

Maximum Allowable Operating Pressure Requirements

SUMMARY

This utility standard describes the requirements to verify, establish, revise, validate, and document the maximum allowable operating pressure (MAOP) for all pipelines to comply with California Public Utilities Commission (CPUC) and Department of Transportation (DOT) regulations.

TARGET AUDIENCE

Gas engineering, operation, and maintenance personnel

SAFETY

NA

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REQUIREMENTS

1 Roles and Responsibilities

1.1 Gas engineering personnel are responsible for:

1. Identifying gas transmission assets, and
2. Initiating, engineering, and approving jobs that install or modify gas assets in service.

1.2 Gas construction personnel are responsible for installing and testing gas assets.

1.3 Gas documentation (e.g., mapping, geographic information system [GIS], records information management [RIM]) personnel are responsible for ensuring proper documentation of pipeline asset MAOPs.

1.4 Gas operations personnel are responsible for operating gas assets.

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2 Verify or Establish and Document MAOP

- 2.1 Maximum allowable operating pressure (MAOP) is the maximum pressure at which a pipeline segment or component is qualified to operate, in accordance with [Code of Federal Regulations \(CFR\) Title 49, Transportation, Part 192—Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards.](#)
- 2.2 Determine the MAOP in accordance with [49 CFR §192.619, “Maximum allowable operating pressure: Steel or plastic pipelines,”](#) as follows:
 1. Verify or establish the MAOP of pipeline subsystems operating at 60 pounds per square inch gauge (psig) or less according to [Utility Procedure TD-4125P-01, “Establishing and Maintaining Distribution MAOP Records.”](#)
 2. Document associated MAOP records in accordance with [Utility Procedure TD-4125P-01, Appendix 1, “MAOP Records Requirements.”](#)
 3. Verify or establish the MAOP of pipelines operating at greater than 60 psig according to [Utility Procedure TD-4125P-02, “Verify or Establish MAOPs and FDPs and Maintain Documentation for Pipelines Operating at Greater Than 60 psig.”](#)
 4. Validate the MAOP per [Utility Procedure TD-4125P-08, “MAOP Validation”](#) to ensure that the integrity assessment of pipeline features is compliant with the MAOP and applicable Pacific Gas & Electric Company (Company or PG&E) standards and procedures.
 5. Document associated MAOP records in accordance with [Utility Procedure TD-4125P-02 Attachment 1, “Electronic MAOP Document Requirements.”](#)

3 Revise MAOP

- 3.1 Update the MAOP by uprating, pressure testing, downrating, and merging.
- 3.2 Uprate the MAOP in accordance with [49 CFR Part 192, Subpart K, “Uprating.”](#)
- 3.3 For subsystems or pipelines requiring an MAOP revision, the following actions are required:
 1. IF the proposed MAOP is 60 psig or less,

THEN revise the MAOP according to [Utility Procedure TD 4125P-03, “Revising the MAOP of Pipeline Subsystems to 60 psig or Less.”](#)

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3.3 (continued)

2. IF the proposed MAOP is greater than 60 psig,
THEN revise the MAOP according to [Utility Procedure TD 4125P-04, "Revising the MAOP of Pipelines Operating at Greater Than 60 psig"](#)

4 Identify Gas Transmission Assets

- 4.1 Identify gas transmission assets by following the instructions contained within [Utility Procedure TD-4125P-10, "Identifying Gas Transmission Assets."](#)

END of Requirements

DEFINITIONS

Appurtenance: Any part of a pipeline that may be subjected to pump or compressor discharge pressure including, but not limited to pipe, valves, fittings, flanges, and closures.

Assembly: A group of mating components joined together.

Complete: Complete records are those in which the record is finalized as evidenced by a name, date or other appropriate marking. For example, a complete pressure testing record should identify a specific segment of pipe, who conducted the test, the duration of the test, the test medium, temperatures, accurate pressure readings, and elevation information as applicable. See [Utility Procedure TD-4125P-08](#) Attachments for more information about how to apply this definition on strength test pressure reports.

Component: An indivisible part, assembly, or subassembly which performs a necessary function in the operation of a pipeline system.

Device: A mechanical contrivance designed to perform a specific function.

Distribution center: The point at which a transmission line changes function to a distribution main. It occurs at the downstream side of the inlet fire valve to a regulator station transporting natural gas into a main primarily serving non-large volume customers who purchase gas for consumption (as opposed to purchasing gas for resale).

