

	<h2 style="margin: 0;">PIPING DESIGN AND TEST REQUIREMENTS</h2>	<p style="margin: 0;"><b>087950</b> <b>(A-34)</b></p>
<p><b>Dept:</b> Gas Systems Technical Support</p> <p><b>Approved by:</b> <span style="background-color: black; color: black;">██████████</span></p>	<p><b>Section:</b> Enter Department Section</p> <p><b>Date:</b> 2-28-95</p>	
<p><b>Rev. #00:</b> This document supersedes Gas Standard 087950 (A-34). For a description of changes see Page 23.</p>		

**Purpose and Scope:**

1. To establish a uniform procedure for designing and testing gas piping systems that will meet the requirements of CPUC G.O. 112, Sections 192.101 and 192.501.
2. Note: The CPUC G.O. 112 also requires written and verbal notification of certain work. See Gas Standard A-34.1 for these requirements.
3. To establish basic guidelines for pipeline construction documents.

**General:**

4. Rescission:
  - Supersedes any previous instructions which are contrary to this Standard.
5. Policy and Application:
  - All gas piping systems and facilities both new and reconstructed are to be designed and tested in accordance with the requirements of G.O. 112, latest edition. This includes the reinstating of abandoned or temporarily disconnected piping.
6. Responsibility:
  - A. The engineer responsible for the design of a facility shall specify the test or tests required, in accordance with this standard. For all facilities to be tested to support an MAOP of 100 psig or greater, the engineer shall prepare a Strength Test Report (Form 62-4921) for each test required. Part I - Design Data, shall be filled out to include all applicable information. These reports shall accompany the construction drawings to the field.
  - B. The supervisor responsible for the construction of the facility shall have the responsibility for testing it in accordance with this standard. Prior to testing any facility which is to be tested to support an MAOP of 100 psi or greater, the supervisor shall verify that a Strength Test Pressure Report (Form 62-4921), with Part I (Design Data) completely filled out, is available at the job site. The supervisor shall verify that the pipe specifications and footages are correct before proceeding with the test. Upon completion of the test, the supervisor is responsible for the completion of Part II - Test Data, of the Strength Test Pressure Report.
  - C. The engineer and the construction supervisor are responsible to ensure that all other applicable provisions of CPUC General Order 112 (latest edition) are followed when designing, constructing and testing a facility.
7. Definitions:
  - The following definitions shall apply to this Standard:
    - A. "Stress" is the magnitude of internal forces that act to change in size or shape, a body acted on by external forces.
    - B. "Operating" stress is the stress in a pipe or structural member under normal operating conditions.
    - C. "Hoop stress" is the stress in a pipe wall, acting circumferentially in a plane perpendicular to the longitudinal axis of the pipe and produced by the pressure of the fluid in the pipe.
    - D. "Design pressure"<sup>1</sup> is the maximum operating pressure permitted by G.O. 112 as determined by the design procedures applicable to the pipe size, wall thickness, material, and location involved.

<sup>1</sup> Standard Practice 463-8 gives a complete description of these terms and their application (S.P. 463-8 is included in the "Engineers Estimators Manual").

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- E. "Maximum allowable operating pressure" <sup>1</sup> (MAOP) is the maximum pressure at which a gas pipeline segment may be operated in accordance with the provisions of G.O. 112.
- F. "Maximum operating pressure" (MOP) is the maximum pressure at which a system may be operated as specified by the responsible operating department.
- G. "Test medium" is a substance such as water, air, or gas used to exert an internal pressure to leak or strength test a facility.
- H. "Test pressure" is the internal fluid pressure specified for testing.
  - I. "Strength test" is a pressure test to prove the mechanical strength of the system.
  - J. "Leak test" is a pressure test to determine the tightness of the system.
- K. "Class location" is a geographic area as classified and described in G.O. 112, Section 192.5, and Standard Practice 460-1.
- L. "Design factor" is the percentage of SMYS to which operating stress must be limited, as further described in G.O. 112, Section 192.111.
- M. "Specified minimum yield strength" (SMYS) is the minimum yield strength prescribed by the specification under which the pipe is manufactured and qualified to be sold.

### 8. Design:

- A. Complete design criteria stamps for all sizes, specifications, grades, seam types and wall thickness of pipe shown on specific Plan & Profile/Sections sheet. A design criteria stamp is required for each MAOP and for each test pressure.
- B. When determining design requirements to establish the MAOP, consideration shall be given to:
  1. Future development of the area.
  2. Current and future gas supply pressures.
  3. Probability of increase in supply pressure.
- C. The design formula for steel pipe is given below:

$$P = \frac{2St}{D} \times F \times E \times T$$

Where: P = maximum allowable design pressure, psig

S = specified minimum yield strength, psi

D = outside diameter, inches

t = nominal wall thickness, inches

F = design factor determined in accordance with Section 192.111 of G.O. 112.

E = longitudinal joint factor determined in accordance with Section 192.113 of G.O.112.

T = temperature derating factor determined in accordance with Section 192.115 of G.O. 112.

### D. Initial Construction:

The design of all new gas facilities and any subsequent additions or alterations to existing facilities shall meet the expected future Class location and at least the planned future MAOP requirements of the pipeline. Use approved pipe shown in Appendices B,C,D,E,F, and G.

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<sup>1</sup> Standard Practice 463-8 gives a complete description of these terms and their application (S.P. 463-8 is included in the "Engineers Estimators Manual.").

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- E. Requirements for Pipeline Construction Drawings:  
 Appendices I, J, and K give the content, format, technical and professional engineering review requirements for pipeline plan and profile construction drawings. For other drawing requirements see Estimates - 4 of the engineers' Estimators' Manual.
- F. Pressure ratings for fittings, valves, and other piping components shall be equal to or greater than the design pressure established for the piping system.

DESIGN CRITERIA

LOCATION CLASS \_\_\_\_\_

DESIGN FACTOR \_\_\_\_\_

D.P. \_\_\_\_\_ SMYS \_\_\_\_\_ %

MAOP \_\_\_\_\_ SMYS \_\_\_\_\_ %

STRENGTH TEST PRESSURE

MAX. \_\_\_\_\_ PSIG \_\_\_\_\_ % SMYS

MINCH \_\_\_\_\_ PSIG \_\_\_\_\_ % SMYS

\_\_\_\_\_ PSIG = 90% SMYS

TEST FLUID \_\_\_\_\_

PIPE SPEC. \_\_\_\_\_

O.D. \_\_\_\_\_

W.T. \_\_\_\_\_

WELD INSPECTION (GAS STD. D-40)\*

RADIOGRAPHIC REQUIRED

20% MIN.

100%

\*VISUALLY INSPECT A MINIMUM OF 20% OF ALL WELDS THAT ARE NOT RADIOGRAPHICALLY INSPECTED. (THIS REQUIREMENT APPLIES EVEN IF NO RADIOGRAPHIC INSPECTION IS REQUIRED).

