK 74102-0871
(918) 588-7000 • FAX (918) 588-7273

COPY

THIS FORM TO BE ATTACHED TO EACH FORM 432 AND/OR JOB ORDER FOR REGULATOR INSTALLATION

REGULATOR AND RELIEF VALVE SELECTION
FORM 761 (REV. 10-77)

JOB ORDER NUMBER

ATION DESCRIPTION: O.S.U. Small Grains
West 6th, Near Devon Rd.

TOWN: Stillwater
ATLAS PAGE
SEC ___ T ___ R ___

EXISTING REG. ☒
PROPOSED REG. ☐

REGULATOR INFORMATION

THIS SETTING IS: ☐ LINE REG. ☐ BORDER STA. ☐ DIST. REG. ☒ SERVICE LINE

LOAD DESCRIPTION: Commercial
12.7 MCFH

REGULATION IS ☒ UPSTREAM ☐ DOWNSTREAM OF METER(S)

Two Stage Setting: ☐ First Cut ☒ 2ND Cut

Monitor Setting: ☐ Monitor Reg. ☐ Control Reg.

Parallel Runs: ☐ Primary Reg. ☐ Stand-by Reg.

Regulator Supplies Isolated System ☒

NORMAL OPERATING RANGE DATA

	Maximum	Minimum
Hourly Load	12.7 Mcfh	3 Mcfh
Inlet Pressure	30 psig	30 psig
Outlet Pressure (1)	10.3 ~~oz.~~ - psig	10.3 ~~oz.~~ - psig
Regulating Capacity	15.4 Mcfh	15.4 Mcfh

Pressure of connecting lines

	Design (2)	MAOP
Inlet	60 psig	60 psig
Outlet	10.4 ~~oz.~~ psig	10.4 ~~oz~~ psig

and Model No. Sprague C134-2 Body Size 2"

Ice Size 5/8" Spring Size Main Orange — Pilot Black ~~Cyan~~ K Factor 700

RELIEF VALVE INFORMATION

☒ Relieves above regulator only
☐ Relieves _____ regulators in this setting

Regulator Failure Capacity

$$\frac{(14.4 + \underset{(5)}{\_\_\_\_}) \times (\underset{(6)=Cg}{\_\_\_\_}) \times (1.29)_{(7)}}{2} = \underset{(8)=Qf}{\_\_\_\_} \text{ cfh}$$

OR

Capacity

$$\frac{(14.4 + \underset{(5)}{60}) \times (\underset{(6)=K}{700})}{2} = \underset{(8)=Qf}{26{,}040} \text{ cfh}$$

Less: Capacity of Internal Relief Valve, If any _____ cfh

Required Relief Valve Capacity _____ cfh

Maximum Relief Valve Inlet Pressure (3) 15 ~~oz.~~ psig

Relief Valve Set Pressure (4) 12 ~~oz.~~ psig

Make and Model: Fisher 289-H

Capacity 27,000 cfh Inlet and Outlet Size 1" X 1"

Type of loading: ☒ Spring ☐ Weight ☐ Lever & Weight ☐ Pilot

(2) or Failure Capacity Formula: Pi x Cg x 1.29 = Qf OR $\frac{KPI}{2} = Qf$
(3) ospheric Pressure & MAOP at Regulator Inlet in psi.
(6) gulator Valve Coefficient from Manufacturer's Data.
(7) ctor to correct spec. grav. of air(1.0) to 0.6 Nat. Gas
(8) al cfh to be relieved at 100% open Reg. Failure

DISTRICT
B. Hall
Prepared By

Appendix I-3
Approved

STANDARD DATA

(1) Set pressure to be 5.333 oz. (9.236"wc) for all LP Service Regulators.
(2) Design pressure to be maximun of a range below.
LP.-2 to 8 oz.
M.P. (A)-Less than 12 psig
(B)-12 to 60 psig
I.P.-60 to 125 psig
HP. (A)-125 to 500 psig
(B)-500 to 800 psig
(C)-Over 800 psig

(3) Maximum build-up on outlet system must NOT EXCEED, for:
LP.-14 oz. (24.20" wc)
M.P. (A)-MAOP + 50%
(B)-MAOP + 6.0 psig
I.P.-MAOP + 10%
HP.-MAOP + 10% up to 75% of SMYS

(4) LP. Relief must begin at 12 oz. (20.76" wc)

General Office Approvals

	Initial	Date
Oper. Supt.		
Meas.		
Tech. Serv.		

COPY

Form 502 Rev. 3-63

REGULATOR INSTALLATION OR REMOVAL

Date of { Installation / Removal } ____ 19__

Location W. Hwy 51 - Small Grains Complex Station No. ____

Controls From C.P.M.P. Controls To Small Grains Complex

Inlet Pressure 30-45# Outlet Pressure 10# Site Size ____

Housing—Kind & Size Open - ON College property

Inlet Gauge Make ____ Ind. ____ Rec. ____ Range ____

Outlet Gauge Make ____ Ind. ____ Rec. ____ Range ____

By Pass Size 1" and 2" Type of Cutoff Stops

Safety Valve Make Fisher 289-H Type Spring (10-20# Size 1"

Set to Pop at 15# Leaks At 12# Pops At 15# Reseats At 12#

Location of Safety Valve ON inlet between regulator & Meter

Other Attachments, Describe

By Pass Stops Not Connected

2" Balon Valve under P.V (Locked)

