

IDENTIFICATION OF STEEL PIPE

PURPOSE

1.1 To assist in the identification of steel pipes based on visual inspection of certain characteristics that occur due to the method to manufacture.

GENERAL

2.1 Steel pipe can be classified into five groups related to the method of manufacture. These five groups are seamless, electric resistance welded, electric fusion welded, lap welded, and butt or continuous welded.

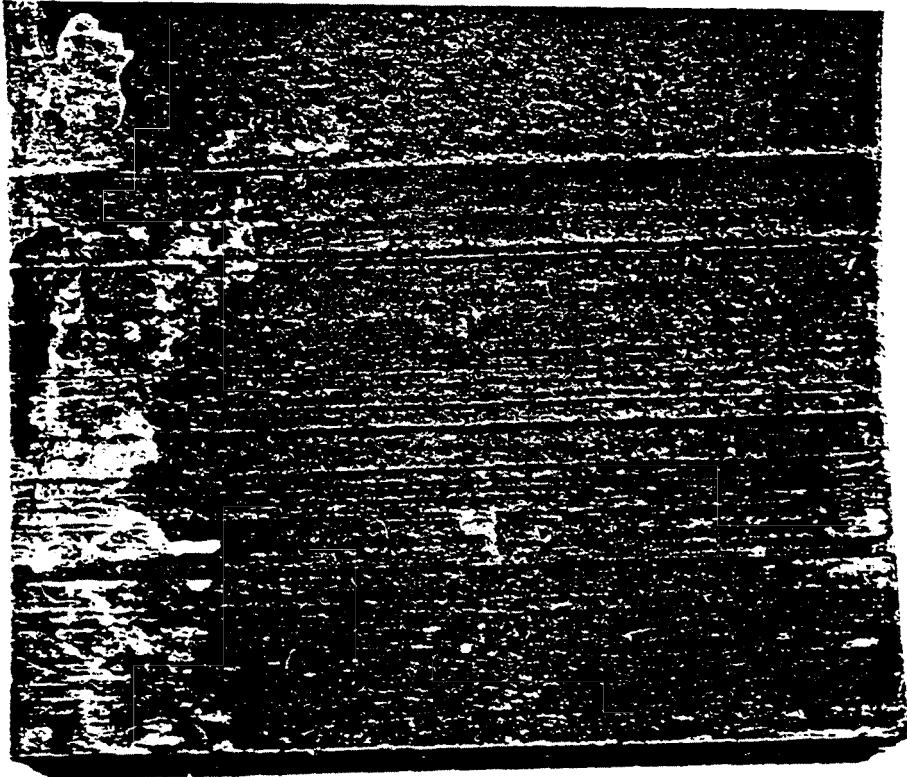
DEFINITIONS

- 3.1 Skelp: A long length of hot rolled steel sheet from which a welded pipe is formed.
- 3.2 Seamless: No seam; produced by spinning and pushing a heated billet over a stationary piercing mandrel.
- 3.3 Electric Resistance Welded: Pipe having a longitudinal butt joint wherein coalescence is produced by the heat obtained from resistance of the pipe to the flow of electric current in a circuit of which the pipe is a part.
- 3.4 Electric Fusion Welded: Pipe having a longitudinal butt joint wherein coalescence is produced in the preformed tube by manual or automatic electric-arc-welding.
- 3.5 A. O. Smith Process: Pipe edges are butted and flashed. The flash weld is followed by a cover pass with electric fusion weld using a filler electrode.
- 3.6 Lap Welded: An obsolete process: Pipe having a longitudinal lap joint made by the forge welding process wherein coalescence is produced by heating the preformed tube to welding temperature and passing it over a mandrel located between welding rolls which compress and weld the overlapping edges.
- 3.7 Butt Weld: A. Bell - the longitudinal butt joint is forge welded by the mechanical pressure developed in drawing the furnace-heated skelp through a cone-shaped die which serves as a combined forming and welding die.  
 B. Continuous - the longitudinal butt joint is forge welded by the mechanical pressure developed in rolling the hot-formed skelp through a set of round pass welding rolls.

