CHART III

WELDING REPAIR SELECTION CHART FOR MAINS WITH DESIGN PRESSURE LEVEL 20% OR MORE OF SPECIFIED MINIMUM YIELD STRENGTH OR OVER 500 PSI AND ALL TRANSMISSION LINES

TYPE OF DEFECT	EXTENT OF DEFECT	PERMISSIBLE METHODS OF REPAIR	LIMITATIONS ON METHOD
1. MECHANICAL DAMAGE: NOTCHES, SCRATCHES, GOUGES, GROOVES, OR LEAKAGE CAUSED BY OTHER THAN CRACKED WELDS OR CORROSION.	A. DEPTH LESS THAN 10% OF PIPE WALL.	1. GRINDING.	PIPE WALL NOT TO BE REDUCED TO LESS THAN 90% OF NOMINAL WALL THICKNESS (92% ON WELDED PIPE 20" O.D. OR LARGER). DENT OR DISTORTION LESS THAN 2% OF O.D. (1/4" FOR PIPE LESS THAN 12.750" O.D.)
	B. DEPTH OVER 10% OF PIPE WALL. D.P., LESS THAN 40% S.M.Y.S.	1. SLEEVING - MAIN TO BE TAPPED SO THAT FULL ENCIRCLEMENT SLEEVE CARRIES PRESSURE.	LESS THAN 2% DISTORTION OR DENT. MAXIMUM SPACE BETWEEN PIPE AND SLEEVE IS 1/16": WELDS UNDER SLEEVE GROUND SMOOTH. BACK-UP STRIP BEHIND LONGITUDINAL WELDS. PRESSURE TO BE REDUCED TO PRODUCE STRESS LESS THAN 20% S.M.Y.S. DURING REPAIR.
	C. DEPTH OVER 10% OF PIPE WALL. LEAKAGE OR DESIGN PRESSURE OF 40% OR MORE S.M.Y.S.	1. TAKE SEGMENT OUT OF SERVICE. CUT OUT CYLINDRICAL PIECE OF PIPE. REPLACE IT WITH PIPE OF SIMILAR OR GREATER DESIGN STRENGTH.	IF TAKING THE MAIN OUT OF SERVICE IS NOT FEASIBLE, REPAIR WITH SLEEVE AS IN 1.B.1.
2. CORROSION DAMAGE (SHORT, LOCALIZED AREAS OF CORROSION WITH A DEPTH OF MORE THAN 10% OF THE PIPE WALL MAY NOT REQUIRE REPAIR. EACH SUCH CASE MUST BE REVIEWED WITH GAS SYSTEM DESIGN DEPT.)	A. DEPTH LESS THAN 10% OF PIPE WALL.	1. NO REPAIR REQUIRED.	
	B. DEPTH OVER 10% OF PIPE WALL (INCLUDING CORROSION PITS WHICH ARE CAUSING LEAKAGE) D.P. LESS THAN 40% S.M.Y.S.	1. PATCHING.	PIPE OF NOT MORE THAN 40,000 P.S.I., S.M.Y.S.. THE REPAIR MAY BE MADE BY FILLET WELDING OVER THE PITTED AREA A STEEL PLATE PATCH WITH ROUNDED CORNERS, OF THE SAME OR GREATER THICKNESS THAN THE PIPE, AND NOT larger THAN ONE HALF THE DIAMETER OF THE PIPE SIZE.
		2. SLEEVING.	SAME AS 1.B.1. NO TAPPING OF MAIN REQUIRED.
		3. LEAK CLAMPS.	COMPANY APPROVED CLAMPS.
	C. DESIGN PRESSURE OF 40% OR MORE OF S.M.Y.S.	1. SAME AS 1.C.1.	SAME AS 1.C.1.
3. LEAKS IN WELDS.	A. ALL	1. SAME AS 1.C.1.	SAME AS 1.C.1.
4. CRACKS OR DEFECTS IN WELD	A. CRACK THAT IS MORE THAN 2" LONG OR PENETRATES EITHER THE ROOT OR SECOND BEAD.	1. SAME AS 1.C.1.	SAME AS 1.C.1.
	B. OTHER SMALL DEFECTS.	1. DEFECT REMOVED AND REWELDED.	AT LEAST 1/8" WALL THICKNESS REMAINING, PRESSURE TO BE REDUCED TO PRODUCE STRESS THAT IS NOT MORE THAN 20% OF S.M.Y.S. OF THE PIPE DURING REPAIR. INSPECT REPAIR; IF DEFECT REMAINS REPAIR AS IN 1.C.1.
5. LEAKS IN BODY OF FITTINGS OR IN CLAMPS.		1. REPLACE FITTING.	X-RAY TIE-IN WELDS. IF ANY.