From Stock At ____ Placed in Stock At ____

REGULATOR { JOB / WORK } ORDER No. ____

Complete Description of Regulator

Make Sprague Cb.34-2 Type of Loading C.L. Pressure

Mfg Serial No. None Co. No. ____

Size Inlet 2" Size Outlet 2" Type Con. Sc. Flange Rating ____

Diameter Bolt Circle Inlet ____ No. Bolts ____ Size ____

Diameter Bolt Circle Outlet ____ No. Bolts ____ Size ____

Size Diaphragm Case Std Lever Length ____

Size Valves 5/8" Double ____ Single X Type Seat Soft

Rated Pressure Range 150# Inlet To 30-45# Outlet 10.4#

Safety Valve Make Fisher 289-H (5-14# Spring Rang

Type of Safety Valve Spring Size 1" Type & Size Dehydrator Pot ____

Other Descriptive Information

9-1-78 Removed Fisher 99 } ORange main Spring
Installed Sprague Cb. 34-2 } Black pilot spring. } 3-30-78
5/8" orifice. Set-10.4#

Appendix I-4

Installation / Removal } Made By ____

OKLAHOMA NATURAL GAS

COPY

May 8, 1996

RECEIVED
OKLA. CORP. COMM.
MAY 13 1996
PIPELINE SAFETY DEPT.

Ms. Tracy Rowlett
Oklahoma Corporation Commission
Pipeline Safety Department, Room 681
Jim Thorpe Building
2101 North Lincoln Boulevard
Oklahoma City, OK 73105

Dear Ms. Rowlett:

OSU MAOP CONFIRMATION

I have provided you with the following:

- A copy of the Regulator and Relief Valve Selection (Form 761) for the Measurement Station 65-708.
- A copy of the Completion Report (Form 702) for construction on the rebuild of Measurement Station 65-708. This document confirms date of installation on the existing Rockwell regulator.
- A copy of the Regulator and Relief Valve Selection (Form 761) for the Measurement Station 91-631.

The Form 761 is the Oklahoma Natural Gas Company document of record regarding regulators and relief valves at commercial and industrial meter settings and at district regulator settings. As can be seen on the attached documents, the Form 761 lists the regulator and relief valve specifications such as size, inlet pressure, capacity, and outlet set points. By Oklahoma Natural procedures, if any component at a meter and regulator station is altered, or if there is an increase of the regulator inlet or outlet pressure, then a new Form 761 must be completed to reflect the changes. After researching our files, we are confident that the attached Form 761s are the most recent and no significant revisions have since been made to the regulators and relief valves.

Appendix I-5

OKLAHOMA NATURAL GAS COMPANY
A DIVISION OF ONEOK Inc.
100 WEST FIFTH STREET, TULSA, OK 74103-4298
P.O. BOX 871, TULSA, OK 74102-0871
(918) 588-7000 • FAX (918) 588-7273

COPY

Ms. Tracy Rowlett
Page 2
May 8, 1996

The attached Form 761 for Station 91-631 accurately reflects the current delivery pressure of 35 psig. However, the Form 761 for Station 65-708, listing the regulator outlet pressure as 35 psig, is no longer correct. Approximately, ten years ago the delivery pressure through this meter setting was reduced to its current level of 32 psig.

Prior to serving customers with elevated pressure, Oklahoma Natural personnel review the customer's piping system to ensure that materials and construction methods meet the appropriate standards. These safety inspections, in addition to the inspections performed by local building inspectors, were performed on the OSU piping systems prior to the initiation of service. The systems met Oklahoma Natural standards for customer piping and were approved to receive 35 psig. A survey of records and Stillwater area personnel indicates no subsequent safety problems on the OSU system. For these reasons, we recommend that the current pressures on the two systems be considered as the MAOP.

If you have questions regarding this matter, telephone me at (918) 588-7412.

Sincerely,

John T. Wofford

J. T. Wofford
Staff Engineer - Regulatory Compliance

Enclosures
c: R. L. Clymer w/o enclosures
R. L. Gambrell w/o enclosures

Appendix I-6

COPY Station # 65-708 1979

THIS FORM TO BE ATTACHED TO EACH FORM 432 AND/OR JOB ORDER FOR REGULATOR INSTALLATION

REGULATOR AND RELIEF VALVE SELECTION
FORM 761 (REV. 10-77)

JOB ORDER NUMBER

ATION DESCRIPTION: McGeorge, West of Monroe
O.S.U. Campus (Vet Village)

TOWN: Stillwater
ATLAS PAGE
SEC ___ T ___ R ___

EXISTING REG. ☒
PROPOSED REG. ☐

REGULATOR INFORMATION

THIS SETTING IS: ☐ LINE REG. ☐ BORDER STA. ☐ DIST. REG. ☒ SERVICE LINE

LOAD DESCRIPTION: (South Regulator) Residential & Commercial 47.1 MCFH

REGULATION IS ☐ UPSTREAM ☒ DOWNSTREAM OF METER(S)

Two Stage Setting: ☐ First Cut ☐ 2ND Cut

Monitor Setting: ☐ Monitor Reg. ☐ Control Reg.

Parallel Runs: ☒ Primary Reg. ☐ Stand-by Reg.