| 2  | R-5-76 PAGE 12 - Chg'd yield of butt weld from 25,000 to 30,000 |             |   |      |      |
|--|---|-------------|---|------|------|
| 1  | 7-26-73 PAGE 12 - BROUGHT UP TO DATE                            |             |   |      |      |
| CHG.   | DATE  | DESCRIPTION | APPR.   | CHG. | DATE |
| APPROVED <i>[Signature]</i><br>BY _____<br>DSGN. _____<br>DR. _____<br>CH. _____<br>O.K. _____<br>DATE 1-8-70 SCALE _____                    |   |             |   |      |      |
| <b>PIPING - DATA SHEET</b><br><b>IDENTIFICATION OF STEEL PIPE</b><br>GAS STANDARD<br>PACIFIC GAS AND ELECTRIC COMPANY<br>SAN FRANCISCO, CAL. |   |             | SUPERSEDES _____<br>SUPERSEDED BY _____<br>SHEET No. 1 OF 12 SHEETS<br>DRAWING NUMBER <b>085053</b> CHANGE <b>2</b> |      |      |

VISUAL CHARACTERISTICS

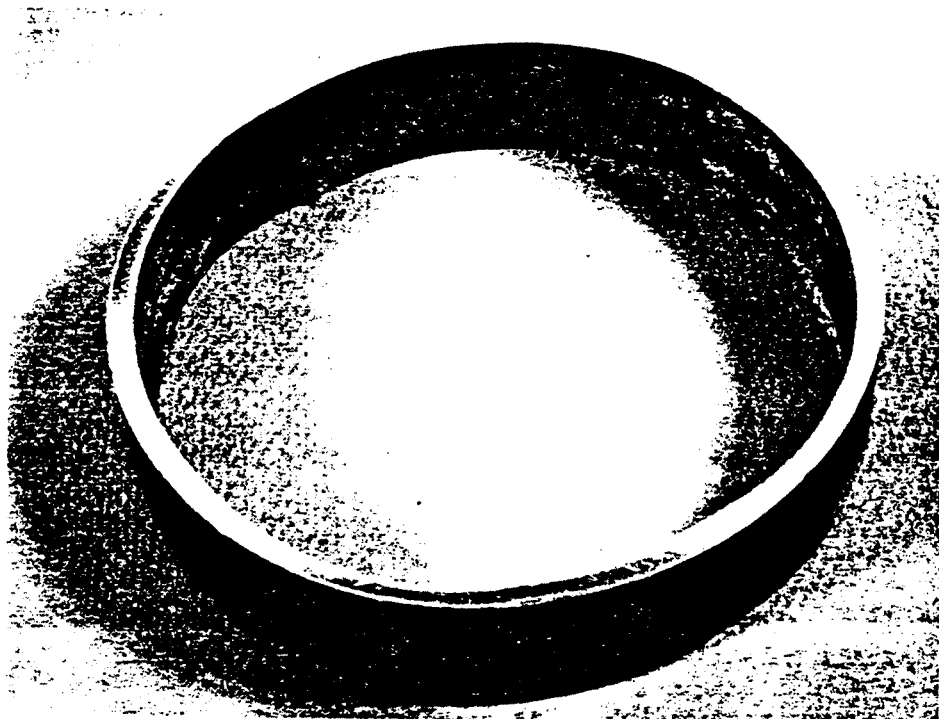
- 4.1 Seamless Pipe: (View 1)
- A) Absence of welded seam;
  - B) Longitudinal internal mandrel scores;
  - C) Non-uniform wall thickness.



One imperfection produced into the pipe during fabrication is the longitudinal internal mandrel scores in varying degrees of depth and quantity.

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4.1 (Con't) Seamless Pipe (View 2)



A small variation in wall thickness can be seen in this sample of seamless pipe.

