

<<Preheat Guides for ASME Section I Code>>

The need for and the temperature of preheat are dependent upon a number of factors such as chemical analysis, degree of restraint of the parts being joined, elevated temperature mechanical properties, and material thicknesses.

ASME Section I Rules for Construction of Power Boilers:

PW-10 HEAT TREATMENT: Vessels and vessel parts shall be preheated in accordance with the requirements in **PW-38**

PW-38.1: Some practices used for preheating are described in **Appendix A-100** as a general guide for the materials listed by **P-Number grouping of QW-420 of ASME Section IX**.

Min. Preheat Temperature provided in Appendix A-100.4

The WeldCanada.com software supports ASME Section I Code, and includes references to preheat data of Appendix A-100.4. When choosing this code from drop-down feature in WPS or PQR form, for any material and P-Number grouping that you select from the database, recommended preheat temperature will be added to your form automatically!

Note: All materials listed by **P-Number grouping of QW-420 of ASME Section IX**

A-100.3 Thicknesses referred to in A-100.4 is nominal thicknesses at the weld for the parts to be joined.

A-100.2 Welding Different P-Number Materials:

When parts of two different P-Number are joined by welding, the minimum preheat temperature required in Welding Procedure Specification (WPS) will be the higher temperature for the materials to be welded.

<<Postweld Heat Treatment Guides for ASME Section I Code>>

ASME Section I Rules for Construction of Power Boilers:

PW-10 Heat Treatment: Vessels and vessel parts shall be postweld heat treated in accordance with the requirements in **PW-39**

Mandatory Requirements for Postweld Heat Treatment of Pressure Parts and Attachments, provided in Tables PW-39-1 through PW-39-14

The WeldCanada.com software supports ASME Section I Code, and includes references to PWHT data of Tables PW-39-1 through PW-39-14. When choosing this code from drop-down feature in WPS or PQR form, for any material and P-Number grouping that you select from the database, recommended preheat temperature will be added to your form automatically!

<<Postweld Heat Treatment Guides for ASME Section I Code>>

ASME Section I Rules for Construction of Power Boilers:

Note 1: All materials listed by **P-Number** grouping of **QW-420** of **ASME Section IX**

Note 2: For PWHT at lower temperatures for longer periods of time, when permitted in Tables PW-39-1 through PW-39-14, See **Table PW-39.1** (Alternate PWHT for Carbon and Low Alloy Steels)

**Summary of Requirements for Postweld Heat Treatment, as PW-39:
(Please See your Code for full detail requirements):**

- (a) Pressure part welds and attachment welds using ferritic filler metals that have a specified chromium content of more than 3% shall receive a postweld heat treatment.
- (b) The holding time at temperature as specified in Tables PW-39-1 through PW-39-14 need not be continuous. It may be an accumulation of time of multiple postweld heat treat cycles.
- (c) Time and temperature specified in Tables for PWHT are MINIMUM
- (d) The term “**nominal thickness**” (T) as used in Tables PW-39-1 through PW-39-14 is defined as follow:

- For full penetration butt welds, T is thinner of the parts being joined.
- For full penetration corner welds, T is the depth of the weld.
- For partial penetration groove and repair welds, T is the depth of the weld.

Note: Use total depth of partial or full penetration groove welds made from both sides, as sum of the depth of both sides at a given location.

- For fillet welds, T is the weld throat.

Note: For fillet weld in conjunction with a groove weld, T is either the depth of the groove weld or the fillet throat dimension, whichever is greater.

- For welded nozzle and other connections to shells, drums, and headers (See Figure PW-16.1), the nominal thickness is the depth of the groove, if present, through the shell or nozzle or reinforcing pad, or the throat of any fillet weld, whichever is greater.

Note: For multiple openings (See Figure PW-16.1), where the spacing between centers is less than twice the average diameter, the nominal thickness of a combination groove and fillet weld shall be the sum of the groove depth and fillet weld throat.

<<Postweld Heat Treatment Guides for ASME Section I Code>>

ASME Section I Rules for Construction of Power Boilers:

(e) When pressure parts of two different P-Number are joined by welding, the post weld heat treatment shall be that specified for the material requiring the higher PWHT temperature, **EXCEPT as noted in PW-39.2.1** (when attaching P-No. 4 or P-No. 5A tubes or pipe to headers of lower P-No. under certain requirements specified in PW-39.2.1).

(f) When non-pressure parts are welded to pressure parts, the postweld heat treatment temperature of pressure parts shall control.

(g) **Clause PW-39.3:** In the procedures that follow, the volume of metal required to be heated, to meet or exceed the minimum PWHT temperature listed in Tables PW-39-1 through PW-39-14, is defined as the **SOAK BAND**. As a minimum, the soak band shall contain the weld and a portion of the base metal on each side of the weld being heat treated, including the weld heat affected zones (HAZ). The width of each portion of base metal to be included in the soak band shall be equal to the lesser of the vessel or shell thickness, or 2 in. (50 mm). A greater amount of base material, on either or both sides of the weld, may also be heated to permit temperature gradient control.

<<Preheat and Postweld Heat Treatment Guides for ASME Section IX Code>>

ASME Section IX (Welding and Brazing Qualifications)

QW-406: PREHEAT Preheat, as one of the Essential Variables, is addressed for each welding processes for the purpose of qualification or re-qualification of a welding procedure (any increase or decreases of preheat temperature qualified, changes to interpass temperature qualified, etc.).

ASME Section IX (Welding and Brazing Qualifications)

QW-407: POSTWELD HEAT TREATMENT (PWHT)

PWHT, as one of the Essential Variables, is addressed for each welding processes for the purpose of qualification or re-qualification of a welding procedure for any of the conditions like: with PWHT, no PWHT, changes to PWHT time and temperature range, performance method of PWHT based on P-Number grouping [PWHT below the lower transformation temperature, above the upper transformation temperature (normalizing), between the upper and lower transformation temperature, PWHT above the upper transformation temperature followed by heat treatment below the lower transformation temperature (i.e. normalizing or quenching followed by tempering) or PWHT within a special temperature range, etc.]

Note: All heat treatment data should be recorded during performance of PQR test(s). All essential and non-essential variables, minimum preheat temperature, maximum interpass temperature, as well as PWHT (when performed in PQR) should be shown in WPS.