Regulator Supplies Isolated System ☒

NORMAL OPERATING RANGE DATA

	Maximum	Minimum
Hourly Load	47.1 Mcfh	20 Mcfh
Inlet Pressure	60 psig	50 psig
Outlet Pressure (1)	35 ~~oz.~~ - psig	35 ~~oz.~~ - psig
Regulating Capacity	148 Mcfh	113 Mcfh

Pressure of connecting lines

	Design (2)	MAOP
Inlet	60 psig	60 psig
Outlet	60 ~~oz.~~ psig	60 ~~oz.~~ psig

and Model No. Rockwell 441-575 Body Size 2"
ce Size 1.5" Spring Size 30-55# (Brown) ~~C~~ K Factor 4270

RELIEF VALVE INFORMATION

☒ Relieves above regulator only
☐ Relieves ___ regulators in this setting

Regulator Failure Capacity: (14.4 + ___ (5)) (___ (6) = Cg) (1.29 (7)) = ___ cfh (8) = Qf

Capacity: (14.4 + 60 (5)) (4270 (6) = K) / 2 OR = 158,844 cfh (8)* = Qf

Less: Capacity of Internal Relief Valve, If any ___ ___ cfh

Required Relief Valve Capacity ___ 158,844 cfh

Maximum Relief Valve Inlet Pressure ___ (3) 40 ~~oz.~~ psig

Relief Valve Set Pressure ___ (4) 40 ~~oz.~~ psig

Make and Model (187,345 CFH) (19,380 CFH) American Axial Flow + 1"1½" Farris 1875-R

Capacity 206,725 TOTAL cfh Inlet and Outlet Size 2" x 2"

Type of loading: ☒ Spring ☐ Weight ☐ Lever & Weight ☒ Pilot

Regulator Failure Capacity Formula: Pi x Cg x 1.29 = Qf OR KPi / 2 = Qf
(Pi = Atmospheric Pressure & MAOP at Regulator Inlet in psi.
Cg = Regulator Valve Coefficient from Manufacturer's Data.
1.29 = Factor to correct spec. grav. of air(1.0) to 0.6 Nat. Gas
(8)* = Total cfh to be relieved at 100% open Reg. Failure

DISTRICT B. Wolle
Prepared By ___ Approved

STANDARD DATA

(1) Set pressure to be 5.333 oz. (9.236"wc) for all LP Service Regulators.
(2) Design pressure to be maximum of a range below.
LP.-2 to 8 oz.
M.P. (A)-Less than 12 psig
(B)-12 to 60 psig
I.P.-60 to 125 psig
HP. (A)-125 to 500 psig
(B)-500 to 800 psig
(C)-Over 800 psig

(3) Maximum build-up on outlet system must NOT EXCEED, for:
LP.-14 oz. (24.20" wc)
M.P. (A)-MAOP + 50%
(B)-MAOP + 6.0 psig
I.P.-MAOP + 10%
HP.-MAOP + 10% up to 75% of SMYS

(4) LP. Relief must begin at 12 oz. (20.76" wc)

General Office Approvals

	Initial	Date
Oper. Supt.		
Meas.		
Tech. Serv.		

Appendix I-7

FORM 702

INSTALL J.O. NUMBER	REQUISITION NUMBER	LINE OR PLANT	REMOVAL J.O. NUMBER
515-36-44(73)		Stillwater	615-36-00(73)

SETTINGS	SERVICE MATERIAL	LINE FITTINGS	SIZE	WEIGHT	TYPE & GRADE	LINE PIPE INSTALLED	MATERIAL SUMMARY	REMOVED	ABAN'D
	42'		4½"	5.84#	1		pipe, A-25 B&S C&W (.125)		
20'			3/8"	.1271#	1		tubing pressure		
	2	2	4"		1		ell, weld lt. wt. 90°		
		2	4"		ONG		bulge caps		
		1	17-D		1		anode galvopak		
1					1		meter and regulator setting per		
							dwg. #385.1155.		
9			2"		ONG		bulge caps (fence)		
63'			2-3/8	3.00#	1		pipe, structural (fence)		
84'			1"	1.68#	1		pipe, A-25 P.E. (fence)		
42'			1"	1.68#	1		tubing pressure (fence)		
62"			5'		1		chain link fence 11 guage		
							16-M meter and regulator setting	1	

COPY

DESCRIBE WORK COMPLETED (SHOW BEGINNING AND ENDING POINTS AND LAY OF LINE OR PROPERTY LINE MEASUREMENTS.)

Installed 42' of 4½" C&W M-P service pipe beginning at a point 586' West and 36' South of the ...er of Monroe and McGeorge, at existing valve #319, thence south to a point 57' South ...he center of McGeorge then west to a point 57' South and 599' West of the center of Monroe and McGeorge where we installed 1- GT16 meter and regulator setting per dwg. #385.1155. Removed the 16M meter and regulator setting from Walnut and McElroy.

A double order was made on 1-2" axial flow valve and the 2" regulators. These items will be transferred to another job when the numbers are made available.

SEC. 15 TWP. 19N RGE. 2E COUNTY Payne S.D. 16 TWP. OR CITY Stillwater

MONTH OF LAST ENTRY AND/OR LIST OF OUTSTANDING ENTRIES: August, 1973

CONTRACTOR: CONTRACT NO.

ONG INSPECTOR OR FOREMAN: G. Casebolt & B. W. Holle

TYPE OF SOIL	PIPE SIZE PLASTIC	PIPE SIZE STEEL	FEET MACH DITCHED	FEET HAND DITCHED	FEET PLOWED	FEET BORED	COATING USED (CODE)	CATHODIC PROTECTION APPLIED BY
Clay		4½"	42'				EGPY	G. Casebolt
DEPTH OF LINE 30"							REASONS FOR UNDER- OR OVERRUN	
SQ. YDS. PAVING CUTS								

RECEIVED AUG 6 1973 SERVICE CENTER AUDIT

TEST DATA

MEDIUM		PRESSURE	DURATION	LEAKS & FAILURES		
AIR	X	BEGIN 90 PSIG	9:30 A.M. 5-11-73 DATE	NO	TYPE	HOW REPAIRED
GAS						
WATER		END 90 PSIG	11:30 A.M. 5-11-73 DATE			
ER						

