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will require a stress-relieving treatment.

(d) Cold bending of carbon-steel and ferritic-alloy steel pipe in sizes and wall thicknesses less than specified in 129.3.3 of ASME B31.1 (incorporated by reference; see 46 CFR 56.01–2) may be used without a postheat treatment.

(e) For other materials the heat treatment of bends and formed components must be such as to ensure pipe properties that are consistent with the original pipe specification.

(f) All scale shall be removed from heat treated pipe prior to installation.

(g) Austenitic stainless-steel pipe that has been heated for bending or other forming may be used in the ''as-bent'' condition unless the design specification requires post-bending heat treatment.

[CGFR 68–62, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9979, June 17, 1970; CGD 73–254, 40 FR 40166, Sept. 2, 1975; USCG–2003–16630, 73 FR 65185, Oct. 31, 2008]

## Subpart 56.85—Heat Treatment of Welds

### § 56.85–5 Heating and cooling method.

Heat treatment may be accomplished by a suitable heating method that will provide the desired heating and cooling rates, the required metal temperature, metal temperature uniformity, and temperature control.

[USCG–2003–16630, 73 FR 65185, Oct. 31, 2008]

### § 56.85–10 Preheating.

(a) The minimum preheat temperatures listed in Table 56.85–10 for P-number materials groupings are mandatory minimum pre-heat temperatures. Preheat is required for Class I, I-L, I-N, II-N and II-L piping when the ambient temperature is below 50 °F.

(b) During the welding of dissimilar materials, the minimum preheat temperature may not be lower than either the highest temperature listed in Table 56.85–10 for any of the materials to be welded or the temperature established in the qualified welding procedure.

(c) The preheat temperature shall be checked by use of temperature-indicating crayons, thermocouples, pyrometers, or other suitable methods to ensure that the required preheat temperature is obtained before, and uniformly maintained during the welding.

TABLE 56.85–10—PREHEAT AND POSTHEAT TREATMENT OF WELDS

| ASME Sec IX Nos. | Preheat required | | | Post heat treatment requirement (1)(2) | | |
|---|---|---|---|---|---|---|
| | | | | | Time cycle | |
| | Minimum wall (3)(4) (inch) | Minimum temperature (5)(6)(°F) | Minimum wall and other (3)(4)(17)(inch) | Temperature (7)(8)(9)(10)(11)(12)(°F)(inch) | Hour per inch of wall (3)(4) | Minimum time within range (hour) |
| P–1(16) | All | 50 (for .30 C. maximum or less) (13). | Over ¾ in | 1,100 to 1,200 (minimum) (maximum). | 1 | 1 |
| P–1(16) | All | 175 (for over .30 C.) (13) and wall thickness over 1 in. | do | do | 1 | 1 |
| P–3(15) | All walls | 175 | Over ½ in | 1,200 to 1,350 (minimum) (maximum). | 1 | 1 |
| P–4(15) | Up to ¾ in inclusive. | 300 | Over ½ in or over 4 in nom. size or. | 1,330 to 1,400 (minimum) (maximum). | 1 | 1 |
| | Over ¾ in | 400 | Over .15 C. maximum. | | | |
| P–5(15) (less than 5 cr.). | Up to ¾ in inclusive. | 300 | Over ½ in or over 4 in. nom. size or. | 1,300 to 1,425 (minimum) (maximum). | 1 | 1 |
| | Over ¾ in | 400 | Over 0.15 C. maximum. | | | |
| P–5(15) (5 cr. and higher). | Up to ¾ inclusive. | 300 | All walls | do | 1 | 2 |

