

<<Preheat Guides for ASME B31.1 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 B31.1 Power Piping Code:

Min. Preheat Temperature provided in Clause 131.4 (Table 131.4.1-1)

The WPSAmerica.com software supports ASME B31.1 Code, and includes references to preheat data of Clause 131.4 (Table 131.4.1-1). 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**

Thickness referred in Table 131.4.1-1 is the greater of the nominal thicknesses at the weld of the parts to be joined.

Clause 131.2 Different P-Number Materials:

When parts of two different P-Number are joined by welding, the minimum preheat temperature required shall be the higher temperature for the materials to be welded.

<<Postweld Heat Treatment Guides for ASME B31.1 Code>>

ASME B31.1 Power Piping Code:

PWHT provided in Table 132.1.1-1

The WPSAmerica.com software supports ASME B31.1 Code, and includes references to PWHT data of Table 132.1.1-1. 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**

Clause 132.2 Mandatory PWHT Requirements (Table 132.1.1-1):

-The upper limit of the PWHT temperature range in **Table 132.1.1-1** is a recommended value that may be exceeded provided the actual temperature does not exceed the lower critical temperature of either material (See Table 129.3.1-1)

-When 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.

ASME B31.1 Power Piping Code:

-When a non-pressure part is welded to pressure part and PWHT is required for either part, the maximum PWHT temperature shall not exceed the maximum temperature acceptable for the pressure retaining part.

-Caution is necessary to preclude metallurgical damage to some materials or welds not intended or qualified to withstand the PWHT temperature required. The use of material transition joint designs may be required.

-The designer may require PWHT even if not mandatory per **Table 132.1.1-1** or **Table 132.2-1**

Clause 132.1.3 For ASTM A335 **P36** and ASTM A182 **F36**, PWHT is mandatory under all conditions. Postweld heat treatment shall be in accordance with **Table 132.1.3-1**

Clause 132.3 Exemptions to Mandatory PWHT Requirements (Table 132.2-1):

Clause 132.3.1 PWHT is not required for the following conditions unless required by the qualified WPS or the designer:

- welds in nonferrous materials
- welds exempted in **Table 132.1.1-1** or **Table 132.2-1**
- welds subject to temperatures above the lower critical temperature (see Table 129.3.1-1) during fabrication provided the WPS has been qualified with PWHT at the temperature range to be reached during fabrication

Clause 132.4 Definition of Thickness Governing PWHT:

Clause 132.4.1 The term **Control Thickness**, as used in **Table 132.1.1-1**, **Table 132.2-1**, and **Notes** is the lesser thickness of (A) or (B) as follow:

- (A) the thickness of the weld
- (B) the thicker of the materials being joined at the weld or the thickness of the pressure-containing material, if the weld is attaching a nonpressure-containing material to a pressure containing material.

Clause 132.4.2 Definition of **thickness of the weld** (T), which is a factor in determining the control thickness, is defined as follows:

- For Groove welds, T is the thicker of two abutting ends after weld preparation, including I.D. machining
- For Fillet welds, T is the throat thickness of the weld
- For Partial penetration welds, T is the depth of the weld groove
- For Material repair welds, T is the depth of the cavity to be repaired
- For Branch welds, See Clause 132.4.2 for formula and figure description

Clause 132.4.3 The term **Nominal Material Thickness**, as used in **Table 132.2-1** is the thicker of the pressure-retaining materials being joined at the weld.

<< Preheat and Postweld Heat Treatment Guides for ASME 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.