Distribution feeder main (DFM): A transmission pipeline that operates at a maximum allowable pressure of greater than 60 psig and is connected to other gas transmission lines on the upstream side and other distribution feeder mains on the downstream side. A DFM transports gas to a Distribution Center(s).

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Definitions (continued)

Distribution line: A pipeline other than a gathering or transmission line. A line is a distribution line if it meets ANY one of the following criteria:

1. Transports gas downstream of a distribution center whether in a Main or Service Line.
2. Operates as a Farm Tap.

Downrate: To reduce the MAOP of a gas system.

Engineering material specification (Gas): Is a Company guidance document that contains detailed requirements for equipment (materials, tools, instruments, assembled units, or components) to be obtained from a supplier. Published gas engineering material specifications (EMSs) are records that may include: manufacturing; scope; design; design review process; functional, form, and physical characteristics; quality; performance; marking; labeling; packaging; handling; shipping; inspection; data file; configuration; bar coding; certification; acceptance testing; testing; regulatory codes; industry standards; surface protective coatings; supplier; liquidated damages; on-site requirements; and product change requirements. These documents are used in material procurement bidding, contracts awarded, purchasing, root cause investigation, and incoming inspection activities.

Equipment: Materials, tools, instruments, assembled units, or components.

Establish MAOP: Set the MAOP of a pressure-retaining, verified feature by performing a pressure test on the previously untested feature.

Fabricated assembly: An assembly of one or more fittings with pipe, equipment with pipe, or pieces of pipe joined together. Examples include, but are not limited to, mainline valve assemblies, branch connections, and tie-in pieces.

Farm Tap: Is a service line that is connected directly from a transmission line or gathering line to serve customers other than a large volume customer.

Feature: Pipeline feature, including pipe, appurtenances, and fixtures.

Fixture: Device or component which transfers the load from the pipe or structural attachment to the supporting structure or equipment. Fixtures include hanging-type fixtures such as hanger rods, spring hangers, sway braces, counterweights, turnbuckles, struts, chains, guides, and anchors, and bearing-type fixtures such as saddles, bases, rollers, brackets, and sliding supports.

Future design pressure (FDP): The minimum pressure to which new or modified pipeline features should be designed and tested. This includes changes to existing facilities such as pipeline repairs or modifications/alterations.

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Definitions (continued)

Gas gathering line: A pipeline that transports gas from a current production facility to a transmission line or main.

High-pressure distribution system: A distribution system in which the gas pressure in the main is higher than the pressure provided to the customer (per [49 CFR, Part 192, "Transportation of Natural and Other Gas By Pipeline: Minimum Federal Safety Standards"](#)).

Incomplete: An incomplete record might reflect that the pressure test was initiated, failed, and restarted without conclusive indication of a successful test. A record that cannot be specifically linked to an individual pipe segment is not a complete record for that segment.

Large volume customer: A customer being served by PG&E gas facilities that have the capability of delivering 40,000 standard cubic feet per hour (scfh) or more.

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 (per [49 CFR, Part 192](#)). The MAOP for low-pressure distribution systems is 12 inches of water column (in.-w.c.).

Main: A distribution line transporting gas that serves as a common source of supply for more than one service line.

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 [49 CFR, Part 192](#).

Maximum allowable operating pressure of design (MAOP-D, MAOP of D, or MAOP of Design): The maximum pressure that a pipeline or pipeline facility is designed to support but is not necessarily tested to support as calculated in 49 CFR §192.619(a)(1).

Maximum allowable operating pressure of test (MAOP-T, MAOP of T, or MAOP of Test): The lowest MAOP qualified on a single feature by the Strength Test on that feature, considering all requirements of [CFR Title 49, Transportation, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, §192.619\(a\)\(2\)](#).

Maximum allowable operating pressure of record (MAOP-R, MAOP of R, or MAOP of Record): The official approved MAOP of a pipeline in the system of record. Meets the requirements of [CFR Title 49, Transportation, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, §192.619\(a\)\(3\)](#).

Maximum allowable operating pressure of the feature (MAOP-F, MAOP of F, or MAOP of the Feature): The minimum of the MAOP-R, MAOP-T and MAOP-D of a single pipeline feature. This is only calculated for pipeline features that contain gas.