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## 4.2 Electric Resistance Welded Pipe: (View 3)

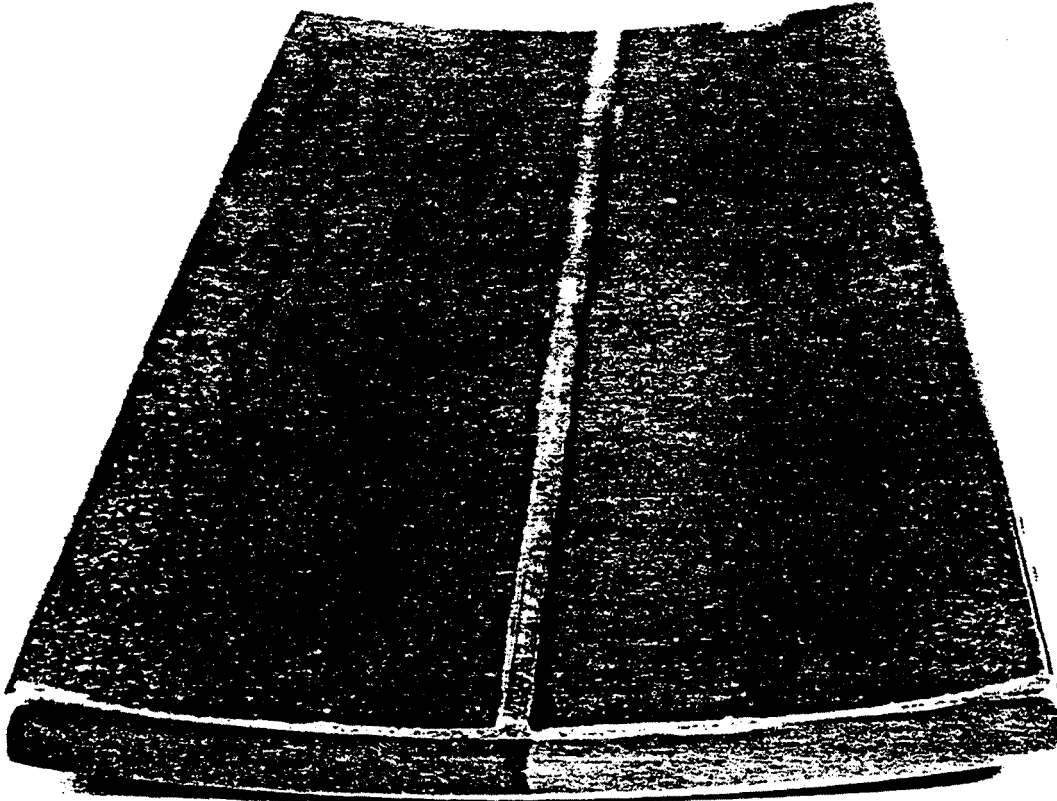
- A) Uniform wall thickness;
- B) Slight upset (as shown) on internal surface is normal. External surface shows cutting tool marks where upset has been trimmed.
- C) Note thin white line at point of fusion. This is characteristic of E.R.W. pipe.



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4.2 (Con't) Electric Resistance Welded Pipe: (View 4)



- A) The dark area around the weld and the upset identify these samples as electric resistance welded pipes. Notice that the external upset has been trimmed.
- B) Note thin white line at point of fusion. This is characteristic of E.R.W. pipe.

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4.3 Electric Fusion Welded Pipe: (View 5)

- A) Uniform wall thickness;
- B) Smooth internal and external surfaces;
- C) Prominent fusion weld bead present on both surfaces if double submerged arc and on external surface if single submerged arc.



This sample is easily identifiable as double submerged arc because of the prominent weld bead on both internal and external faces.

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4.3 (Con't) Electric Fusion Welded Pipe: (View 6) (A. O. Smith Process)

- A) Uniform wall thickness;
- B) Smooth internal and external surfaces;
- C) Uneven external weld and internal wedge shaped upset.

