Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines

Summary

This standard specifies requirements for establishing, revising, and documenting the maximum allowable operating pressure (MAOP), the maximum operating pressure (MOP), and future design pressure (FDP) of transmission, gathering, and distribution pipelines and mains.

This standard applies to all gas transmission and gas gathering pipelines, as well as all distribution system piping.

In addition, this standard provides requirements for recording and reviewing distribution system pressures to meet the requirements of Code of Federal Regulation (CFR) Title 49, Subpart M—Maintenance, § 192.741, "Pressure limiting and regulating stations: Telemetering or recording gauges."

This standard does not cover requirements for the following equipment or functions:

- Recorders used to determine pressure for customer billing purposes downstream from customer regulators at customer meters.
- The operation of compressor stations.
- Telemetering (except for telemeter charts used to meet the requirements described herein).

Target Audience

All utility gas engineering, operation, and maintenance employees.

Safety

Perform all gas system engineering, design, operations, and maintenance safely and in accordance with all applicable safety rules, the *Code of Safe Practices*, and Utility Standard Practice (USP) 22, "Safety and Health Program."

[redacted]

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Table of Contents for Requirements

Requirements

Notify the California Public Utility Commission (CPUC) of a proposed increase to the MAOP in accordance with the requirements of Numbered Document A-34.1, "General Requirements Work Reportable to the CPUC," and either the steps outlined in TD-4125P-03, "Revising The MAOP of Pipelines Operating at 60 psig or Less," or the steps outlined in TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig."

1 Distribution

1.1 TD-4125P-01, "Establishing MAOP and Maintaining Documentation for Distribution Pressures," and TD-4125P-03, "Revising The MAOP of Pipelines Operating at 60 psig or Less," detail work procedures and contain attached forms for establishing, maintaining, and revising distribution MAOPs of pipelines operating at 60 psig or less.

[redacted]

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1.2 Utility Procedure TD-4125P-02, "Establishment and Documentation of MAOPs, MOPs, and FDPs for Pipelines Operating at Greater Than 60 PSIG," and TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig," detail work procedures and contain attached forms for establishing, maintaining, and revising distribution MAOPs of pipelines operating at greater than 60 psig.

1.3 Requirements for establishing and monitoring pressure recording devices are detailed in TD-4125P-05, "Recording Pressures in Distribution Gas Systems."

2 MAOP – Establishing Distribution

2.1 Low Pressure Distribution Systems

1. For systems or portions of systems installed, replaced, or rehabilitated on or after July 1, 1970, conduct tests to establish the MAOP in accordance with the requirements of Numbered Document A-34, "Piping Design and Test Requirements."

2. For systems or portions of systems installed prior to July 1, 1970, establish the MAOP as 150% of the standard delivery pressure. (For standard delivery pressure of 7 inches water column (WC), the MAOP is 10½ inches WC).

2.2 Semi-High and High Pressure Distribution Systems

1. For systems or portions of systems installed, replaced, or rehabilitated on or after July 1, 1970, conduct tests to establish the MAOP in accordance with the requirements of Numbered Document A-34, "Piping Design and Test Requirements."

2. For systems or portions of systems installed prior to July 1, 1970:

   a. Establish the MAOP by the highest, documented operating pressure for the 5 years ending July 1, 1970 (for example, documented in a pressure chart, station or foreman's log, dispatcher's order, etc.), unless the system was subsequently uprated in accordance with CFR Title 49, Part 192, Subpart K, "Uprating," or pressure tested after July 1, 1965 in accordance with the requirements of Numbered Document A-34, "Piping Design and Test Requirements."

[redacted]

2.2 (continued)

b. For distribution systems operating at MAOP of 60 psig or less, If there is no pressure record available to document the operating pressure of a system during the 5 years prior to July 1, 1970, establish the MAOP alternatively by the documented pressure of the system during the most recent leak survey made in the period between July 1, 1970 and March 1, 1979. The leak survey must demonstrate the system to be safe while operating at the documented pressure (meaning the documented pressure at time of survey or before and after survey). If a leak survey was made but there is no record of the pressure at the time of survey (or before and after the survey), establish the MAOP as the pressure of record, if knowledgeable personnel can certify that the pressure at the time of the survey was the same as the pressure of record. The next leak survey must verify MAOPs established in this manner.