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Definitions (continued)

Maximum allowable operating pressure of the subsystem (MAOP-S, MAOP of S, or MAOP of the Subsystem): The lowest MAOP-F of all pipeline features within a subsystem. (This term replaces the term MOP, which is being retired.) In the absence of a qualifier, MAOP by itself generally refers to MAOP of subsystem.

Pipe: Any pipe or tubing used in the transportation of gas, including pipe-type holders.

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

Pipeline facility: New and existing pipeline, rights-of-way, and any equipment, facility, or building used in the transportation or in the treatment of gas during the course of transportation.

Pipeline feature: A component of a pipeline system, including station piping that is designed to contain natural gas under pressure, or reinforce another pressure containing component. Pipeline features include, but are not limited to, pipes, appurtenances, valves, tees, reducers, elbows, caps, flanges, closures, pressure control fittings, sav-a-valves, service tees, Type-A and Type-B repair sleeves, reinforcing sleeves, reinforcing pads, reinforcing collars, clock springs, mechanical repair clamps, etc.

Pipeline features list (PFL): A listing, categorization, and record of all pipeline features and associated attributes.

Pipe-supporting element: A fixture or other structural attachment.

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.

Record: Information created, received, and maintained for a business purpose or to comply with regulatory or legal requirements, including the documentation of a specific action, a transaction, a decision, a regulatory compliance requirement, or a legal commitment made by the Company during the course of its business activity.

Section: An ad hoc selection of pipe between any two mile points, control points, stationing, or any other key identifiers on any given pipeline.

Semi-high pressure distribution system: A system traditionally operated at a pressure greater than 12 in.-w.c. but not more than 25 psig. Service regulators with the characteristics listed in [49 CFR §192.197\(a\)](#) are required on each customer meter set.

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Definitions (continued)

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.

Specification: A detailed, exact statement of pertinent and substantial particulars, prescribing materials, dimensions, and workmanship for a feature or equipment to be built, installed, or manufactured.

Specified minimum yield strength (SMYS): The minimum specified stress a material will absorb before plastic deformation begins as stated by the material or product specification.

Standard delivery pressure: Standard delivery pressure is 7 in.-w.c.

Subsystem: A group of pipeline features that are limited in operating pressure and separated from other pipeline subsystems. The subsystem is separated from any other pipeline subsystem by equipment designed to regulate or prevent flow (i.e., regulators, valves, compressors, etc.).

Traceable: Traceable records are those which can be clearly linked to original information about a pipeline segment or facility. Traceable records might include pipe mill records, purchase requisition, or as-built documentation indicating minimum pipe yield strength, seam type, wall thickness and diameter. Careful attention should be given to records transcribed from original documents as they may contain errors. Information from a transcribed document, in many cases, should be verified with complementary or supporting documents.

Transmission line: A pipeline, other than a gathering line, that *meets ANY of the following criteria*:

1. Transports gas from a transmission line, gathering line, or storage facility to any of the following:
 - a. Distribution Center.
 - b. Storage Facility.
 - c. Large Volume Customer that is upstream of a Distribution Center.
2. Operates at or above a hoop stress of 20% SMYS, or is upstream of a segment of pipe operating at or above a hoop stress of 20% SMYS.
3. Transports gas within a storage field.

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Definitions (continued)

Tubing: Smaller diameter pipe (usually stainless steel or copper) with diameter usually less than ½ inch that is generally used as instrumentation or control piping to sense pipeline conditions for instrumentation monitoring and control. The nominal tube diameter roughly equals the outside diameter (OD) of the tube.

Upgrading: The qualifying of an existing pipeline or main for a higher maximum allowable operating pressure.

Validate MAOP: Confirm an established MAOP by evaluating the pressure test of a verified feature. The pressure test must be supported by traceable, verifiable, and complete records of sufficient quality to validate the feature.

Verifiable: Verifiable records are those in which information is confirmed by other complementary, but separate, documentation. Verifiable records might include contract specifications for a pressure test of a line segment complemented by pressure charts or field logs. Another example might include a purchase order to a pipe mill with pipe specifications verified by a metallurgical test of a coupon pulled from the same pipe segment. In general, the only acceptable use of an affidavit would be as a complementary document, prepared and signed at the time of the test or inspection by an individual who would have reason to be familiar with the test or inspection.