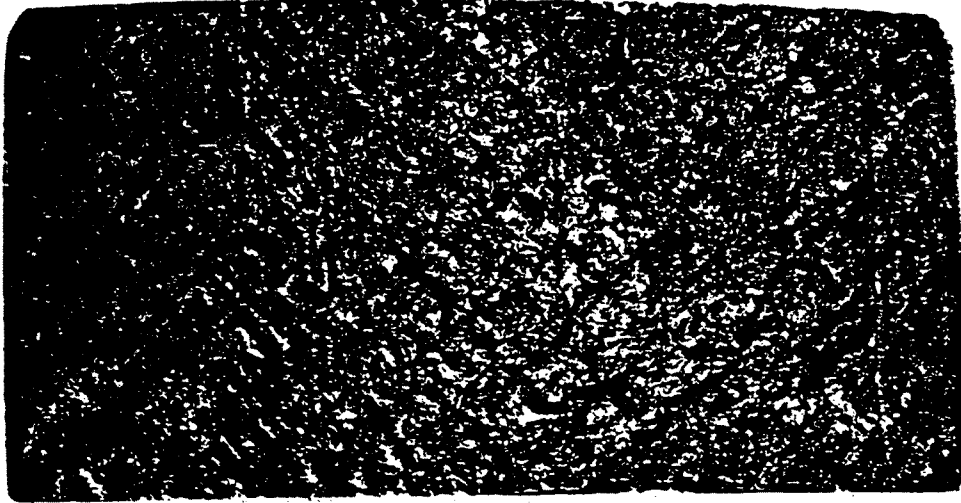


The large rough external weld bead and wedge shaped internal upset makes this sample easily identifiable as being manufactured by the A. O. Smith Process.

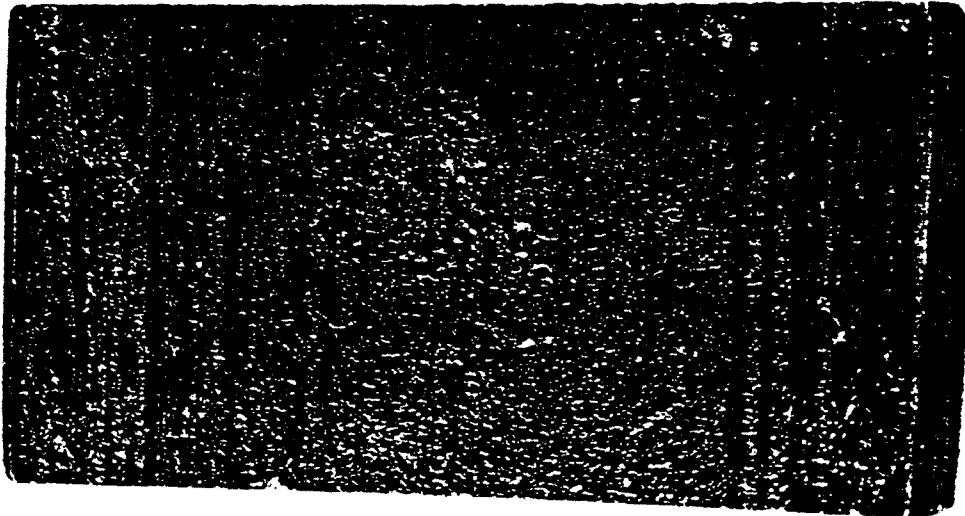
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4.4 Lap Welded Pipe: (Views 7 and 7a)

- A) Prominent external herringbone or knurled pattern;
- B) Internal longitudinal marks;
- C) Lap weld sometimes visible as irregular line on either surface.



External surface showing knurled pattern.



Internal surface showing longitudinal marks.

|                                      |                |        |
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4.4 (Con't) Lap Welded Pipe: (View 8)