ER'S NAME: M. P. Robison & J. Kates

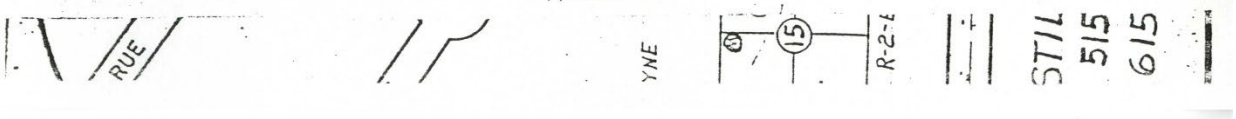
PRESSURE TEST BY: G. Casebolt

PREPARED BY: Robert Knox 8-2-73

APPROVED BY: DATE:

	INSTALL JOB	REMVL JOB
DATE STARTED	5-7-73	5-11-73
DATE COMPLETED	7-27-73	7-27-73
MAN HRS. WORKED	185	36

Appendix I-8



REGULATOR AND RELIEF VALVE SELECTION AND RIS SYSTEM DATA
FORM 761 (11-92)

COPY

FORM DISTRIBUTION:
ORIGINAL-DISTRICT
COPY-G. O. MEASUREMENT--FILE

THIS FORM TO BE ATTACHED TO EACH FORM 432 AND/OR JOB ORDER FOR REGULATOR INSTALLATION

TATION INFORMATION

ATION NO.	MTR. & REG. TECH. NO.	TOTAL NO. REG. IN SETTING	TOTAL NO. RV IN SETTING
9 1 1 - 6 3 1	0 7 0 7	0 4	0 0

JOB ORDER NO.: 2 1 5 3 7 2 5 1 1 1 2 0 0 0 0 1
INSTALL DATE: 0 2 0 7 9 1

LOCATION DESCRIPTION: 1300 Block N. Western

QTR.	SEC.	TWP.	RGE.	TRANS. LINE NO.
	1 0	1 9 N	0 2 E	

TYPE SET ▶ [X] NEW [ ] EXIST
TOTAL CONNECTED LOAD-MCFH: 1 5 5 . 1

TOTAL CONNECTED LOAD DESCRIPTION AND TYPE EQUIPMENT

1 - Boiler @ 25.1 mcfh Future Additional Boiler @ 30 mcfh

CITY LIMITS ▶ [X] INSIDE [ ] OUTSIDE
AD VALOREM REF NO.

TOWN	ATLAS	NODE	NODE
S T I L L W A T E R	2 1		

REGULATOR INFORMATION

REGULATOR IS [ ] UPSTREAM [X] DOWNSTREAM FROM METER(S).

REGULATOR POSITION: [ ] LINE [ ] DISTRICT [ ] CB [ ] SERVICE LINE

ACTUAL OPERATING RANGE DATA	MAXIMUM	MINIMUM
HOURLY LOAD ①	5 5 5 . 1 MCFH	5 MCFH
INLET PRESS.	7 5 PSIG	7 5 PSIG
ET PRESS.	3 5 psiig	3 5 psiig
REG. CAP	5 7 . 5 MCFH ②	5 7 . 5 MCFH

MINIMUM REGULATORY CAPACITY ② MUST EQUAL OR EXCEED MAXIMUM HOURLY LOAD ①

PRESSURES OF CONNECTING LINE	DESIGN	MAOP
INLET	2 7 5 PSIG	1 7 5 PSIG
OUTLET	6 0 ~~XX~~ PSIG	6 0 ~~XX~~ PSIG

INITIAL REG. SET PRESSURE: 3 5 . 0 OZ PSIG

MULTI STAGE SETTING: S E C O N D CUT
MONITOR SETTING: C O N T R O L REGULATOR
PARALLEL RUNS: P R I M A R Y REGULATOR
REG. SUPPLIES ISOLATED SYS.: Y E S
REG. MAKE/MODEL NO.: M O N F L O W G R I D
SERIAL NO.: 4 7 9 9
REG. BODY SIZE: 2 . 0 0 0
REG. ORIFICE SIZE: 5 0 % C A P
REG. SPRING / SPRING COLOR / PRESSURE RANGE:
PILOT SPRING / COLOR / PRESSURE RANGE: B L U E
PILOT OVER-RIDE / PILOT SPRING / COLOR / PRESSURE RANGE:
REGULATOR SIZING CG ~~ORIFICE~~ FACTOR: 1 6 2 0
REG. SEAT TYPE: S O F T
MAX. REG. PRESS. RATING: 2 8 5 PSIG
PILOT MAKE/MODEL: M O N S E R I E S 2 0
TRIM: 5 0 %
CONTROLS FROM LINE: C P I P
CONTROLS TO LINE: U N I V M P

NOTE: *SEE REVERSE SIDE FOR RELIEF VALVE INFORMATION, REGULATOR FAILURE CAPACITY, AND STANDARD DATA INFORMATION.*

DISTRICT APPROVAL

PREPARED BY: Bill Holle

GENERAL OFFICE

OPERATING	MEASUREMENT	ENGINEERING

Appendix I-9

Dear

DISTRIBUTION:
ORIGINAL – MEASUREMENT
COPY – DISTRICT

This Setting Installed as backup to College 32# System. BL

FORM 502 (1-84)

REGULATOR INSTALLATION OR REMOVAL

Date of { Installation / ~~Removal~~ } 8/21 19 97

Customer Name O.S.U. Campus
Location Washington and Hall of Fame Station No.
Controls From CP MP Controls To O.S.U. Campus
Inlet Pressure 50-60# Outlet Pressure 30# Site Size
Housing—Kind & Size Open
By Pass Size 2" Type of Valve P/V Lock: Yes ___ No X
Location of Relief Valve Inlet Riser - Up stream of Meter
Other Attachments, Describe
By Pass not connected.