Verify MAOP: Justify an existing MAOP for a pressure-retaining pipeline feature by comparing its design pressure supported by traceable, verifiable, and complete records with its historical operating pressure.

Water column (WC): A measurement of pressure. At 60°F, 7 in.-w.c. is equivalent to approximately ¼ psig.

IMPLEMENTATION RESPONSIBILITIES

Gas TDM Comms post the document to the Technical Information Library (TIL). Gas TDM Comms issue a notification email to the target audience groups.

The communications and rollout plan consists of a two part approach for gas maintenance & operations personnel:

- General awareness training to system-wide gas operations personnel is available in My Learning as an online learning experience (web based) training, course code Gas-9152WBT "Gas Transmission Definition 1." Leadership communications will be conducted to encourage participation and to reinforce the importance of using a common and consistent definition of Transmission Assets throughout gas maintenance and operations.

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Implementation Responsibilities (continued)

- Personnel in engineering, estimating, regulatory compliance, integrity management, selected GIS / mapping groups and codes and standards with the need to apply knowledge of the procedure, decision tree and definitions in identifying transmission assets versus distribution assets under various pipeline and customer scenarios or configurations and demonstrate competency will be presented with instructor-led training course GAS-9153 "Gas Transmission Definition 2."

Post implementation support will be provided by the Codes and Standards Hot Line.

The revision of the Company's definition of transmission line has significant impacts. The following actions are currently being done to implement the transmission line definition revision:

- Gas asset information systems are made consistent with the revised definitions.
- Work management system maintenance frequencies and requirements are made consistent with the revised definitions for affected gas assets.
- Gas system assets are maintained and operated in accordance with the assets' classification as transmission or distribution, including leak survey and patrolling activities.
- Gas transmission line shutdown valves and primary regulator sets serving transmission large volume customers need to be maintained on the transmission schedule frequencies and requirements.
- Standby activities must occur on all gas transmission assets, including transmission pipelines (including plastic portions) that serve large volume customers.
- Gas guidance documents are made consistent as they come up for review and update on their regular cycle in accordance with all new and revised definitions of terms contained in this revision.
- The company reports mileage of transmission and distribution assets to Department of Transportation Pipeline (DOT) and Hazardous Materials Safety Administration (PHMSA) to match the revised definitions for gas transmission and distribution assets.

The following actions are to be completed by the designated dates:

- Pipeline markers are installed on all gas transmission pipelines by January 1, 2019.
- Transmission Integrity Management Program (TIMP) assessments are completed by January 1, 2026.

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GOVERNING DOCUMENT

[Gas Operations Policy TD-01, "Gas Asset Management"](#)

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

[Code of Federal Regulations \(CFR\) Title 49, Transportation, Part 192-Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards](#)

49 CFR Part 192 Subparts:

[Subpart K, "Uprating"](#)

[Subpart L, "Operations"](#)

49 CFR Subsections:

[192.619, "Maximum allowable operating pressure: Steel or plastic pipelines"](#)

[192.620, "Alternative maximum allowable operating pressure for certain steel pipelines"](#)

[192.621, "Maximum allowable operating pressure: High-pressure distribution systems"](#)

[192.623, "Maximum and minimum allowable operating pressure: Low-pressure distribution systems"](#)

[192.741, "Pressure limiting and regulating stations: Telemetry or recording gauges"](#)

California Public Utilities Commission General Orders (GOs):

[58 A, "Standards for Gas Service in the State of California"](#)

[112-F, "State of California Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems"](#)

REFERENCE DOCUMENTS

Developmental References:

American Society of Mechanical Engineers (ASME) Standard B31.8-2012

[American Gas Association \(AGA\) Glossary](#)

DOT PHMSA Letters:

March 4, 2013 DOT PHMSA Interpretation Letter – Farm taps as distribution lines

May 29, 2012 DOT PHMSA Interpretation Letter - Deduct meters

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Developmental References (continued)

July 12, 2011 DOT PHMSA Interpretation Letter – Large Volume Customer

April 19, 2011 DOT PHMSA Interpretation Letter – Farm TAP part of DIMP

March 22, 2010 DOT PHMSA Interpretation Letter – Distribution Center and Distribution Feeder Mains

[Corporation Policy GOV-01, “Enterprise Records and Information Management Policy”](#)