} See Paragraph 10.F.

**Figure 1  
Design Criteria Stamp**

- 9. Inspection:
  - A. Welds must be inspected as required by Gas Standard D-40.
  - B. Trench, pipe and pipe coating must be inspected as required by Gas Standard A-36.
- 10. Testing:
  - A. All new, replaced, or reconnected pipelines and facilities transporting natural gas must be tested in accordance with the requirements in this standard. Except as noted in Notes 6 and 7 of Appendix A, the test shall be conducted after the pipeline and/or facilities have been installed.
  - B. The test medium shall be one permitted for the design pressure and class location as specified in Appendix A. Factors to be considered in the choice of test media, as shown in the table of test requirements (Appendix A) shall include safety, availability, and economy.

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- C. Test pressure shall not be less than that required by Appendix A to test the tightness and strength of a system. All lines shall be tested in accordance with Appendix A.
  - D. Pipe held for emergency use must be tested as specified in Appendix A.
  - E. Girth welds used to tie-in fabricated units and short sections of pipe shall be inspected as required by Gas Standard D-40.
  - F. Pipelines should normally be tested as required to support an MAOP equal to the design pressure. Testing to support only a lower MAOP is acceptable, but would require an additional test or uprating procedure to justify any subsequent increases in the MAOP.
  - G. Testing of Facilities Damaged by Construction Work:
    - 1. All facilities known or suspected to have been struck during excavation or construction activities must be checked to assure their safety if they are to remain in service.
    - 2. Transmission and Distribution Lines:

The inspection, repair and testing required for a damaged transmission or distribution line will depend on the extent of the damage and other conditions, which can best be determined by the responsible supervisor in the field. However, adequate steps must be taken either by testing or leak survey to insure that no leakage is present.

      - (a) Repairs to damaged steel transmission or distribution lines shall be made in accordance with Gas Standard A-65.
      - (b) Repairs to damaged plastic mains shall be made in accordance with Gas Standard A-93.1.
      - (c) Special attention shall be given to a damaged casing for a plastic insert, to make certain that the damage did not result in a failure in the plastic at another location remote from the point of contact.
    - 3. Service Lines (including service risers):
      - (a) If a steel, copper, or other metallic service line or the casing for a metallic insert has been broken, bent, pulled, crushed, or otherwise deformed, the service must be tested from tee to riser in accordance with Appendix A.
      - (b) Steel, copper, or other metallic service lines or casings for metallic inserts that have been hit but not moved or deformed may be leak surveyed with a leak detector as an alternate check. The survey should include the entire length of the service and adjacent areas as appropriate.
    - 4. See Gas Standard A-93.1 for plastic lines and plastic inserts. Also, refer to Gas Standard A-93.1 for plastic service risers which may have been exposed to excessive heat.
    - 5. All service risers that have been struck and/or damaged in above ground incidents shall be leak surveyed with a leak detector. The survey shall include the service line adjacent to the customer's building and/or other areas as appropriate.
11. Test Limitations on Valves:
- A. When performing a hydrostatic test on a line, the test pressure to which a valve may be subjected shall not exceed the manufacturer's shell test pressure, which are shown in Section F of the Gas Standards. Where the required MAOP of the line cannot be established because of these limitations, an engineering study shall be made to verify that it is safe to subject the valve to the higher pressure during the test. When making this study, consideration shall be given to the pressure to which the valve was tested by the manufacturer, the age and condition of the valve, and the effect of stresses which may be transmitted to the valve by the pipeline.
  - B. When performing a test with air or inert gas, or an uprating with natural gas, the pressure to which a valve may be subjected shall be limited to 110% of the maximum working pressure of the valve. Where the required MAOP of the line cannot be established because of this limitation, the matter shall be reviewed with the responsible operating department, to determine whether a higher test pressure may be permitted. This limitation shall not apply to the 100 psig air test on a service line.
  - C. When a valve is to be subjected to a test pressure which is greater than its maximum working pressure, it shall normally be in the open position. However, in some cases, with prior approval from the responsible operating department, closed valves may be subjected to hydrostatic test pressure exceeding their rating working pressure, depending on the type and condition of the valve and with the limitations that the differential pressure must not exceed the working pressure and the test pressure must not exceed the manufacturer's shell test pressure.

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- D. When practical, mainline valve assemblies should be tested separately from pipeline construction to prevent damage to the valves during the initial pigging of the pipeline. The separate test of the valve assembly should be followed by a 100 psig leak test of the valve seats prior to welding the assembly in the pipeline.

### 12. Records:

#### A. Facilities Designed to Operate at 100 PSIG or Greater:

1. Estimated sketches and design drawings shall contain the following information: specifications of pipe, fittings, and valves, design pressure, MAOP, Class location, design factor and strength or leak test information. Where more than one size of pipe is involved, the requires information shall be supplied for each size and type.
2. A Strength Test Pressure Report (Form 62-4921) is required for each facility being tested to support an MAOP of 100 psig or greater (see Appendix A). For instructions on completing the Strength Test Pressure Report, refer to Mains-9 of the engineers-Estimators Manual.
3. If the line is to have an MAOP equivalent to 30% or more of its SMYS, a test chart in accordance with Section 11.0 is required.
4. If any portion of a line is tested to over 90% SMYS, a dead weight tester (DWT) shall be in service continuously during the test in addition to the pressure recording chart. A log of the DWT reading shall be made every 1/2 hour. The pressure recording chart and the DWT log shall be submitted with the Strength Test Pressure Report. The DWT log shall be considered the official record of the test. In the event that the DWT fails during the test, the pressure recording chart may be accepted as the official test record.
5. Estimate Form 62-6251 shall be marked by the person making the estimate to indicate if the pipe has to be strength tested.

#### B. Facilities Designed to Operate at Less Than 100 PSIG:

For facilities designed to operate at less than 100 psig, test information shall be recorded on the gas service record, the estimated sketch, and work order or other authorized form.