From Stock At Placed in Stock At

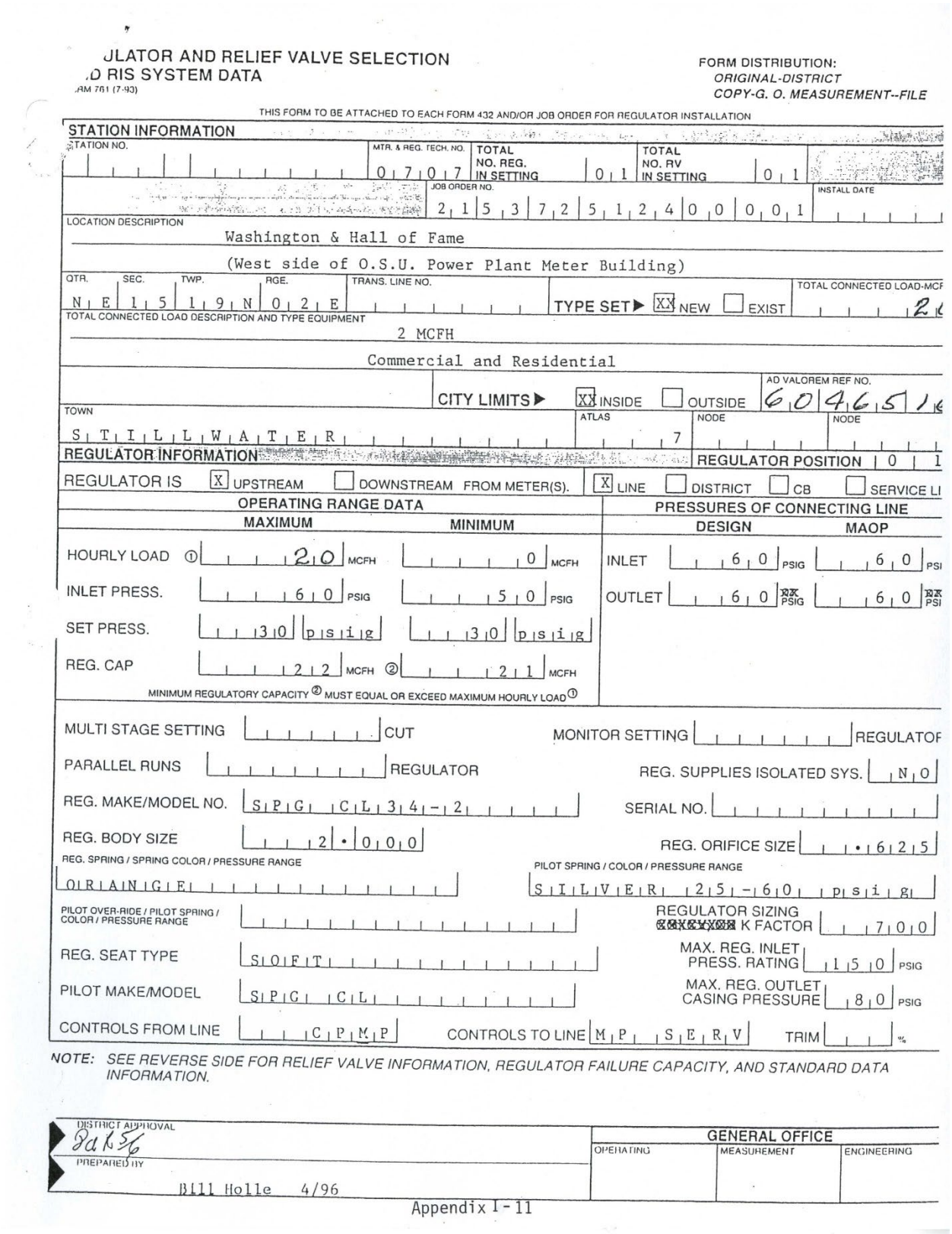
REGULATOR { JOB / WORK } ORDER NO. ___

Complete Description of Regulator

Make Sprague CL34-2 Type of Loading C. L.
Mfg. Serial No. Co. No.
Size Inlet 2" Size Outlet 2" Type Con. Sc. Flange Rating
Size Diaphragm Case Std. Actuator Size
Size Orifice .625 ☐ Double ☒ Single Type Seat Soft ~~Metal~~ K 700
Rated Pressure Range 150# Inlet To 60# Outlet 30#
Relief Valve Make Fisher 289-H Type Spring Size 1" x 1"
Set to Relieve 42# Leaks At 37# Full Relief At 42# Reseats At 39#
Inlet Gauge Make Ind. Rec. Range
Outlet Gauge Make 0-50# V-P Ind. Rec. Range
Type of Pilot Sprague C. L. Press. Range 25-60# Set At 30#
Type and Size Dehydrator Pot
Other Descriptive Information
Orange Main Spring
Silver Pilot Spring

{ Installation / ~~Removal~~ } Made By Bill Holle

Appendix I-10



JLATOR AND RELIEF VALVE SELECTION
.D RIS SYSTEM DATA
AM 761 (7-93)

FORM DISTRIBUTION:
ORIGINAL-DISTRICT
COPY-G. O. MEASUREMENT--FILE

THIS FORM TO BE ATTACHED TO EACH FORM 432 AND/OR JOB ORDER FOR REGULATOR INSTALLATION

STATION INFORMATION

STATION NO.:
MTR. & REG. TECH. NO.: 0707
TOTAL NO. REG. IN SETTING: 01
TOTAL NO. RV IN SETTING: 01
JOB ORDER NO.: 21537251240001
INSTALL DATE:
LOCATION DESCRIPTION: Washington & Hall of Fame
(West side of O.S.U. Power Plant Meter Building)
QTR.: NE SEC.: 15 TWP.: 19N RGE.: 02E
TRANS. LINE NO.:
TYPE SET ▶ [XX] NEW [ ] EXIST
TOTAL CONNECTED LOAD-MCF: 2
TOTAL CONNECTED LOAD DESCRIPTION AND TYPE EQUIPMENT: 2 MCFH
Commercial and Residential
CITY LIMITS ▶ [XX] INSIDE [ ] OUTSIDE
AD VALOREM REF NO.: 604651
TOWN: STILLWATER
ATLAS: 7
NODE:
NODE:

REGULATOR INFORMATION

REGULATOR POSITION: 01
REGULATOR IS [X] UPSTREAM [ ] DOWNSTREAM FROM METER(S). [X] LINE [ ] DISTRICT [ ] CB [ ] SERVICE LI

OPERATING RANGE DATA	MAXIMUM	MINIMUM	PRESSURES OF CONNECTING LINE	DESIGN	MAOP
HOURLY LOAD ①	20 MCFH	0 MCFH	INLET	60 PSIG	60 PSI
INLET PRESS.	60 PSIG	50 PSIG	OUTLET	60 PSIG	60 PSI
SET PRESS.	30 psig	30 psig			
REG. CAP	22 MCFH	② 21 MCFH			

MINIMUM REGULATORY CAPACITY ② MUST EQUAL OR EXCEED MAXIMUM HOURLY LOAD ①

MULTI STAGE SETTING: CUT
MONITOR SETTING: REGULATOR
PARALLEL RUNS: REGULATOR
REG. SUPPLIES ISOLATED SYS.: NO
REG. MAKE/MODEL NO.: SPG CL 34-2
SERIAL NO.:
REG. BODY SIZE: 2.000
REG. ORIFICE SIZE: .6250
REG. SPRING / SPRING COLOR / PRESSURE RANGE: ORIANGE
PILOT SPRING / COLOR / PRESSURE RANGE: SILVER 25-60 psig
PILOT OVER-RIDE / PILOT SPRING / COLOR / PRESSURE RANGE:
REGULATOR SIZING K FACTOR: 7000
REG. SEAT TYPE: SOFT
MAX. REG. INLET PRESS. RATING: 150 PSIG
PILOT MAKE/MODEL: SPG CL
MAX. REG. OUTLET CASING PRESSURE: 80 PSIG
CONTROLS FROM LINE: CPMP
CONTROLS TO LINE: MP SERV
TRIM: %

NOTE: SEE REVERSE SIDE FOR RELIEF VALVE INFORMATION, REGULATOR FAILURE CAPACITY, AND STANDARD DATA INFORMATION.

DISTRICT APPROVAL: DaN56
PREPARED BY: Bill Holle 4/96

GENERAL OFFICE

OPERATING	MEASUREMENT	ENGINEERING

Appendix I - 11

CHAPTER 15 - NG Maintenance Forms

Various Natural Gas Maintenance and Inspection Forms

KEY VALVE INSPECTION FORM

KEY VALVE INSPECTIONS are completed once per calendar year.

DATE		
Valve Number	**Location**	**Smart Number**
Problem Noted:		
Action Taken:		

DATE		
Valve Number	**Location**	**Smart Number**
Problem Noted:		
Action Taken:		

DATE		
Valve Number	**Location**	**Smart Number**
Problem Noted:		
Action Taken:		

Operator (Print Name) _____ Operator Signature _____

I hereby certify that I have inspected this valve and found it to be Acceptable _____ Unacceptable _____

Inspection notes after correction of unacceptable findings: _____

Inspector (Print Name) _____ Inspector Signature _____

PIPE JOINING FORM

FUSION 1			
Type of Joint	Butt Fusion	Electrofusion	Metallic Weld
Items Joined			
Size and Material			
Start Time			
Electrofusion Info Only			
Fusion Time	Clamp Time	Voltage	

FUSION 2		
Items Joined		
Size and Material		
Start Time		
Electrofusion Info Only		
Fusion Time	Clamp Time	Voltage

FUSION 3		
Items Joined		
Size and Material		
Start Time		
Electrofusion Info Only		
Fusion Time	Clamp Time	Voltage

FUSION 4		
Items Joined		
Size and Material		
Start Time		
Electrofusion Info Only		
Fusion Time	Clamp Time	Voltage

_____ _____

Operator (Print Name) Operator Signature

I hereby certify that I have inspected this joint and found it to be Acceptable _____ Unacceptable _____

_____ _____

Inspector (Print Name) Inspector Signature

If joint is unacceptable, action taken to correct: _____

_____

I hereby certify that I have inspected this joint and found it to be Acceptable _____ Unacceptable _____

_____ _____

Inspector (Print Name) Inspector Signature

PRESSURE TEST FORM

DATE	
Test Station Location	
Test Station Length	
Pipe Material	**Pipe Size**
Test Medium	
Time Started	**Time Ended**
Pressure at Start	**Pressure at End**
Reason for any line loss that occurred:	
Repairs made to correct leakage:	
Insert sketch of piping layout or make one on reverse side of this form.	

Operator (Print Name)

Operator Signature

SNIFF TEST FORM

SNIFF TESTS are completed quarterly.

DATE:

Sprec (0709)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Plant Pathology Research Greenhouse (0689)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Greenwood School of Music (0272)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Track Facility (0289)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

SNIFF TEST FORM

SNIFF TESTS are completed quarterly.

DATE:

Alumni Center (0005)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Bennett Hall (0038)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Sherman Smith Training Center (0286)		
Odor Noted	**YES**	**NO**
Action taken if no odor was detected.		