3. For semi-high pressure systems which contain cast iron pipe in which there are unreinforced bell and spigot joints, do not exceed 25 psig in accordance with CFR Title 49, Part 192, subpart L "Operations".

4. In October 2008, CFR Title 49, Part 192 was amended to allow gas utilities to establish alternative MAOPs. However, PG&E does not use alternative MAOPs.

5. If records described in Paragraphs 2a. or 2b. above are not available, conduct tests to establish the MAOP in accordance with the requirements of Numbered Document A-34, "Piping Design and Test Requirements."

3 MAOP – Distribution Design Requirements for New or Replaced Lines

3.1 Distribution Systems

1. For distribution systems operating at MAOP of 60 psig or less except as provided in Paragraph 2 above, design and test new, replaced, or rehabilitated mains and services in low-pressure, semi-high, and high-pressure distribution systems to qualify for a future MAOP of 60 pounds per square inch gauge (psig).

2. If the main is considered for future service greater than 60 psig, design for future design pressure of the nearest transmission or distribution feeder main pipeline.

3. Leak test cut, test, and transferred services in low-pressure distribution systems that remain low-pressure at 10 psig. This includes the following services:

   a. Services which must be extended with new pipe to tie into the new main.

   b. Repaired services (i.e., services with segments that have been repaired or replaced with new pipe).

4. Distribution feeder mains shall be designed per Section 9.

[redacted]

3.1 (continued)

5. Refer to Numbered Document A-34, "Piping Design and Test Requirements," for detailed design requirements.

4 MAOP and MOP– Revising Distribution

Notify the CPUC of a proposed increase in the MAOP in accordance with the requirements of Numbered Document A-34.1, "General Requirements Work Reportable to the CPUC," and the steps outlined in TD-4125P-03, "Revising The MAOP of Pipelines Operating at 60 psig or Less." Or Utility Procedure TD-4125P-04, "Revising the MAOP, MOP, and FDP of Pipelines Operating at Greater than 60 psig" as appropriate

4.1 If any distribution system requires an MAOP greater than the established MAOP, uprate the system in accordance with the requirements in TD-4125P-03, "Revising The MAOP of Pipelines Operating at 60 psig or Less," or CFR Title 49, Part 192, Subpart K, "Uprating," as appropriate. Any plan for system uprating with an MAOP lower than 60 psig should be considered for an MAOP of 60 psig.

4.2 If any distribution system requires an MAOP greater than the established MAOP and greater than 60 psig, uprate the system in accordance with the requirements in TD-4125P-04, "Revising The MAOP of Pipelines Operating at greater than 60 psig," or CFR Title 49, Part 192, Subpart K, "Uprating," as appropriate.

4.3 If any distribution line requires an MAOP greater than the established MAOP, uprate the line in accordance with the requirements of CFR Title 49, Part 192, Subpart K, "Uprating." This requires the following steps:

1. Prepare a written procedure.

2. Increase the pressure in increments if required.

   a. Check for leaks after each pressure increase.

   b. Repair any hazardous leaks before further pressure increases.

   c. Limit the pressure the pipeline may be increased in accordance with the allowable maximum under CFR Title 49, § 192.619, "Maximum allowable operating pressure: Steel or plastic pipelines," and CFR Title 49, § 192.621, "Maximum allowable operating pressure: High-pressure distribution systems," for a new segment of pipeline constructed of the same materials in the same location. In addition, if any of the variables necessary to determine the design pressure under the design formula (CFR Title 49, § 192.105, "Design formula for steel pipe") is unknown, the MAOP may be increased as provided in CFR Title 49, § 192.619(a)(1).

[redacted]

4.4 Utility Procedure TD-4125P-04, "Revising the MAOP, MOP, and FDP of Pipelines Operating at Greater than 60 psig" lists the specific requirements for revising pressures above 60 psig.