#### C. For systems being updated, a test chart in accordance with Section 11.0 is required.

#### D. All required test records shall be retained for the useful life of the facility.

### 13. Test Chart:

For pipelines being tested or updated to support an MAOP equivalent to 30% of SMYS or greater, a chart record shall be made of the pressure test. The procedure for handling the chart, and the minimum information required on the chart is outlined below:

- A. The chart must be designed for the recorder on which it is to be used and must have appropriate scale and time lines.
- B. The calibration of the recorder must have been checked.
- C. The chart must be set on the correct time at the start of the test. The actual time, date, and initials of the person starting the test must be shown on face of the chart at the start of the test.
- D. The chart must show a minimum of eight hours (except where a four hour test is permitted in Appendix A). Any discrepancies should be explained.
- E. At the end of the test, the actual time, date, and initials of the person removing the chart must be shown on the face of the chart.
- F. The section of pipe under test must be identified on the face of the chart, along with the job number.
- G. The following additional information is to be shown on the back of the chart:
  1. Job number
  2. Location of test
  3. Test pressure, date and duration
  4. Size, wall thickness, pipe specification, and length of section tested.
  5. The serial number of the recorder or other means of identification

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6. The date the recorder was last calibrated and serial number of the dead weight tester or other reference standard used.
  - H. The above information is to be recorded on the chart at the time of the test. After the test is completed, the supervisor is to review the chart and then sign and date it to verify that it complies with the requirements of this standard.
  - I. The original of the test chart is to be attached to the original of the Strength Test Pressure Report Form 62-4921. A copy of the test chart is to be attached to each copy of the test report. This record is to be retained for the life of the facility.
14. Appendixes
- A. Piping Data Sheet - Design and Test Requirements
  - B. Piping Data Sheet - API 5L Grades B and A-25
  - C. Piping Data Sheet - API 5L Grade X-42
  - D. Piping Data Sheet - API 5L Grade X-52
  - E. Piping Data Sheet - API 5L Grade X-60
  - F. Piping Data Sheet - API 5L Grade X-65
  - G. Plain End Pipe Minimum Wall Thickness
  - H. Emergency Pipe Test Information Form
  - I. Requirements for Pipeline Plan and Profile Construction Drawings
  - J. Required Information for Pipeline Construction Drawings
  - K. Transmittal Form.

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Appendix A

Table 1 Test Requirements for Pipelines, Mains, Services, Instrument Lines and Other Gas Facilities

Proposed MAOP		30% Smys or More		Pretested Pipe for Emergency Use (See Note 7.)	Under 30% Smys and at or above 100 psig	Less Than 100 psig (Including Low Pressure)	Plastic (See Note 12.)
Component To Be Tested		Pipeline (Including Fabricated Units Tested in Place)	Fabricated Units, Short Sections of Pipe (See Note 6.)		Including Fabricated Units and Short Sections of Pipe		
		Strength	Strength	Strength	Leak	Leak	Leak
Test Medium		Water, Air, Inert Gas, or Gas (See Notes 1., 2. and 16.)	Water, Air, Inert Gas, or Gas (See Notes 1., 2. and 16.)	Water	Water, Air, Inert Gas, or Gas (See Notes 1., 2. and 16.)	Air or Gas (See Note 16.)	Air or Gas (See Note 16.)
Maximum Test Pressure (See Notes 1. & 2.)		100% Smys or Factory Test Pressure of Fitting (See Notes 3. and 5.)	100% Smys or Factory Test Pressure of Fitting (See Notes 3. and 5.)	100% Smys	(See Notes 3. and 14.)	110 psig	3 x Design Pressure
Minimum Test Pressure		1.5 x Design Pressure (See Notes 4 and 5.)	1.5 x Design Pressure (See Notes 4. and 5.)	90% Smys (Recommended)	1.5 x Design Pressure (See Note 4.)	100 psig	100 psig or 1.5 x MAOP Whichever is Greater
Duration of Test		8 Hours Minimum (See Note 17.)	4 Hours Minimum (See Note 17.)	4 Hours Minimum	1 Hour Minimum (See Note 17.)	5 Minutes	5 Minutes (See Note 9.)
Test Records Required (See Note 15.)	Forms Required	Completed Strength Test Pressure Report	Completed Strength Test Pressure Report	Completed Strength Test Pressure Report	Completed Strength Test Pressure Report	Complete Box on W.O. Form or Gas Service Record Form	Complete Box on W.O. Form or Gas Service Record Form
	Test Chart	Yes (See Note 11.)	Yes (See Note 11.)	Yes (See Note 11.)	No (See Note 13.)	No (See Note 13.)	No (See Note 13.)

Notes:

1. Maximum test pressure permitted, expressed as a percent of SMYS:

Class Location	1	2	3	4
Air or Inert Gas (See Note 10.)	80	75	50	40
Natural Gas	80	30	30	30
Water	100	100	100	100

2. Safety – When testing with air, inert gas, or natural gas, the pressure shall be held at about 100 psig and observed for leakage before raising to the required test pressure.

3. Maximum test capabilities of fittings (i.e. valves and elbows) must be determined before testing (see Paragraph 9.).

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### Appendix A (continued)

4. The minimum test pressure shall not be less than 1.5 times the design pressure in Class 2, 3 and 4 locations, and not less than 1.25 times the design pressure in Class 1 location. The only exception is for transmission lines where testing to 1.5 times the design pressure creates problems due to limitations imposed by valves (see Note 3.) and where the future MAOP to be established is below the design pressure. The minimum test pressure may then be limited to 1.5 times the MAOP, with the approval of a professional engineer (see Appendix I, professional engineering review).
5. Testing Pipelines & Station Piping:
  - A. All pipelines 6 inches and larger, which are designed to operate at more than 40% of SMYS, are to be tested to a minimum of 90% of SMYS, and as close to 100% of SMYS as practical (tests of ERW pipe should be limited to a maximum of 95% of SMYS). This will permit them to continue to operate at a established MAOP should a class location change occur. However, a test to 90% of SMYS is not to be used to continue to operate at a established MAOP should a class location change occur. However, a test to 90% of SMYS is not to be used to continue to operate at a established MAOP should a class location change occur. However, a test to 90% of SMYS is not to be used as an alternative to designing a pipeline to meet a higher class location which may reasonably be anticipated to occur in the future.
  - B. For pipelines 6 inches and larger, which are designed to operate at over 20% of SMYS, up to 40% of SMYS; consideration should be given to a test to a minimum of 90% of SMYS. Testing to this pressure will provide additional assurance of the integrity of the line, and will minimize the possibility of a failure due to stress resulting from soil settlement or other environmental effects. The decision to conduct a test to the higher pressure should be based on engineering judgment, considering the importance of the line to meet system demand, and any potential environmental effects on the line, such as might be caused by intense development, or heavy construction near the line.
  - C. It is often not practical to test station piping to 90% of SMYS because of limitations of valves, flanges and other devices. In these cases, the station will not be able to continue to operate after a class location change that results in a design factor requirement lower than the station was designed for. Therefore, it is extremely important that the station be designed for the lowest design factor that might occur during the life of the station. In many cases, it will probably be prudent to use a 0.4 design factor so the station can continue to operate in a location Class 4 area.
6. Pre-Installation Tests:

For fabricated units and short sections of pipe for which a post installation test is impractical, a preinstallation test may be substituted. The preinstallation test must comply with the pressure requirements for a post installation test. For pipe to operate at or above -00 psig and below 30% SMYS, the pipe must be maintained at the test pressure for only one hour or longer. For pipe to operate at less than -00 psig, the preinstallation lead test must meet all of the requirements of a post installation leak test. For Gas Std. A-34, the following definitions shall apply:

  - A. A short section of pipe is defined as a single piece of pipe containing no girth welds.
  - B. A fabricated unit is an assembly of two or more fittings and/or pieces of pipe joined together, where more than 40 ft. of pipe is included in the unit; there shall be a full eight-hour test.