Operator (Print Name) _____ Operator Signature _____

SURVEILLANCE and PATROLLING INSPECTION FORMS

Performed twice each year for entire system.
New form to be completed each day. Use the back of sheet or multiple sheets if necessary.

Date _____

Vegetation and Insect Survey

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Above-Ground Corrosion Inspection

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Problem area: _____ Action taken: _____

Survey Results Notes:

_____

_____

_____

_____

_____

_____ _____

Operator (Print Name) Operator Signature

CHAPTER 16 – PE and Metallic Pipe Joining Procedures

PLASTIC PIPE FUSION INSTRUCTIONS

METALLIC WELDING and QUALIFICATION PROCEDURES

The qualification of OSU ES welders shall be done by a recognized independent testing entity conducted in accordance with Section IX, ASME Boiler and Pressure Vessel Code. Timing for certification is as follows.

After initial qualification, a welder may not perform welding unless:

1. Within the preceding 15 calendar months, the welder has re-qualified, except that the welder must re-qualify each calendar year, or
2. Within the preceding 7½ calendar months, but at least twice each calendar year, the welder has had a production weld cut out, tested, and found acceptable in accordance with the qualifying test.

Welder qualification procedures from the independent testing entity shall be kept on file.

GENERAL WELDING PROCEDURES

WELDING STEEL PIPE:

All welding shall conform to ASME Section 9, with a retest every 6 months.

1. Welder shall use position welding with the vertical down as the direction of welding.
2. Each joint shall be wire brushed or use other acceptable means to remove rust, dirt, mill scale or other foreign substances before being placed in alignment for welding.
3. The adjoining lengths of pipe shall be accurately aligned using a suitable alignment clamp. The adjoining lengths of pipe shall be accurately spaced before welding. Under no circumstances shall metered pipe welds be allowed.
4. The root bead shall be applied completely around the circumference of the pipe and adequately cleaned of all scale and slag. The second bead (the hot pass) shall be applied immediately after this cleaning operation. Before the day's work is completed hot passes will be applied to all root beads. Under no circumstances will welded joints be accepted when such have been connected only by the root bead from the end of one day's work to the next. Each completed weld shall be thoroughly cleaned of slag, coating, and scale. Welded sections of pipe will not be rolled off dollies until all affected welds have cooled.
5. In case of cold, rainy weather, or excessive winds, the operator shall provide protection for the welders while at work and care will be taken to assure that welds are not subject to sudden changes in temperature until such welds are thoroughly cooled. Welding will not be carried on when, in the judgment of the operator, the weather is unsuitable for welding operations.
6. If upon inspection, a weld appears defective, the welder shall cut from the line a cylinder of pipe continuing such a weld and replace it with good pipe or shall have the weld repaired to the satisfaction of the Superintendent. The following limits apply:
    a. Cracks, regardless of their location, will not be repaired.
    b. Defects, except cracks, which are externally exposed in the cover pass may be repaired without prior approval from the Superintendent.
    c. Defects beneath the cover of the surface of the cover pass specifically defined, in the opinion of the Superintendent as slag inclusions, porosity or gas pockets may be repaired in compliance with API 1104 provided:
        i. The defect can be repaired without grinding completely through the weld.
        ii. No single area of the defect shall exceed 25 percent of the pipe circumference length. A given single area of defect may consist of one or more defects.

iii. Adjacent areas of defects shall be separated by sound weld metal of a length not less than 7 percent of the pipe circumference length.
iv. Before such repairs are made, such defects shall be entirely removed to clean metal by grinding in a manner acceptable to the Superintendent. All slag and scale will be removed by wire bending.
v. Flame cutting and air carbon arc gouging will not be used for removing defects in production of tie-in welds. Air carbon arc may be used to remove defects in fabrication welds only.
vi. When preheating is required, an area of four inches on each side of the repair shall be preheated to a minimum of 200 degrees F. and maintained during repair welding. Temperature will be checked by using a temperature indicating crayon.
vii. All repair cavities will not be less than 2 inches in length. All repairs will be made with a minimum of two passes. The start and stop of repair passes will not be superimposed over the start and stop of the preceding repair pass.
viii. All repairs shall meet the Standard of Acceptable Nondestructive Testing.
ix. No further repairs will be made in these areas.

WELDING PRECAUTIONS:

The welder will take necessary precautions to ensure that no arcing occurs between the ground lead of the welding machine and the pipe of the fittings. Striking the arc on any point other than the welding grove will not be permitted. All arc burns on the pipe will be removed by cutting a cylinder of pipe continuing the arc burn and replacing it with good pipe.

Preheating will be used when welding fitting to fitting and pipe to pipe fittings, and when the internal pipe temperature is 45° or below. Preheating will also be used when the pipe, for any reason, is wet or damp. Such preheating will be accomplished by any means acceptable to the Superintendent and shall cover an area of at least four inches on each side of the weld. A minimum of 200° F. will be maintained during the welding process and will be checked by using a temperature indicating crayon.

During shutdown, the open ends of the pipe shall be securely closed, and all pipe ends raised to prevent the entrance of small animals, water or obstructions and shall not be reopened until work recommences. A suitable cover of about the same diameter as the pipe will be placed over the open ends of the tie-in sections or both ends of a long section. Any obstructions that occur must be removed by the welder to the satisfaction of the Superintendent. The line must be delivered entirely free from water, dirt, obstructions, or other foreign material.

No pup joints will be installed in the line that is less than 20" in length.

All construction tie-ins, other than those at road or stream crossings, will be made at a point level with the top of the trench, unless otherwise specified by the Superintendent.

WELDING OF SERVICE LINES:

Steel service lines are constructed with approved black pipes. The maintenance crews are provided with tools and components to cut and thread black pipe so that welding is not required for service lines except the tapping tees. Taps are welded onto the top surface of the mains. Welders who do any welding for OSU are to be tested in this type of welding.