5 MOP – Establishing Distribution

The responsible operating department determines the MOP of a gas distribution system in accordance with the criteria provided in this section.

5.1 Low-Pressure Distribution Systems

The MOP of a system must not exceed the lower of the following pressures:

1. A pressure that would cause the unsafe operation of any approved, connected, and properly adjusted low-pressure appliance.
2. 150% of standard delivery pressure. (For a standard delivery pressure of 7 inches WC, the MAOP is 10½ inches WC).

5.2 Semi-High and High-Pressure Distribution Systems operating at 60 psig or less

The MOP of a system must not exceed the lowest of the following pressures:

1. 60 psig
2. 25 psig for systems having cast iron pipe with unreinforced bell and spigot joints.
3. The established MAOP.
4. The MAOP of any connected system of lower MAOP, unless required regulation and overpressure protection is provided between them.
5. A pressure limited by operating conditions, or the condition of the system.

5.3 Distribution Feeder Mains

The MOP must not exceed the lowest of the following pressures:

1. The lowest established MAOP for any pipe segment in the pipeline system.
2. The MAOP of any connected system of lower MAOP, unless required regulation and overpressure protection is provided between them.
3. A pressure limited by operating conditions, or the condition of the system.
4. The pressure rating of any valve, fitting, piece of equipment, or facility installed in, or connected to, any pipe segment in the pipeline system.

[redacted]

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6 Requirements for Recording Pressures in Distribution Systems

6.1 PG&E must monitor, record, and review distribution system pressures to conform with the requirements of CFR Title 49, § 192.741, "Pressure limiting and regulating stations: Telemetering or recording gauges," to indicate an abnormal operating condition, to assist PG&E in determining the adequacy of the system design, and to assist in maintaining the maximum and minimum allowable operating pressures as required by §§ 192.619, 192.621, and 192.623.

6.2 Excluded from this standard are pressure recording requirements for the following:

1. Recorders used to determine pressures for customer billing purpose downstream from customer regulators at customer meters.

2. The operation of compressor stations.

3. Major gas control and pressure regulating facilities, as defined by California Gas Transmission (CGT) Utility Standard S4430, "CGT Gas Facilities Requirements," and Utility Standard S4433, "Gas Pressure Relief Devices - Responsibility for Annual Inspection and Verification of Capacity."

4. Telemetering (except for telemeter charts used to meet the requirements under TD-4125P-05, Procedural Step 1.2,"Permanent Pressure Recorder Requirements," Page 1).

6.3 Procedural details describing the requirements for and use of pressure recording gauges in distribution systems are contained in Utility Procedure TD-4125P-05, "Recording Pressures in Distribution Gas Systems."

7 Transmission and Gathering Lines

Utility Procedure TD-4125P-02, "Establishment and Documentation of MAOPs, MOPs, and FDPs for Pipelines Operating at Greater Than 60 PSIG," TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig," TD-4125P-06, "Revising Setpoints of Overpressure Protection Devices," and TD-4125P-07, "Establishing Setpoints on Overpressure Protection Devices," detail work procedures and contain attached forms for establishing, maintaining, and revising transmission and gathering MAOPs.

8 MAOP – Establishing Transmission and Gathering Lines

8.1 For lines installed, replaced, or rehabilitated on or after July 1, 1970, conduct tests to establish the MAOP in accordance with the requirements of Numbered Document A-34, "Piping Design and Test Requirements."

[redacted]

8.2 For lines installed prior to July 1, 1970, establish the MAOP by the highest actual operating pressure documented for the five years ending July 1, 1970 (for example, documented in a pressure chart, station or foreman's log, dispatcher's order, etc.), unless the system was subsequently uprated in accordance with CFR Title 49, Part 192, Subpart K, "Uprating," or pressure tested after July 1, 1965 in accordance with the requirements of Numbered Document A-34.