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### Appendix A (continued)

#### 7. Testing Emergency Pipe:

- A. The "Location Class," "Design Factor", "Present MAOP of Facility", "MAOP to be established by this test", "Design Pressure — This section (Future Design Pressure)", and "% of SMYS at Design Pressure" should not be specified on the strength test pressure report for the emergency pipe since it is not known at the time of the test where the pipe will be installed.
- B. It is recommended that all emergency pipe be tested to a minimum of 90% of SMYS for a minimum of four hours.
- C. The emergency pipe test information form (see Appendix H) shall be completed subsequent to the strength test and attached to the strength test pressure report.

For emergency repairs, some exceptions to the design and test requirements may be permitted but only with the approval of the Gas System Design Department.

#### 8. Testing Instrument Lines:

All instrument lines made of steel pipe and subjected directly to mainline gas pressures shall be tested in accordance with the applicable test requirements in the above table. It is not necessary to test tubing, but all fittings and connections should be checked for leaks after start-up.

9. Although the test duration for plastic pipe is five minutes, if the construction schedule permits, it is desirable to maintain the test pressure for a longer period of time. If the pipe is not gassed up on the same day as the test, it must be retested before gassing up.
10. All tests to over 50% SMYS should be performed with water as the test medium, unless such a test is impractical. Where a hydrostatic test is impractical, air or inert gas may be used, with the limitations shown in Note \_\_\_\_\_. Buildings within 300 of the test section must be evacuated during the test.
11. Test charts must be completed and retained as outlined in A-34, Paragraph 11.0.
12. Temperature of thermoplastic material must not be more than 100F during the test.
13. Table indicates test chart requirements for new facilities. Test charts are required for all uprating jobs regardless of the operating pressure of the line.
14. For facilities operating at under 30% SMYS and at or above 100 psig, the maximum test pressure is to be determined by the project engineer. A reasonable differential between maximum and minimum test pressures should be allowed, considering elevation differentials and the requirements of Note 3.
15. All test records must be retained for the life of the facility.
16. Testing using water, air, or inert gas is not normally permitted where the test section is isolated from an operating line only by a closed valve, squeeze off equipment, or plugging equipment, since leakage may occur creating an undesirable and potentially hazardous situation. If the test must be performed under this circumstance, prior approval must be obtained from a professional engineer (see Appendix I, Professional Engineering Review) and additional precautions may be required in order to minimize the possibility of an accident, for test limitations on valves, see Paragraph 9.
17. Where pipelines are installed on street or highway bridges under permits from governmental agencies, more stringent testing may be required by the agency than would be required by this Gas Standard. For pipelines designed to operate over 200 psig and located on California State bridges, the test pressure shall be maintained for a minimum of 24 hours.
18. Installation of a hot tap branch connection with reinforcement pad or sleeve: the branch to header weld shall be leak tested prior to the installation of the reinforcement pad or sleeve for a minimum of five minutes. The minimum test pressure shall be 100 psig.
19. Installation of line stopper fittings: after the fitting has been completely welded to the header and prior to tapping the header, the fitting shall be leak tested for a minimum of five minutes. The minimum test pressure shall be 100 psig.

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### Appendix B

#### Notes:

1. The symbols and abbreviations used in tables in these appendices refer to the following:
  - ERW – Electric Resistance Welded
  - DSAW – Double Submerged Arc Welded
  - SMYS – Specified Minimum Yield Strength
  - 20%, 30%, , etc. - 20%, 30%, of specified minimum yield strength.
2. A-25 and X-42 are the most economical choices for most applications through 10 inches Grade B is normally used when schedule 40 pipe is required.
  - X-52, X-60, and X-65 become desirable as diameters and operating pressures increase.
3. Other combinations of size, grade, and wall thickness are available.

Gas System Design should be consulted if pipe that is not shown is to be used, or if there is a question as to the most economical grade and wall thickness for a particular application.
4. When specifying pipe, the following information shall be given in sequence:
  - A. Outside diameter and wall thickness.
  - B. API Specification and grade.
  - C. Longitudinal seam welding process.
  - D. Coating: Specify bare or coated. If coated, the type of coating for each installation must be recorded in the permanent records (See Gas Std. E-10.).
  - E. PG&E code number. Refer to Gas Std. A-15 or M&S Code Book.
5. Examples:
  - A. Typical specification for ordering pipe:
    - 16" O.D. x .250 W.T.
    - API 5LX Grade X-42, ERW, Coated
    - Code No. 010131
  - B. Typical specification for permanent records:
    - 16" O.D. x .250 W.T.
    - API 5LX Grade X-42, ERW, Coated
    - Code No. 010131

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**Appendix B (continued)**

C. Typical bare pipe specification for either orders or records:

4.50" O.D. x .237 W.T.

API 5LX Grade X-42, ERW, Coated

Code No. 010131

6. "Standard Wall" pipe (See Gas Std. A-10 & A-10.1) is minimum allowable wall thickness for stations and bridge crossings. Minimum allowable wall thickness for sizes 2 inch thru 8 inch for use in gathering systems are indicated in appendices B & C of this standard. Consult the Gas System Design Department if further information is required.

**Table 2 Steel Pipe Specification – API 5L Grade B Seamless, 35,000 PSI Smys**

Nominal Pipe Size (Inches)	Outside Diameter <sup>3</sup> (Inches)	Wall Thickness <sup>3</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys							
				Class Location:							
				100%	90%	72%	60%	50%	40%	30%	20%
3/4 <sup>1</sup>	1.05	.113	700	7533	6780	5424	4520	3767	3013	2260	1507
1-1/4 <sup>1</sup>	1.66	.140	1300	5904	5313	4251	3542	2952	2361	1771	1181
2 <sup>1,2</sup>	2.375	.154	2500	4539	4085	3268	2723	2269	1816	1362	908
3 <sup>1</sup>	3.5	.216	2500	4320	3888	3110	2592	2160	1728	1296	864
4 <sup>1</sup>	4.5	.237	2210	3687	3318	2654	2212	1843	1474	1106	737
6 <sup>1</sup>	6.625	.280	1780	2958	2663	2130	1775	1479	1183	888	592
8 <sup>1</sup>	8.625	.322	1570	2613	2352	1881	1568	1307	1045	784	523
10	10.75	.365	1430	2377	2139	1711	1426	1188	951	713	475
12	12.75	.375	1240	2059	1853	1482	1235	1029	824	618	412
16	16.0	.375	980	1641	1477	1181	984	820	656	492	328
20	20.0	.375	790	1313	1181	945	788	656	525	394	263
24	24.0	.375	660	1094	984	788	656	547	438	328	219

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> Pipe is minimum allowable grade and wall thickness for use in Gas Field gathering systems with MAOP of 800 PSIG or less.