[Corporation Standard GOV-7101S, “Enterprise Records and Information Management Standard”](#)

[Gas Design Standard A-34, “Piping Design and Test Requirements”](#)

[Pipeline and Hazardous Materials Safety Administration \(PHMSA\) Glossary](#)

[MAOP Catalog \(Historical Drawing 086868\)](#)

[Utility Standard SAFE-1001S, “Safety and Health Program Standard”](#)

Supplemental References:

[Gas Design Standard H-70, “Pressure-Relief Devices”](#)

[Gas Rate Schedule G-NT](#)

Utility Procedures:

[TD-4012P-05, “Reporting MAOP Uprates and CPUC Pressure Restorations”](#)

[TD-4125P-01, Establishing and Maintaining Distribution MAOP Records”](#)

[TD-4125P-02, “Verify or Establish MAOPs and FDPs and Maintain Documentation for Pipelines Operating at Greater than 60 psig”](#)

[TD-4125P-03, “Revising the MAOP of Pipelines Operating at 60 PSIG or Less”](#)

[TD-4125P-04, “Revising the MAOP of Pipelines Operating at Greater than 60 psig”](#)

[TD-4125P-10, “Identifying Gas Transmission Assets”](#)

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Developmental References (continued)

Utility Standards:

[4430, "CGT Gas Facilities Requirements"](#)

[TD-4010S, "Gas Asset Information Management Systems"](#)

[TD-4016S, "Gas Operations Records and Information Management"](#)

APPENDICES

NA

ATTACHMENTS

NA

DOCUMENT REVISION

This utility standard supersedes Utility Standard TD-4125S, "Maximum Allowable Operating Pressure Requirements," Rev. 1, issued 11/19/2014.

The definitions for the terms "gas transmission line," "distribution center," and "large volume customer" in this document supersede any other definitions of these terms that have been previously published in any other guidance documents. Those documents will be updated with these definitions at their next regular update cycle.

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REVISION NOTES

Where?	What Changed?
Section 3, "Identify Gas Transmission Assets"	Added section to reference instructions contained in TD-4125P-10, "Identifying Gas Transmission Assets."
Definitions	<p>Distribution Feeder Main (DFM): new definition added.</p> <p>Large Volume Customer (LVC): minor revision.</p> <p>Transmission Line: minor revision.</p> <p>Low Pressure System: Modified the definition to indicate that the Company's MAOP for low pressure systems is 12 inches of water column (in.-w.c.), per Utility Bulletin TD-4125B-002, "Low Pressure MAOP," Revision 1 (published 2/21/2014):</p> <p>Per Utility Bulletin TD-4125B-003, "Definitions: Gas System Pressure Terms" Revision 0 (published 12/02/2015), modified these terms:</p> <p>Feature: minor revision</p> <p>Future design pressure (FDP): minor revision.</p> <p>Pipeline Feature: new term defined.</p> <p>Subsystem: minor revision.</p> <p>Maximum Allowable Operating Pressure of Design (MAOP-D, MAOP of D, or MAOP of Design): new term defined</p> <p>Maximum Allowable Operating Pressure of Test (MAOP-T, MAOP of T, or MAOP of Test): new term defined</p> <p>Maximum Allowable Operating Pressure of Record (MAOP-R, MAOP of R, or MAOP of Record): new term defined</p> <p>Maximum Allowable Operating Pressure of the Feature (MAOP-F, MAOP of F, or MAOP of the Feature): new term defined</p> <p>Maximum Allowable Operating Pressure of the Subsystem (MAOP-S, MAOP of S, or MAOP of the Subsystem): new term defined</p>
Governing Document	Added Gas Operations Policy TD-01, "Gas Asset Management." Moved regulatory requirements to Compliance Requirement / Regulatory Commitment section.
Compliance Requirement / Regulatory Commitment	Moved all references to federal and State government regulatory requirements to this section.
References	<p>Moved Government Regulatory requirement sections to the Compliance Requirement / Regulatory Commitment Section.</p> <p>Added five DOT PHMSA Interpretation letters that support the Company's revised definition of transmission line and other supporting definitions, such as distribution center and large volume customers.</p>
Implementation Plan	Added specific implementation plan for this document revision.
Document Contacts	Updated Document Approver, Owner, and Contact.