8.3 In October 2008, CFR Title 49, Part 192 was amended to allow gas utilities to establish alternative MAOPs. However, PG&E does not use alternative MAOPs.

9 MAOP – Transmission and Gathering Lines Design Requirements for New or Replaced Lines

9.1 Design and test new, replaced, or rehabilitated sections of line in accordance with the requirements of Numbered Document A-34 to qualify the pipeline to be operated up to the FDP of the system, as listed in the latest version of PG&E Drawing 086868, "Pipeline - Data Sheet, MAOP of Lines Operating at or Over 20% SMYS Typical."

9.2 In existing systems where the MAOP is less than the FDP, new additions to that system must have a design pressure at least equal to the FDP.

9.3 Refer to Numbered Document A-34, "Piping Design and Test Requirements," for detailed design requirements.

10 MAOP and MOP – Revising Transmission and Gathering Lines

10.1 Notify the CPUC of a proposed increase in the MAOP in accordance with the requirements of Numbered Document A-34.1, "General Requirements Work Reportable to the CPUC," and the steps outlined in TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig."

10.2 If any transmission or gathering line requires an MAOP greater than the established MAOP, uprate the line in accordance with the requirements of CFR Title 49, Part 192, Subpart K, "Uprating." This requires the following steps:

1. Prepare a written procedure.
2. Increase the pressure in increments.
   a. Check for leaks after each pressure increase.
   b. Repair any hazardous leaks before further pressure increases.

[redacted]

10.2 (continued)

c. Limit the pressure the pipeline may be increased in accordance with the allowable maximum under CFR Title 49, § 192.619, "Maximum allowable operating pressure: Steel or plastic pipelines," and CFR Title 49, § 192.621, "Maximum allowable operating pressure: High-pressure distribution systems," for a new segment of pipeline constructed of the same materials in the same location. In addition, if any of the variables necessary to determine the design pressure under the design formula (CFR Title 49, § 192.105, "Design formula for steel pipe") is unknown, the MAOP may be increased as provided in CFR Title 49, § 192.619(a)(1).

10.3 Utility Procedure TD-4125P-04, "Revising the MAOP, MOP, and FDP of Pipelines Operating at Greater than 60 psig" lists the specific requirements for revising pressures above 60 psig.

10.4 Make proper notifications of changes in an MAOP or MOP of a transmission or gathering line as detailed in Utility Procedure TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig."

10.5 Records must remain on file for the life of the segment including a record of each investigation required by this subpart, of all work performed, and of each pressure test conducted in connection with the uprating.

11 MOP – Establishing Transmission and Gathering Lines

The MOP must not exceed the lowest of the following pressures:

1. The lowest established MAOP for any pipe segment in the pipeline system.

2. The MAOP of any connected system of lower MAOP, unless required regulation and overpressure protection is provided between them.

3. A pressure limited by operating conditions, or the condition of the system.

4. The pressure rating of any valve, fitting, piece of equipment, or facility installed in, or connected to, any pipe segment in the pipeline system.

5. For segments in a High Consequence Area (HCA - see Map Guide for locations) that are made from pre-1970 electric resistance welded (ERW) pipe, or pipe with a joint efficiency factor less than 1, and MAOP was not previously established by a valid Subpart J pressure test, the previous 5 year maximum historical operating pressure.

12 FDP – Establishing Transmission and Gathering Lines

12.1 The department managing gas transmission system planning activities must establish the FDP for transmission and gathering lines in consultation with the department managing pipeline engineering activities.

[redacted]

12.2 For pipelines with nominal diameters up to 24 inches, establish the FDP at 275 psig, 720 psig, or 1440 psig to match ANSI ratings of 150, 300, and 600 respectively. The FDP selected depends on current and projected operating needs and conditions.

12.3 Establish the FDP on a project-specific basis for nominal diameters greater than 24-inches or for very large jobs where it is more cost effective to optimize the pipe for the job and class location.

13 Annual Update of MOP, MAOP, and FDP

The departments that manage the gas transmission planning and mapping and operating records must work together to update PG&E Drawing 086868, "Pipeline - Data Sheet, MAOP of Lines Operating at or Over 20% SMYS Typical," annually on or before March 15 of each year.