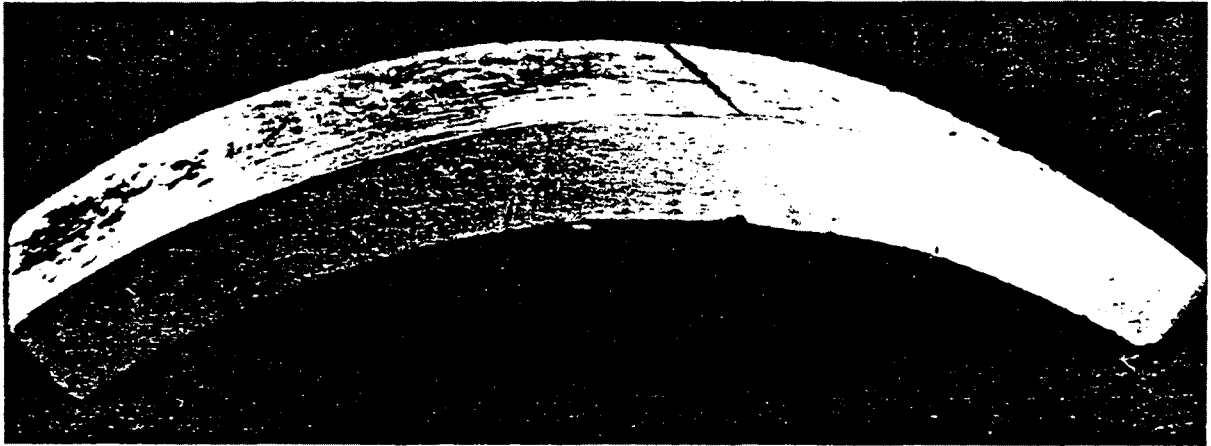


The weld joint in this lap weld can be seen as a dark, but indistinct line.

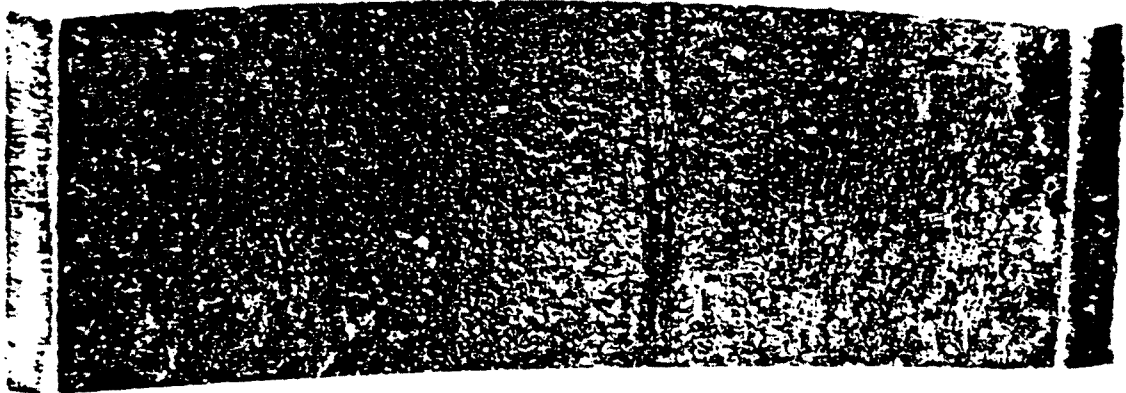
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4.5 Butt Weld (Bell and Continuous): (View 9 and 9a)

- A) Smooth internal and external surfaces;
- B) Visible straight line weld internally or externally.



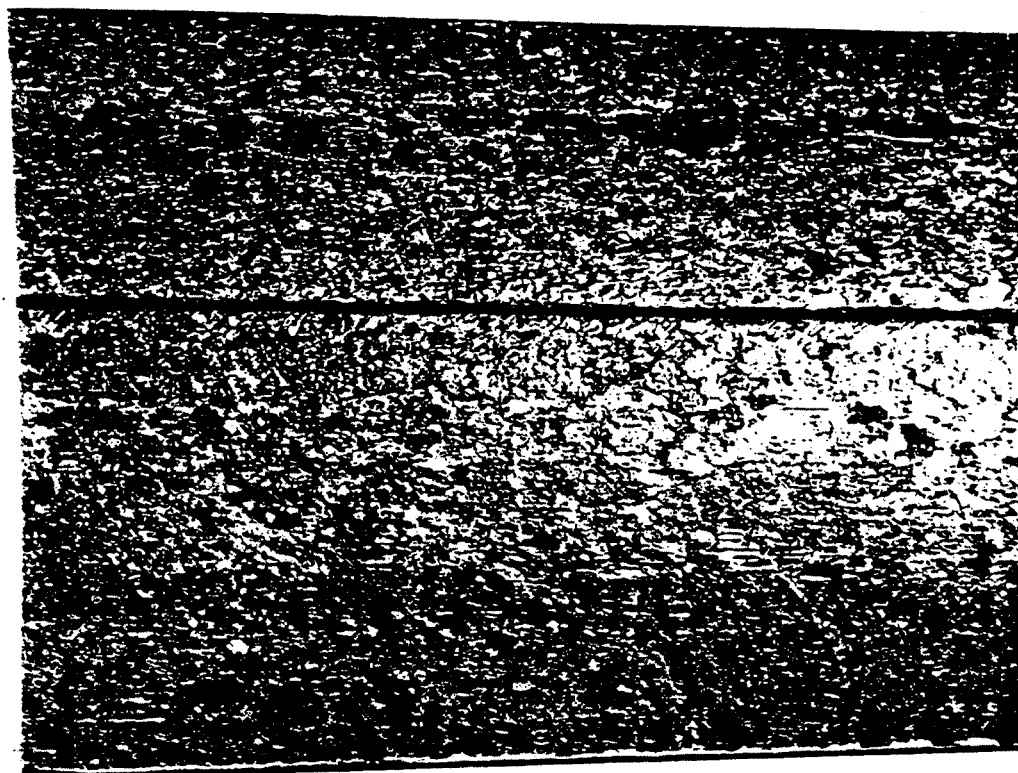
External surface showing smooth surface and straight weld line.