TABLE 56.85–10—PREHEAT AND POSTHEAT TREATMENT OF WELDS—Continued

| ASME Sec IX Nos. | Preheat required | | | Post heat treatment requirement (1)(2) | | |
|---|---|---|---|---|---|---|
| | Minimum wall (3)(4) (inch) | Minimum temperature (5)(6)(°F) | Minimum wall and other (3)(4)(17)(inch) | Temperature (7)(8)(9)(10)(11)(12)(°F)(inch) | Time cycle | |
| | | | | | Hour per inch of wall (3)(4) | Minimum time within range (hour) |
| | Over ¾ in ..... | 400 ..... | Over 0.15 C. maximum. | | | |
| P–6 ..... | All walls ..... | 300 (14). ..... | All walls ..... | 1,400 to 1,500 (minimum) (maximum). | 1 | 2 |
| P–8 ..... | .....do ..... | None required | .....do ..... | None required. | | |

For P–7, P–9A, P–9B, P–10C and other materials not listed the Preheat and Postheat Treatment is to be in accordance with the qualified procedure.

Notes Applicable to Table 56.85–10:

(1) Not applicable to dissimilar metal welds.

(2) When postheat treatment by annealing or normalizing is used, the postheat treatment temperatures must be in accordance with the qualified welding procedure.

(3) Wall thickness of a butt weld is defined as the thicker of the two abutting ends after end preparation including I.D. machining.

(4) The thickness of socket, fillet, and seal welds is defined as the throat thicknesses for pressure and nonpressure retaining welds.

(5) Preheat temperatures must be checked by use of temperature indicating crayons, thermocouple pyrometers, or other suitable method.

(6) For inert gas tungsten arc root pass welding lower preheat in accordance with the qualified procedure may be used.

(7) The maximum postheat treatment temperature listed for each P number is a recommended maximum temperature.

(8) Postheat treatment temperatures must be checked by use of thermocouple pyrometers or other suitable means.

(9) Heating rate for furnace, gas, electric resistance, and other surface heating methods must not exceed: (i) 600 °F per hour for thicknesses 2 inches and under.

(ii) 600 °F per hour divided by ½ the thickness in inches for thickness over 2 inches.

(10) Heating route for induction heating must not exceed:

(i) 600 °F per hour for thickness less than 1½ inches (60 and 400 cycles).

(ii) 500 °F per hour when using 60 cycles and 400 °F per hour when using 400 cycles for thicknesses 1½ inches and over.

(11) When local heating is used, the weld must be allowed to cool slowly from the postheat treatment temperature. A suggested method of retarding cooling is to wrap the weld with asbestos and allow to cool in still air. When furnace cooling is used, the pipe sections must be cooled in the furnace to 1000 °F and may then be cooled further in still air.

(12) Local postheat treatment of butt welded joints must be performed on a circumferential band of the pipe. The minimum width of this band, centered on the weld, must be the width of the weld plus 2 inches.

Local postheat treatment of welded branch connections must be performed by heating a circumferential band of the pipe to which the branch is welded. The width of the heated band must extend at least 1 inch beyond the weld joining the branch.

(13) 0.30 C. max applies to specified ladle analysis.

(14) 600 °F maximum interpass temperature.

(15) Welding on P–3, P–4, and P–5 with 3 Cr max. may be interrupted only if—

(i) At least ⅜ inch thickness of weld is deposited or 25 percent of welding groove is filled, whichever is greater;

(ii) The weld is allowed to cool slowly to room temperature; and

(iii) The required preheat is resumed before welding is continued.

(16) When attaching welding carbon steel non-pressure parts to steel pressure parts and the throat thickness of the fillet or partial or full penetration weld is ½ in. or less, postheat treatment of the fillet weld is not required for Class I and II piping if preheat to a minimum temperature of 175 °F is applied when the thickness of the pressure part exceeds ¾ in.

(17) For Class I-L and II-L piping systems, relief from postweld heat treatment may not be dependent upon wall thickness. See also §§56.50–105(a)(3) and 56.50–105(b)(3) of this chapter.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 69–127, 35 FR 9980, June 17, 1970; CGD 72–104R, 37 FR 14234, July 18, 1972; CGD 72–206R, 38 FR 17229, June 29, 1973; CGD 73–254, 40 FR 40166, Sept. 2, 1975; CGD 77–140, 54 FR 40615, Oct. 2, 1989; USCG–2003–16630, 73 FR 65185, Oct. 31, 2008]