14 Documentation

14.1 Except as noted, all original records (for example, charts, strength test pressure reports, completed forms associated with procedures with the prefix TD-4125P- Fxx , letters, etc.) must remain in the job file.

Note: If there is no job associated with an MAOP or MOP change, as in the case of an MAOP lowered due to class location change and documented only by form TD 4125P-04-F01, "Approval to Revise MAOP/MOP Transmission and Gathering Lines," the original record must remain in the MAOP file described below in Paragraph 14.2.

14.2 The records section in gas transmission and distribution (GT&D) (for transmission facilities) and maintenance and construction (M&C) area headquarters (for distribution facilities) must establish and maintain MAOP files that consolidate copies of records documenting the MAOP and MOP of a pipeline (or segment of pipeline), main, or pipeline facility.

14.3 All records (originals and copies contained in the MAOP files) that document the MAOP and MOP of pipelines and mains must remain on file for the life of the pipeline, main, or pipeline facility.

14.4 For gas systems where original records establishing MAOP are not available, Use TD-4125P-01, Attachment 1, "Establishing MAOP," to record the basis for which the MAOP is established.

END of Requirements

[redacted]

Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines

Definitions

Distribution line: a pipeline other than a gathering or transmission line.

Distribution main: a distribution line that serves as a common source of supply for more than one service line.

Distribution feeder main (DFM): A pipeline operating over 60 pounds per square inch gauge (psig) that does not meet the definition of "Transmission" as defined in CFR Title 49, § 192.3, "Definitions."

Distribution system: a system including distribution mains and service lines.

Future design pressure (FDP): the pressure to which proposed and future additions, or changes to existing facilities, are designed and tested.

Gathering line: a pipeline that transports gas from a current production facility to a transmission line or distribution main.

High pressure distribution system: a distribution system in which the gas pressure in the main is higher than the pressure provided the customer.

Low pressure distribution system: a distribution system in which the gas pressure in the main is substantially the same as the pressure provided to the customer.

Maximum allowable operating pressure (MAOP): the maximum pressure at which a pipeline segment or component is qualified to operate in accordance with the requirements of CFR Title 49, Part 192.

Maximum operating pressure (MOP): the maximum pressure a gas pipeline system may operate in accordance with the requirements of CFR Title 49, Part 192 definition of maximum allowable operating pressure for a *system*.

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

Pressure recording device: a mechanical or electronic tool that records gas pressure automatically on an analog chart. It can also mean an electronic device that either produces a printed log of the pressure, or records it on storage media.

[redacted]

Semi-high pressure distribution system: a system traditionally operated at a pressure greater than 10½ inches WC but not more than 25 psig. Service regulators with the characteristics listed in CFR Title 49, § 192.197 (a) are required on each customer meter set.

Service line: a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.

Specified minimum yield strength (SMYS): the minimum yield strength in pounds per square inch (psi) prescribed by the specification under which pipe is purchased from the manufacturer or as specified in CFR Title 49, Part 192.

Standard delivery pressure: 7 inches WC.

System: the portion of a pipeline that, as a unit, is protected by overpressure protection devices (for example, a regulator and monitor) in a manner that prevents the lowest MAOP of any component of the system from being exceeded.

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

1. Transports gas from a gathering line or storage facility to a distribution center, storage facility, or large volume customer that is not down-stream from a distribution center; or

2. Operates at a hoop stress of 20 percent or more of SMYS; or

3. Transports gas within storage field as defined in CFR Title 49, § 192.3, "Definitions."

Note: A large volume customer may receive similar volumes of gas as a distribution center, and includes factories, power plants, and institutional users of gas.

Uprate: The process for increasing the MOP or MAOP (uprating) for pipelines according to the requirements of CFR Title 49, Part 192, Subpart K, "Uprating."

Water column (WC): a unit of pressure. At 60° F, 7 inches WC is equivalent to approximately ¼ psig.