APPROVED BY [redacted]

CHG	DATE	DESCRIPTION	BY	CH.	APPD.	GM

SUPV. BY
DSGN.
DR. [redacted]
CH.
O.K.

DATE 4-17-73 | SCALE NONE

PIPING – DATA SHEET

WELDING AND REPAIRS ON LINES UNDER PRESSURE

GAS STANDARD
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

SUPERSEDES 084491, SH.6
SUPERSEDED BY
SHEET NO. 283906 | SHEETS | CHANGE

CHART II

WELDING REPAIR SELECTION CHART FOR MAINS WITH MAXIMUM ALLOWABLE OPERATING PRESSURE GREATER THAN 100 PSIG BUT DESIGN PRESSURE LEVEL LESS THAN 20% OF SPECIFIED MINIMUM YIELD STRENGTH OR 500 PSIG, WHICHEVER IS LESS*

Type of Defect	Extent of Defect	Permissible Methods of Repair	Limitations on Method
1. Mechanical Damage Notches, Scratches, Gouges, Grooves.	a. Depth less than 10% of pipe wall	1. Grinding	Less than 5% Distortion or Dent. Pipe wall not to be reduced to less than 90% thickness.
	b. Depth between 10% and 30% of pipe wall.	1. Grinding & Welding	Less than 5% Distortion or Dent. Repair not to exceed ¼ of pipe circumference nor 4 square inches. Not more than one repair per 5 pipe diameters of length.
		2. Patching - Main to be tapped so that patch carries pressure.	Patch not to exceed ½ pipe circumference. No limit on length for pipe thru 8-5/8" O.D. Length not over 10 diameters on pipe over 8-5/8" O.D. Less than 5% distortion or dent. 6" minimum clearance.
		3. Sleeving-Main to be tapped so sleeve carries pressure.	Less than 5% distortion or Dent. Main to be tapped so that sleeve carries pressure.
	c. Depth over 30% of pipe wall.	1. Patching	Same as 1 b 2.
		2. Sleeving	Same as 1 b 3.
2. Corrosion Damage	a. Depth less than 20% of pipe wall	1. No repair required.	
	b. Depth between 20% and 30% of pipe wall.	1. Grinding & welding.	Same as 1 b 1
		2. Patching	Same as 1 b 2. No tapping of main required.
		3. Sleeving	No limitation. No tapping of main required.
		4. Mueller Nipple	2" Maximum size.
		5. Leak Clamp	Company approved leak clamps.
	c. Depth over 30% of pipe wall.	1. Patching	Same as 1 b 2. No tapping of main required.
		2. Sleeving	No limitation. No tapping of main required.
		3. Mueller Nipple	2" Maximum size.
		4. Leak Clamp	Company approved leak clamps
3. Leaks in Welds	a. Porosity or pinholes.	1. Patching	Same as 1 b 2.
		2. Sleeving	No limitation.
		3. Mueller Nipple	2" Maximum size.
4. Cracked Welds	a. Circumferential Welds	1. Sleeving	No Limitation.
	b. Longitudinal Seam Welds	1. Patching	Patch must extend to ½ of pipe circumference. No limit on length of patch for pipe thru 8-5/8" O.D. Length not to exceed 10 diameters on pipe over 8-5/8" O.D.
		2. Sleeving	No limitation.
5. Leaks in body of fittings or in clamps.		1. Remove Fitting	No limitation.
		2. Canning or encasing	Approval required by Gas System Design Department

*Does not include Transmission Lines. See Chart III for all Transmission Lines.

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SHEET 5 OF 5 SHEETS
P. G. and E. CO.
DRAWING NUMBER 084491
CHANGE 1