<sup>3</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

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**Table 3 Steel Pipe Specification – API 5L Grade B ERW, 35,000 PSI Smys**

Nominal Pipe Size (Inches)	Outside Diameter <sup>3</sup> (Inches)	Wall Thickness <sup>3</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys									
				Class Location:		1		2		3		4	
				100%	90%	72%	60%	50%	40%	30%	20%		
3 <sup>1,2</sup>	3.5	.156	1870	3120	2808	2246	1872	1560	1248	936	624		
4 <sup>1,2</sup>	4.5	.156	1460	2427	2184	1747	1456	1213	971	728	485		
6	6.625	.219	1390	2314	2083	1666	1388	1157	926	694	463		
8	8.625	.219	1070	1777	1600	1280	1066	889	711	533	355		
10	10.75	.219	860	1426	1283	1027	856	713	570	428	285		
12	12.75	.219	720	1202	1082	866	721	601	481	361	240		
14	14.0	.250	750	1250	1125	900	750	625	500	375	250		
16	16.0	.250	660	1094	984	788	656	547	438	328	219		

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> Pipe is minimum allowable grade and wall thickness for use in Gas Field gathering systems with MAOP of 800 PSIG or less.

<sup>3</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

**Table 4 Steel Pipe Specification – API 5L Grade A-25, Furnace Butt Weld<sup>2</sup>, 25,000 PSI Smys**

Nominal Pipe Size (Inches)	Outside Diameter <sup>3</sup> (Inches)	Wall Thickness <sup>3</sup> (Inches)	Mill Test Pressure (PSIG)	(Company's Operating Limit for A-25 Pipe is 400 PSIG)	Pressure at % of Smys
3 <sup>1</sup>	1.05	.113	700		>400
1-1/4 <sup>1</sup>	1.66	.140	1000		>400
2 <sup>1</sup>	2.375	.154	1000		389

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> Butt weld pipe has .6 joint factor. However, for pipe specified in Table, calculated pressures exceed the 400 PSIG company limit

<sup>3</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

Appendix C

Table 5 Steel Pipe Specification API 5L Grade X-42, 6” – 16” ERW, 18” – 42” DSAW, 42,000 Smys

Nominal Pipe Size (Inches)	Outside Diameter <sup>3</sup> (Inches)	Wall Thickness <sup>3</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys									
				Class Location:		1		2		3		4	
				100%	90%	72%	60%	50%	40%	30%	20%		
6	6.625	.156 <sup>1,2</sup>	1480	1978	1780	1424	1187	989	791	593	396		
		.172	1640	2181	1963	1570	1308	1090	872	654	436		
		.188 <sup>1</sup>	1790	2384	2145	1716	1430	1192	953	715	477		
8	8.625	.172 <sup>2</sup>	1260	1675	1508	1206	1005	838	670	503	335		
		.188 <sup>1</sup>	1370	1831	1648	1318	1099	915	732	549	366		
		.219 <sup>1</sup>	1600	2133	1920	1536	1280	1066	853	640	427		
10	10.75	.219	1350	1711	1540	1232	1027	856	685	513	342		
		.250 <sup>1</sup>	1660	1953	1758	1407	1172	977	781	586	391		
		.281	1860	2195	1976	1580	1317	1098	878	659	439		
		.365	2420	2852	2567	2054	1711	1426	1141	856	570		
12	12.75	.219	1230	1443	1299	1039	866	721	577	433	289		
		.250	1400	1647	1482	1186	988	824	659	494	329		
		.281 <sup>1</sup>	1570	1851	1666	1333	1111	926	741	555	370		
		.375 <sup>1</sup>	1750	2056	1850	1480	1233	1028	822	617	411		
16	16.0	.250	1120	1313	1181	945	788	656	525	394	263		
		.281	1250	1475	1328	1062	885	738	590	443	295		
		.375 <sup>1</sup>	1670	1969	1772	1418	1181	985	788	591	394		
18	18.0	.250	990	1167	1050	840	700	583	467	350	233		
		.312	1240	1456	1310	1048	874	728	582	437	291		
20	20.0	.250	940	1050	945	756	630	525	420	315	210		
		.281	1060	1180	1062	850	708	590	472	354	236		
		.312	1180	1310	1179	943	786	655	524	393	262		
		.344	1300	1445	1300	1040	867	722	578	433	289		
		.375	1420	1575	1418	1134	945	788	630	473	315		
22	22.0	.250	860	955	859	687	573	477	382	286	191		
		.312	1070	1191	1072	858	715	596	477	357	238		

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> Pipe is minimum allowable grade and wall thickness for use in Gas Field gathering systems with MAOP of 800 PSIG or less. Refer to Gas Std. B-20 for thin wall fittings suitable for welding to this pipe.

<sup>3</sup> In design formula for steel pipe, G.O. 112, §192.105. These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

Appendix C (continued)

Table 6 Steel Pipe Specification API 5L Grade X-42, 6” – 16” ERW, 18” – 42” DSAW, 42,000 Smys (Continued)

Nominal Pipe Size (Inches)	Outside Diameter <sup>1</sup> (Inches)	Wall Thickness <sup>1</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys									
				Class Location:		1		2		3		4	
				100%	90%	72%	60%	50%	40%	30%	20%		
24	24.0	.250	790	875	788	630	525	438	350	263	175		
		.281	890	984	885	708	590	492	393	295	197		
		.312	980	1092	983	786	655	546	437	328	218		
		.344	1080	1204	1084	867	722	602	482	361	241		
		.375	1180	1313	1181	945	788	656	525	394	263		
26	26.0	.281	820	908	817	654	545	454	363	272	182		
		.312	910	1008	907	726	605	504	403	302	202		
		.344	1000	1111	1000	800	667	556	445	333	222		
30	30.0	.406	1020	1137	1023	818	682	568	455	341	227		
		.438	1100	1226	1104	883	736	613	491	368	245		
		.469	1180	1313	1182	946	788	657	525	394	263		
32	32.0	.469	1110	1231	1108	886	739	616	492	369	246		
		.500	1180	1313	1181	945	788	656	525	394	263		
		.562	1330	1475	1328	1062	885	738	590	443	295		
34	34.0	.469	1040	1159	1043	834	695	579	463	348	232		
		.500	1110	1235	1112	889	741	618	494	371	247		
		.562	1250	1388	1250	1000	833	694	555	417	278		
36	36.0	.500	1050	1167	1050	840	700	583	467	350	233		
		.562	1180	1311	1180	944	787	656	525	393	262		
		.625	1310	1458	1313	1050	875	729	583	438	292		
40	40.0	.562	1060	1180	1062	850	708	590	472	354	236		
		.625	1180	1313	1181	945	788	656	525	394	263		
		.688	1300	1445	1300	1040	867	722	578	433	289		
42	42.0	.562	1010	1124	1012	809	674	562	450	337	225		
		.625	1120	1250	1125	900	750	625	500	375	250		
		.688	1240	1376	1238	991	826	688	550	413	275		