Welding must not begin until there is enough space to allow the welder freedom of movement. The welding must not be performed during severe weather. Any flammable materials must be kept clear.

Visual inspection of all welds is expected of both the welder and any other crew members present who are qualified to visually inspect welds. A qualified welder is also considered qualified to inspect welds. The metal of the main where a branch is to be located, must be in decent shape so that it will hold up under the increased stresses due to discontinuity in the pipe material. The area on the main close to the weld must be clean and dry. The weld, when complete, should be cleaned of weld slag so that it can be inspected for undercutting and so that rough spots or excessive reinforcement can be ground off. Runs of pipe for mains are welded. The welding procedure requirements that crew members should watch out for are outlined as follows:

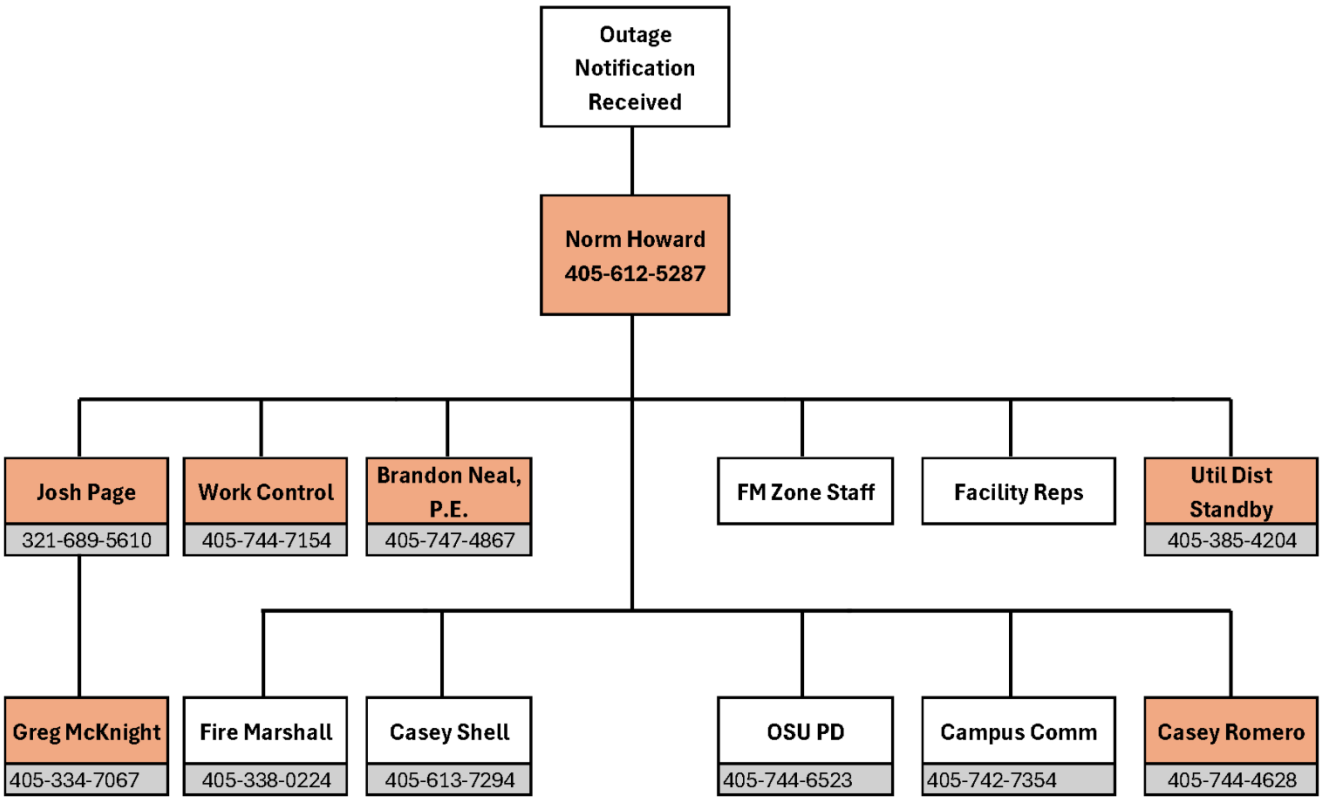
1. The only person permitted to do the welding is the one qualified.
2. The welder is to be looked after during welding operations. Sometimes it is important that his instructions or requests are conducted quickly and correctly.
3. The other crew members are allowed to help with the set-up, cleaning, scraping, and grinding. However, anyone using power tools must wear safety glasses.
4. The metal in the weld must be clean and dry before any welding is done.
5. The alignment and pre-spacing must be maintained while the root bead are made.
6. The weld slag and rough spots must be chipped and cleaned before the second weld is started.
7. The second weld should be made shortly after the root bead is completed but not while the root bead is still hot.
8. The weld slag and rough spots must be chipped and ground away. If this is the final weld, a visual inspection must be made to make sure there is not any undercutting and that the proper amount of reinforcement exists. Additional welds are the same as the second weld for the purpose of these instructions.

CHAPTER 17 – Line Locator User Manual

CHAPTER 18 – NG System Earthquake Plan

CHAPTER 19 – NG System Emergency Operations Plan

NG OUTAGE COMMUNICATION TREE



Primary Roles (mandatory notification)

If the next person in a primary role cannot be reached, take responsibility to call the next level of primary roles. If anyone in the middle of the tree receives the first notification, notify the primary role above and respective roles below.

CHAPTER 20 – OSU Stillwater Natural Gas MAP

Link to the GIS map is: https://fm-gis-portal.okstate.edu/portal/apps/utilitymapviewer/#