Internal surface showing smooth surface and straight weld line.

|                                     |                |        |
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4 (Con't) Butt Weld: (View 10)



The external weld line is  
visable in this sample of butt welded  
pipe.

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PIPE IDENTITY BY SIZE

The following table based on the historical pipe purchases by the Company, indicates the probable types of pipes that could be found for various sizes:

| <u>PURCHASE DATE</u> | <u>SIZE</u>   | <u>TYPE PIPE</u>                                 | <u>JOINT EFFICIENCY</u> | <u>APPROXIMATE YIELD STRENGTH PSI</u> |
|----------------------|---------------|--|-------------------------|---------------------------------------|
| 1920/1927            | 3/4" - 4"     | Butt Weld  | .60                     | 28,000                                |
|                      | 6" and Larger | Lap Weld   | .80                     | 28,000                                |
| 1927/1930            | 3/4" - 4"     | Butt Weld  | .60                     | 28,000                                |
|                      | 6" and Larger | Lap Weld   | .80                     | 28,000                                |
|                      | 6" and Larger | Seamless   | 1.00                    | 30,000                                |
|                      | 20" - 26"     | Single Submerged Arc Weld and A.O. Smith Process | .80                     | 33,000                                |
| 1930/1948            | 3/4" - 4"     | Butt Weld  | .60                     | 28,000                                |
|                      | 3/4" - 24"    | Seamless   | 1.00                    | 30,000                                |
|                      | 20" - 24"     | Single Submerged Arc Weld                        | .80                     | up to 39,000                          |
| 1941/1948            | 6" - 16"      | Elec. Resistance Weld                            | 1.00                    | 30,000                                |
| 1949/1974            | 10" - 18"     | Elec. Res. Weld                                  | 1.00                    | 42,000 - 52,000                       |
|                      | 3/4" - 12"    | Seamless   | 1.00                    | 35,000                                |
|                      | 16" - 24"     | Seamless   | 1.00                    | 35,000 - 42,000                       |
|                      | 18" - 36"     | Double Submerged Arc Weld (Expanded)             | 1.00                    | 42,000 - 60,000                       |
| 1949/1972            | 3/4" - 3"     | Butt Weld  | .60                     | 25,000 - 28,000                       |
|                      | 4" - 8"       | Elec. Res. Weld                                  | 1.00                    | 35,000 - 42,000                       |
| 1973/1974            | 3/4" - 3"     | Butt Weld  | .60                     | 25,000                                |
|                      | 3" - 8"       | Elec. Res. Weld                                  | 1.00                    | 42,000                                |
| 1975 to date         | 3/4" - 2"     | Butt Weld  | .60                     | 25,000                                |
|                      | 3" - 8"       | Elec. Res. Weld                                  | 1.00                    | 35,000 - 42,000                       |
|                      | 10" - 18"     | Elec. Res. Weld                                  | 1.00                    | 42,000 - 60,000                       |
|                      | 3/4" - 12"    | Seamless   | 1.00                    | 35,000                                |
|                      | 18" - 42"     | Double Submerged Arc Weld (Expanded)             | 1.00                    | 42,000 - 65,000                       |

Note: Years in which a type pipe was installed may not agree completely with this standard due to special purchases, or older pipe being held in inventory.

P G &amp; E CO.

SHEET 12 OF 12 SHEETS

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CHANGE

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