PURPOSE

1. To establish a uniform procedure for designing and testing gas piping systems that will meet the requirements of G.O. 112C §192.101 and §192.501 of the CPUC.

RESCISSION

2. Supersedes earlier letter and instructions, including:
   a. Letter, April 2, [redacted] to Division Gas Superintendents, "Marking Estimates for Work on Piping Systems *Designed to Operate at Stress Levels Over 20% of the Specified Minimum Yield Strength*".
   b. Letter, May 4, 1962, [redacted] to Division Gas Superintendents, "Replacement of Pipe in Mains Operating at Stress Levels Over 20% of the Specified Minimum Yield Strength".
   c. Letter, March 25, 1936, [redacted] to Division Managers, calling attention to the serious consequences that may result when main or services are damaged.

POLICY AND APPLICATION

3. All gas piping systems and facilities both new and reconstructed are to be designed and tested in accordance with the requirements of G.O. 112C. This includes the reinstating of abandoned or temporarily disconnected piping.

RESPONSIBILITY

4. The Supervisor in charge of engineering and installation shall be responsible for design and testing, respectively, of pipe facilities in accordance with this Standard. Other provisions required by G.O. 112C of the CPUC shall be observed.

DEFINITIONS

5. The following definitions shall apply to this Standard:
   a. Stress is the resultant internal force that resists change in size or shape of 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 is the maximum operating pressure permitted by G.O. 112C as determined by the design procedures *applicable to the material and locations involved.*
   e. Maximum Allowable Operating Pressure (MAOP) is the maximum pressure at which a gas system may be operated in accordance with the provisions of G.O. 112C.
   f. Maximum Operating Pressure (MOP) is the maximum operating pressure existing in a piping system during a normal annual operating cycle, or as specified by the Manager of G.S.D. DEPT. and in conformance with SP. 463-8.
   g. Test Medium is a substance such as water, air, or gas through which a force acts 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. Location Class is a geographic area as classified and described in G.O. 112C §192.5.
   l. Construction Type is a construction specification for pipeline and mains that fixes the stress levels.
   m. Specified Minimum Yield Strength (SMYS) is the minimum yield strength prescribed by the specification under which the pipe is purchased from the manufacturer (psi).

APPROVED	CHG	DATE	DESCRIPTION	BY	CH.	APPD.
	2	2-17-72	Revised Title For Computer Listing, Also Paragraphs 1, 3, & 5e		M.C.	[illegible]
	1	9-10-70	Revised Par. 5f.			[illegible]

SUPV. BY	PIPING — DATA SHEET	SUPERSEDES 084509	
DSGN.	DESIGN AND TEST REQUIREMENTS	SUPERSEDED BY	
DR.	GAS STANDARD	SHEET NO. 1 OF 4 SHEETS	
CH.	PACIFIC GAS AND ELECTRIC COMPANY	DRAWING NUMBER	CHANGE
O.K.	SAN FRANCISCO, CALIFORNIA	283621	2
DATE 2-11-69	SCALE NONE		

DESIGN

6. When determining MAOP consideration shall be given to:

   a. Future development of the area.

   b. Current and future Gas Supply Pressures.

   c. Probability of increase in Supply Pressure.

7. Initial Construction

   Design all gas facilities to meet the requirements of the expected future location class.

8. Addition to Existing Facilities

   The design requirements for subsequent additions or alterations to existing pipeline facilities shall be at least equivalent to that of the original construction.

9. Facilities designed to either type A and B construction or which deviate from the steel pipe specifications (Appendix B,C and D) shall be submitted to the Gas System Design Department for approval.

10. Pressure ratings for fittings, valves, and other piping components shall be equal to or greater than the design pressure established for the piping system.

TESTING

11. The test medium shall be one permitted for the design pressure and location class as specified in G.O. 112C §192.503. 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.

12. Test Pressure shall not be less than that required by G.O. 112C §192.501 to test the tightness and strength of a system, except as modified by paragraph 13, all lines shall be tested in accordance with Appendix A.

13. Exceptions:

   Short replacement shall be treated as follows.

   a. Replacement section of pipe shall be subjected to a preinstallation strength test. The section of replacement pipe shall be tested to the pressure required for a new pipeline or main installed in the same location by maintaining the pressure at or above the test pressure for at least four hours. The test may be made on the replacement pipe prior to installation provided all tie-in girth welds are nondestructively tested.