<sup>1</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

Appendix D

Table 7 Steel Pipe Specification – API 5L Grade X-52, 10” – 16” ERW, 18” – 42” DSAW, 52,000 Smys

Nominal Pipe Size (Inches)	Outside Diameter <sup>2</sup> (Inches)	Wall Thickness <sup>2</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys							
				Class Location:							
				100%	90%	72%	60%	50%	40%	30%	20%
10	10.750	.219	1800	2119	1907	1525	1271	1059	847	636	424
12	12.750	.219	1520	1786	1608	1286	1072	893	715	536	357
		.250	1730	2039	1835	1468	1224	1020	816	612	408
16	16.0	.250	1380	1625	1463	1170	975	813	650	488	325
		.281	1550	1827	1644	1315	1096	913	731	548	365
		.312	1720	2028	1825	1460	1217	1014	811	608	406
18	18.0	.250	1230	1444	1300	1040	867	722	578	433	289
20	20.0	.250	1170	1300	1170	936	780	650	520	390	260
		.281	1320	1461	1315	1052	877	731	584	438	292
		.312	1460	1622	1460	1168	973	811	649	487	324
		.344	1610	1789	1610	1288	1073	894	716	537	358
		.375 <sup>1</sup>	1760	1950	1755	1404	1170	975	780	585	390
22	22.0	.406	1900	2111	1900	1520	1267	1056	844	633	422
		.250	1060	1182	1064	851	709	591	473	355	236
24	24.0	.250	980	1083	975	780	650	542	433	325	217
		.281	1100	1218	1096	877	731	609	487	365	244
		.312	12220	1352	1217	973	811	676	541	406	270
		.344	1340	1491	1342	1073	894	745	596	447	298
		.375	1460	1625	1463	1170	975	813	650	488	325
26	26.0	.438	1710	1898	1708	1367	1139	949	759	569	380
		.281	1010	1124	1012	809	674	562	450	337	225
		.312	1120	1248	1123	899	749	624	499	374	250
		.344	1240	1376	1238	991	826	688	550	413	275
		.375	1350	1500	1350	1080	900	750	600	450	300

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> In design formula for steel pipe, G.O. 112, §192.105., These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

Appendix D (continued)

Table 8 Steel Pipe Specification – API 5L Grade X-52, 10” – 16” ERW, 18” – 42” DSAW, 52,000 Smys (Cont.)

Nominal Pipe Size (Inches)	Outside Diameter <sup>1</sup> (Inches)	Wall Thickness <sup>1</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys									
				Class Location:		1		2		3		4	
				100%	90%	72%	60%	50%	40%	30%	20%		
30	30.0	.375	1170	1300	1170	936	780	650	520	390	260		
		.406	1270	1407	1267	1013	844	704	563	422	281		
		.438	1370	1518	1367	1093	911	759	607	456	304		
32	32.0	.406	1190	1320	1188	950	792	660	528	396	264		
		.438	1280	1424	1281	1025	854	712	569	427	285		
		.469	1370	1524	1372	1097	915	762	610	457	305		
		.500	1460	1625	1463	1170	975	813	650	488	325		
34	34.0	.438	1210	1340	1206	965	804	670	536	402	268		
		.469	1290	1435	1291	1033	861	717	574	430	287		
		.500	1380	1529	1376	1101	918	765	612	459	306		
36	36.0	.438	1140	1265	1139	911	759	633	506	380	253		
		.469	1220	1355	1219	976	813	677	542	406	271		
		.500	1300	1444	1300	1040	867	722	578	433	289		
40	40.0	.500	1170	1300	1170	936	780	650	520	390	260		
		.562	1320	1461	1315	1052	877	731	584	438	292		
		.625	1460	1625	1463	1170	975	813	650	488	325		
42	42.0	.500	1110	1238	1114	891	743	619	495	371	248		
		.562	1250	1392	1252	1002	835	696	557	417	278		
		.625	1390	1548	1393	1114	929	774	619	464	310		

<sup>1</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).



Piping Design And Test Requirements

Appendix E

Table 9 Steel Pipe Specification – API 5L Grade X-60, 20” – 42” DSAW, 60,000 Smys

Nominal Pipe Size (Inches)	Outside Diameter <sup>2</sup> (Inches)	Wall Thickness <sup>2</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys							
				Class Location:							
				100%	90%	72%	60%	50%	40%	30%	20%
20	20.0	.250	1350	1500	1350	1080	900	750	600	450	300
		.281	1520	1686	1517	1214	1012	843	674	506	337
		.312	1680	1872	1685	1348	1123	936	749	562	374
		.375	2020	2250	2025	1620	1350	1125	900	675	450
22	22.0	.250	1230	1364	1227	982	818	682	545	409	273
24	24.0	.250	1120	1250	1125	900	750	625	500	375	250
		.281	1260	1405	1265	1012	843	703	562	422	281
		.312 <sup>1</sup>	1400	1560	1404	1123	936	780	624	468	312
		.375	1690	1875	1688	1350	1125	938	750	563	375
		.406	1830	2030	1827	1462	1218	1015	812	609	406
26	26.0	.281	1170	1297	1167	934	778	648	519	389	259
		.312	1300	1440	1296	1037	864	720	576	432	288
		.344	1430	1588	1429	1143	953	794	635	476	318
		.375	1560	1731	1558	1246	1038	865	692	519	346
		.406	1690	1874	1686	1349	1124	937	750	562	375
30	30.0	.375	1350	1500	1350	1080	900	750	600	450	300
		.406	1460	1624	1462	1169	974	812	650	487	325
		.438	1580	1752	1577	1261	1051	876	701	526	350
32	32.0	.375	1270	1406	1266	1013	844	703	563	422	281
		.406	1370	1523	1370	1096	914	761	609	457	305
		.438	1480	1643	1478	1183	986	821	657	493	329
34	34.0	.406	1290	1433	1290	1032	860	716	573	430	287
		.438	1390	1546	1391	1113	928	773	618	464	309
		.469	1490	1655	1490	1192	993	828	662	497	331
		.500	1590	1765	1588	1271	1059	882	706	529	353
36	36.0	.406	1220	1353	1218	974	811	677	541	406	271
		.438	1310	1460	1314	1051	876	730	584	438	292
		.469	1410	1563	1407	1126	937	782	625	469	313
		.500	1500	1667	1500	1200	1000	833	667	500	333
40	40.0	.438	1180	1314	1183	946	788	657	526	394	263
		.469	1270	1407	1266	1013	844	704	563	422	281
		.500	1350	1500	1350	1080	900	750	600	450	300
42	42.0	.469	1210	1340	1206	965	804	670	536	402	268
		.500	1290	1429	1286	1029	857	714	571	429	286
		.562	1450	1606	1445	1156	963	803	642	482	321

<sup>1</sup> Pipe normally in stock at Decoto Pipe Yard. For Code Numbers see Gas Std. A-15.