[redacted]

Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines

Implementation Responsibilities

The senior director responsible for gas transmission and distribution issues and updates this standard. Each work procedure associated with this standard must contain the detailed implementation responsibilities for that particular procedure.

Implementation of this standard will result in compliant pressure operation of PG&E's gas systems.

Governing Document

This standard implements CFR Title 49, §§ 192.619, 192.620, 192.621, and 192.623 of the federal gas safety code requiring gas utilities to operate facilities within maximum pressure limits, and § 192.741 requiring gas utilities to record distribution pressures.

Compliance Requirement/ Regulatory Commitment

CFR Title 49, Part 192

Reference Documents

Developmental References:

CFR Title 49, § 192.619, "Maximum allowable operating pressure: Steel or plastic pipelines."

CFR Title 49, § 192.621, "Maximum allowable operating pressure: High-pressure distribution systems."

CFR Title 49, § 192.623, "Maximum and minimum allowable operating pressure; Low-pressure distribution systems."

CFR Title 49, § 192.741, "Pressure limiting and regulating stations: Telemetering or recording gauges."

CFR Title 49, Part 192, Subpart K, "Uprating."

CFR Title 49, Part 192, Subpart L, "Operations."

Code of Safe Practices

[redacted]

Numbered Document A-34, "Piping Design and Test Requirements."

Numbered Document A-34.1, "General Requirements Work Reportable to the California Public Utilities Commission."

PG&E Drawing 086868, "Pipeline - Data Sheet, MAOP of Lines Operating at or Over 20% SMYS Typical."

Utility Procedure TD-4125P-01, "Establishing MAOP and Maintaining Documentation for Distribution Pressures."

Utility Procedure TD-4125P-02, "Establishment and Documentation of MAOPs, MOPs, and FDPs for Pipelines Operating at Greater Than 60 PSIG."

Utility Procedure TD-4125P-03, "Revising The MAOP of Pipelines Operating at 60 psig or Less."

Utility Procedure TD-4125P-04, "Revising the MOP, MAOP, of Pipelines Operating at Greater than 60 psig."

Utility Procedure TD-4125P-05, "Recording Pressures in Distribution Gas Systems."

Utility Procedure TD-4125P-06, "Revising Setpoints of Overpressure Protection Devices."

Utility Procedure TD-4125P-07, "Establishing Setpoints on Overpressure Protection Devices."

Utility Standard Practice 22, "Safety and Health Program."

Utility Standard S4430, "CGT Gas Facilities Requirements."

Utility Standard S4433 "Gas Pressure Relief Devices - Responsibility for Annual Inspection and Verification of Capacity."

Supplemental References:

Gas Rate Schedule G-NT.

General Order 58 A, "Standards for Gas Service in the State of California."

General Order 112-E, "State of California Rules governing Design, construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems."

Numbered Document H-70, "Pressure Relief Devices."

[redacted]

Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines

Utility Standard S4460, "Gas Transmission Operating Maps and Operating Diagrams."

Utility Standard S4540, "Gas Pressure Regulation Maintenance Requirements."

Appendices NA

Attachments NA

Document Rescission

D-S0430/S4125, "Maximum Allowable Operating Pressure, Requirements for Distribution Systems and Transmission and Gathering Lines" dated 8-1998.

D-S0456, "Recording Pressures in Distribution Systems" issued 4/1999.

CGT Standard S4125.1, "Setpoints, Overpressure Protection Devices" issued 11/1/1998.

CGT Standard S4125.2, "Establishing Setpoints on Overpressure Protection Devices" issued 10/1/1999.

Gas Bulletin 302, "Establishing Gas System Piping Maximum Allowable Operating Pressures (MAOPs)."

Numbered Document A-34.2, "General Requirements, Uprating Procedures Low Pressure to High Pressure."

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Maximum Allowable Operating Pressure Requirements for Gas Distribution Systems and Transmission and Gathering Lines

Document Contact [redacted]

Revision Notes

Where?	What Changed?
NA	This is a new document.

[redacted]