14. Damaged service lines shall be repaired if necessary, and then tested in accordance with Appendix A.

APPROVED	CHG	DATE	DESCRIPTION	BY	CH.	APPD.
	2	2-17-72	Revised Title For Computer Listing & Paragraphs 11,12 & K.		M.C.	
	1	9-10-70	Revised Par. 13a			

SUPV. BY	PIPING — DATA SHEET	SUPERSEDES 084509	
DSGN.	DESIGN AND TEST REQUIREMENTS	SUPERSEDED BY	
DR.	GAS STANDARD	SHEET NO. 2 OF 4 SHEETS	
CH.	PACIFIC GAS AND ELECTRIC COMPANY	DRAWING NUMBER	CHANGE
O.K.	SAN FRANCISCO, CALIFORNIA	283621	2
DATE 2-11-69	SCALE NONE		

RECORDS

15. a. For facilities operating above 100 psi, estimate sketches and design drawings shall contain:

DESIGN CRITERIA:

1. Location Class_____
2. Design Factor_____
3. Design Pressure_____
4. % of S.M.Y.S._____
5. M.A.O.P._____
6. % of S.M.Y.S._____
7. Strength T.P._____
   Max._____
   Min._____
8. Test Fluid_____
9. Pipe Specs._____
   Pipe Dia._____ W.T._____

b. Leak test information shall be recorded on the gas service record, the estimate sketch, and work order or other authorized form for facilities operating under 100 psig.

c. Estimate Form 62-6251 shall be marked by person making estimate to indicate that the pipe is over 20% yield and has to be strength tested.

d. Strength test pressure report form 62-4921 shall be made whenever a test is required. See Appendix A. A copy of the strength test pressure report shall be filed with the completed foreman's copy of the estimate for the life of the facility. Distribute other copies as indicated on the form.

APPROVED						
	1	2-17-72	Revised Title For Computer Listing & Revised Design Criteria		M.C.	
	CHG	DATE	DESCRIPTION		BY CH.	APPD.

SUPV. BY	PIPING — DATA SHEET	SUPERSEDES 084509	
DSGN.	DESIGN AND TEST REQUIREMENTS	SUPERSEDED BY	
DR.	GAS STANDARD	SHEET NO. 3 OF 4 SHEETS	
CH.	PACIFIC GAS AND ELECTRIC COMPANY	DRAWING NUMBER	CHANGE
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TEST REQUIREMENTS FOR PIPELINES, MAINS AND SERVICES

Design Pressure	30% SMYS or More	Under 30% SMYS & Over 100 Psi	100 Psi to 1 Psi or Less	Plastic
Type of Test	Strength	Strength	Leak	Strength
Test Medium	Water, Air, Inert Gas or Gas (1) (2)	Water, Air, Inert Gas or Gas (1) (2)	Air or Gas	Air or Gas
Max. Test Pressure (2)	100% SMYS (4) Factory Test press. of fitting (3)	1.50 DP (3)	100 Psi	3x DP
Min. Test Pressure	1.50 DP	1.50 DP	100 Psi	100 Psi
Duration of Test	8 Hours Minimum (5)	1 Hour Minimum	5 Minutes	5 Minutes (6)

Notes: (1) Maximum test pressure percent of SMYS - Location Class

	1	2	3	4
Air or Inert Gas	80	75	50	40
Gas	80	30	30	30

(2) Safety - when testing with air, inert gas, or gas, the pressure shall be held at about 100 psi and observed for leakage before raising to the required test value.

(3) Max. test capabilities of fittings such as valves and elbows should be examined when testing.

(4) It is the intent to test at pressure over 90% of SMYS and as close to SMYS as practical. There may be instances, as in Item 3, where pressures shall be limited, but in no case shall it be less than 1.5 DP.

(5) Short Sections - on short section of pipe where post installation test is not practical, a preinstallation test may be conducted for a minimum 4 hour period.

(6) Hold at test pressure for as long as practical. If not gassed up immediately following test, retest before gassing up.

(7) Temperature of thermoplastic material must not be more than 100°F during the test.

APPROVED	CHG	DATE	DESCRIPTION	BY	CH.	APPD.
	4	2-17-72	Revised Title For Computer Listing, Change To 30 SMYS & Note 4		M.C.	
	3	1-71	Added Note 7, Revised Wording Under 20% And Duration Of Test.			
	2	10-70	Redrawn			

SUPV. BY	
DSGN.	
DR.	
CH.	
O.K.	
DATE	2-11-69
SCALE	NONE

PIPING — DATA SHEET

DESIGN AND TEST REQUIREMENTS

GAS STANDARD

PACIFIC GAS AND ELECTRIC COMPANY

SAN FRANCISCO, CALIFORNIA

SUPERSEDES 084509

SUPERSEDED BY

SHEET NO. 4 OF 4 SHEETS

DRAWING NUMBER 283621

CHANGE 4