<sup>2</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

**Appendix F**

**Table 10 Steel Pipe Specification – API 5L Grade X-65, 34” – 42” DSAW, 65,000 Smys**

Nominal Pipe Size (Inches)	Outside Diameter <sup>1</sup> (Inches)	Wall Thickness <sup>1</sup> (Inches)	Mill Test Pressure (PSIG)	Pressure at % of Smys							
				Class Location:							
				100%	90%	72%	60%	50%	40%	30%	20%
34	34.0	.375	1290	1434	1290	1032	860	717	574	430	287
		.406	1400	1552	1400	1118	931	776	621	466	310
		.438	1510	1675	1510	1206	1005	837	670	502	335
36	36.0	.406	1320	1466	1320	1056	880	733	586	440	293
		.438	1420	1582	1424	1139	949	791	633	475	316
		.469	1520	1694	1524	1219	1016	847	677	508	339
		.500	1620	1806	1625	1300	1083	903	722	542	361
40	40.0	.438	1280	1424	1281	1025	854	712	569	427	285
		.469	1370	1524	1372	1097	915	762	610	457	305
		.500	1460	1625	1463	1170	975	813	650	488	325
42	42.0	.469	1310	1452	1307	1045	871	726	581	436	290
		.500	1390	1548	1393	1115	929	774	619	464	310
		.562	1570	1740	1566	1252	1044	870	696	522	348

<sup>1</sup> In design formula for steel pipe, G.O. 112, §192.105,. These correspond to outside diameter (D) and nominal wall thickness (+).

Piping Design And Test Requirements

**Appendix G**

**Notes:**

1. The minimum wall thickness and grade of material listed in the pipeline column are based on normal material availability and the minimum strength necessary to accommodate overburden stresses.
2. For fabricated assemblies/compressor stations (above ground piping), the minimum Grade B Material with standard or extra strong wall thickness is based on compatibility with standard and extra heavy wall fittings. Extra strong pipe should be used for all screwed connections through 2 inches nominal diameter.
  - A. Extra strong pipe through 2 inches nominal diameter is recommended for compressor stations because of the potential fatigue problems due to vibration.
  - B. All the above pipe is adequate for a 16,000 lb. wheel load with a minimum cover of 36 inches

**Table 11 Plain End Pipe Minimum Wall Thickness**

Nominal Pipe Size (Inches)	Outside Diameter (Inches)	Minimum Wall Thickness and Grade of Material	
		Pipeline (Inches)	Fabricated Assemblies/Compressor Stations (Inches)
3/4	1.050	—	.113/.154 (GR. B)
1	1.315	—	.113/.179 (GR. B)
1-1/4	1.660	—	.140/.191 (GR. B)
2	2.375	.154 (GR. B)	.154/.218 (GR. B)
3	3.5	(GR. B)	.216 (GR. B)
4	4.5	(GR. B)	.237 (GR. B)
6	6.625	(X-42)	.280 (GR. B)
8	8.625	(X-42)	.322 (GR. B)
10	10.750	(GR. B)	.365 (GR. B)
12	12.750	(GR. B)	.375 (GR. B)
14	14.0	(GR. B)	.375 (GR. B)
16	16.0	(GR. B)	.375 (GR. B)
18	18.0	(X-42)	.375 (GR. B)
20	20.0	(X-42)	.375 (GR. B)
22	22.0	(X-42)	.375 (GR. B)
24	24.0	(X-42)	.375 (GR. B)
26	26.0	(X-42)	.375 (GR. B)
30	30.0	(X-42)	.375 (GR. B)
32	32.0	(X-42)	.375 (GR. B)
34	34.0	(X-42)	.375 (GR. B)
36	36.0	(X-42)	.500 (GR. B)
40	40.0	(X-42)	.500 (GR. B)
42	42.0	(X-42)	.500 (GR. B)

Piping Design And Test Requirements

**Appendix H – Emergency Pipe Test Information Form**

1. This form is to be completed subsequent to the strength test and attached to the *Strength Test Pressure Report*.

**Part 1:**

2. This information is available from the completed Strength Test Pressure Report (Form 62–4921).

Location of Test	_____
Date of Test	_____
Duration of Test	_____ Hours _____ Minutes
Pipe Specification (O.D. x W.T. x Smys)	_____
Footage Tested	_____ Ft.
Test Pressure	_____ PSIG

**Part 2:**

3. For a given class location, this pipe may be used in pipeline facilities having future design pressures up to and including the pressure calculated in the “maximum pressure” column.

Class Location	Design Factor	Test Factor	Limited by Design Factor (1) PSIG	Limited by Test Pressure (2) PSIG	Allowable Use <sup>1</sup>	
					Maximum Pressure PSIG	Class Location
1	.72	1.25				1
2	.60	1.50				2
3	.50	1.50				3
4	.40	1.50				4

<sup>1</sup> When determining if the emergency pipe is qualified for a particular Gas facility (the class Location & Design Factor are specified), the Design Factor of the Gas Facility must be compared to the Design Factors are listed in the chart. For certain types of Gas Facilities, the Design are less than those in the chart. If the Design Factors are different, (2) must be recalculated using hte correct Design Factor, then compared to (2). The smaller of (1) and (2) will be the new “Maximum Pressure.”

$$(1) = \frac{2 \times \text{SMYS (psi)} \times \text{w.t. (inch)}}{\text{O.D. (inch)}} \times F$$

$$(2) = \frac{\text{Test pressure (From Part 1)}}{\text{Test factor}}$$

Maximum pressure – the smaller of (1) and (2)

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Piping Design And Test Requirements**

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**Appendix I****Requirements for Pipeline Plan and Profile/Sections Construction Drawings:**

1. Any gas pipeline work that is reportable to the CPUC (under Section 141.2 of G.O. 112-D) must have construction drawing that show plan and profile.
2. In addition, because the CPUC G.O. 112-D requirements are a minimum criteria and plan and profile/sections drawings demonstrate good pipeline engineering practice, it is required that plan and profile/sections drawings be used for pipeline work on the following critical lines, even if they are not reportable under Section 141.2:
  - All numbered transmission pipelines
  - DFMs that operate at or greater than 20% of SMYS
  - Any critical lines which operate over 60 psig and have elevation variations

**Drawing Format:**

3. The requirement for pipeline construction drawings can be met by using the existing 3 or 4-size plan and profile construction drawing format or a sections and details drawing format for small projects or simple offsets to clean underground structures.

**Technical Review:**

4. Any gas pipeline work that is reportable to the CPUC must have a technical review by a qualified engineer as designated by the manager responsible for the facilities.
5. In addition to the CPUC reportable projects, it is recommended that drawings for pipeline sections that are more than 100 ft. in length or 12 inches in diameter or larger, and are to be installed on bridges, also be submitted for technical review prior to being issued for bids or construction.

**Professional Engineering Review:**

6. There is currently no legal requirement for pipeline construction drawings\* (other than Civil and Structural drawings) to be stamped by a licensed Professional Engineer. However, it is current practice to stamp new construction drawings for gas facilities. To emphasize professional engineering review and focus accountability, all drawings for work on pipelines with a design pressure or future design pressure greater than 60 PSIG must be reviewed and stamped by a professional engineer. The engineer (civil or mechanical) must be currently registered in the State of California and competent in pipeline engineering as designated by the manager responsible for the facilities.

## Piping Design And Test Requirements

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### Appendix J

#### Required Information for Pipeline Construction Drawings:

##### Purpose and Scope:

1. This document has been prepared by the Gas System Design Department as a checklist for use in the preparation and review of pipeline construction drawings.
2. Plan and Profile/Sections
  - A. In plan view show dimensions from pipeline to fixed above-ground structures and/or property line. Show ETS's and all applicable details in the Reference Details section. Show right-of-way and all substructures. Clearly identify new, existing, or to-be-abandoned gas lines.
  - B. In profile view, or a section detail, identify significant offsets and approximate dimensions to substructures which require the offsets. Show stationing for survey details.
  - C. Specify minimum depth of cover.
  - D. In pipeline details stationing section, show stations for all pipeline details, including tie-ins, substructures, valves, elbows, and transition points (changes in pipe wall thickness, SMYS, coating, etc.), and ETS's. Indicate all applicable details (tie-ins, ETS's, etc.) shown in Reference Details section.
3. Bill of Materials are required for all pipeline drawings. Bill of Materials Section (include complete description of all items). Include all PG&E Material Codes and reference drawings or Gas Standards and Specifications.
  - A. Pipe - Indicate size, wall thickness, longitudinal seam type, grade, and specification to which pipe is to be manufactured. Also, identify type of coating (and joint tape).
  - B. Fittings - Indicate size, wall thickness, special end preparation, material and grade. Also, include the specification to which fitting is to be manufactured.
  - C. Valves – Indicate type of valve (ball, plug or gate, etc.), size pressure rating, type of end connections, type and configuration of operator (gearing or lever or automatic operated) with dimensions, Wall thickness of weld ends (if applicable), and the specification serial number to be As-Built — Serial No. \_\_\_\_\_.
  - D. Taps - Indicate type of reinforcement (including grade, wall thickness, size and specification of plate material to be used). Refer to appropriate Gas Standard and Specification for construction, either cold branch or hot tap.
  - E. Sleeves - Indicate size, wall thickness, grade and specification of plate material to be used. Also specify back up strips and appropriate Gas Standard and Specification for installation and fabrication of sleeve.
  - F. Casings - Indicate size, wall thickness, and grade. Also specify appropriate Gas Standard and Specification and vent material. Specify appropriate insulators and end seals.
  - G. Pipeline Markers - Specify type and appropriate Gas Standard and Specification.
  - H. Cathodic Protection - Specify type and location and appropriate Gas Standard and Specification. If an insulating fitting is to be installed, specify manufacturer, size, and type of end connections (wall thickness, grade and specification of the pipe to which fitting is to be welded.). If pipe flanges, insulating gasket, and insulating kits for bolts are to be used, be sure to specify pressure rating size and bore of flanges, size and number of bolts required, and size and number of insulating kits required.
4. Reference Details Section
  - A. Tie-in details – include diameter, wall thickness, grade, seam and specification of new pipe and the existing pipe to which new pipe is to be tied. No tie-in is to be made at a fitting or a valve. Also, because stresses due to pipe expansion and contract tend to be concentrated at elbows, if the new pipe is to be tied to existing pipe with a thinner wall thickness and the tie-in point is near an existing thin wall elbow or an elbow fabricated from sections of mitered pipe, the design should be changed to replace the existing elbow with one matching the strength of the new pipe.

**Piping Design And Test Requirements****Appendix J (continued)**

At the tie-in location, if there is a wall thickness difference greater than 3/32 inch or a pipe yield strength difference between the new and existing pipe, the applicable weld detail from GS&S D-22 must be shown on the drawing. In every case an attempt shall be made to attain an acceptable butt welded joint. However, if misalignment of carrier pipes or other problems preclude any reasonable possibility of obtaining an acceptable butt welded joint, then a sleeve should be used. The use of a single-split sleeve is preferred over the double-split sleeve for this purpose

- B. Welding details - show where there is a wall thickness change greater than 3/32" between adjoining pipe components. Detail at each change in line pipe. Line pipe to fitting detail can be typical.
  - C. Trench details - show a typical trench detail indicating minimum cover, back fill material and minimum trench width.
  - D. Crossing details - show railroad and highway crossings including casings and vents. Also, show locations of vent risers.
  - E. Cathodic protection details - show a detail for each type of cathodic protection station, and reference Gas Standard 0-10. For Type E stations, show the dimension between the connection points.
5. Miscellaneous Requirements:
- A. Design criteria stamps for all sizes, specifications, grades, seam types, wall thicknesses, and location class of pipe shown on specific Plan & Profile/Sections sheet. A design criteria stamp is required for each MAOP and for each test pressure.
  - B. Welding requirements stamp.
  - C. Testing requirements - including time duration of test and maximum and minimum pressures during tests. Fill out a Strength Test Pressure Report for each hydrotest performed.
  - D. Signatures of approving parties. Drawings must be signed by the Regional Gas Manager or his or her designated representative.
  - E. Be sure the following notes are on each sheet:
    - 1. "All field bends are smooth field bends, except where elbows are noted. Field bends shall be made in accordance with Gas Standard and Specification A-36, Section 4.4.3."
    - 2. "This Pipeline must be installed with at least 12 inches of clearance from any other underground structure not associated with the pipeline."
  - F. Listing of any reference drawings which are pertinent to the installation of the piping shown on the plan and profile sections of the drawing.
  - G. Indicate mile posts at beginning, and end of project. Also include mile post (or stationing) of any taps or valves being installed.
  - H. Special notes - include need to notify CPUC if required. Also indicate notification required to local agencies and PG&E personnel before starting work. Indicate any special constructions conditions imposed by CPUC, local agencies, or PG&E.
  - I. When hot tapping is required, indicate maximum pressure allowed in pipeline during welding and tapping operations.
  - J. All pipeline plan and profile/sections construction drawings for work on pipelines with a Design Pressure or Future Design Pressure greater than 60 psig shall be reviewed, signed and stamped by a Professional Engineer. The engineer (mechanical or civil) must be currently registered in the State of California and competent in pipeline engineering as designated by the manager responsible for the facilities.

Revision 00 has the following changes: Converted Gas Standard 087950 (A-34) to Interleaf Document 087950 (A-34). Added Appendices A-I. Rearranged contents; completely revised text, table and graphics numbering streams; reset Revision number stream to zero. This document also supersedes Gas Standard 284283 (A-34).