

<<Preheat Guides for ASME Section VIII Div. 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 Section VIII Division 1 Rules for Construction of Pressure Vessels:

Min. Preheat Temperature provided in Appendix R

The WPSAmerica.com software supports ASME Section VIII Code Div. 1, and includes references to preheat data of Appendix R. 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**

Appendix R Welding Different P-Number Materials:

When parts of two different P-Number groups 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 VIII Div. 1 Code>>

ASME Section VIII Division 1 Rules for Construction of Pressure Vessels:

POSTWELD HEAT TREATMENT: UW-40, UCS-56, UHA-32, UNF-56, UHT-56

UW-40 Procedure for Heat Treatment: Pressure Vessels Fabricated by Welding shall be postweld heat treated in accordance with the requirements in **UW-40, UCS-56, Table UCS-56 and Table UCS-56.1, UHA-32 and Table UHA-32, UNF-56, UHT-56 and Table UHT-56**

Mandatory Requirements for Postweld Heat Treatment of Pressure Vessels Fabricated by Welding, provided in Tables UCS-56, UCS-56.1, UHA-32, and UHT-56

The WPSAmerica.com software supports ASME Section VIII Div. 1 Code, and includes references to PWHT data of Tables UCS-56, UCS-56.1, UHA-32, and UHT-56. 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 VIII Div. 1 Code>>

ASME Section VIII Division 1 Rules for Construction of Pressure Vessels:

Summary of Procedures for Postweld Heat Treatment (UW-40):

(Please See your Code for full detail requirements):

(I) All materials listed in all Tables by **P-Number grouping of QW-420 of ASME Section IX**

(II) Time and temperature specified in Tables for PWHT are MINIMUM

(III) UW-40 (f): The term “**nominal thickness**” (T) as used in Tables UCS-56-1 through UCS-56-11, UCS-56.1, UHA-32-1 through UHA-32-7, and UHT-56 is the thickness of the weld joint **as defined below**. For pressure vessels or parts of pressure vessels being postweld heat treated in a furnace charge, it is the **greatest weld thickness** for all weld types as defined in (1) through (6) below in any vessel or vessel part that has not previously been postweld heat treated.

1-For full penetration butt welds, when the weld joint connects parts of the same thickness, T is the total depth of the weld exclusive of any permitted weld reinforcement

2-For groove welds, T is the depth of the groove. For single or double-sided groove welds, the nominal thickness is the total depth of the groove.

3-For fillet welds, T is the weld throat dimension

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

4-For stud welds, T is the diameter of the stud

5-When a welded joints connects parts of unequal thicknesses:

T shall be as (a) the thinner of two adjacent butt-welded parts including head to shell connections [see definition of thickness on (b) (c) (d) in regards to figures UW-13.1 sketch (e), Fig. 2-4 (7), Fig. UW-16.1, and Fig. UW-16.2] (e) the thickness of the nozzle neck or shell or head or reinforcing pad or attachment fillet weld, whichever is the greater (f) the thickness of the weld at the point of attachment when a non-pressure part is welded to a pressure part (g) the thickness of the tube in tube-to-tube sheet connections. (h) the thickness of the weld metal overlay when weld metal overlay is the only welding applied

6-For repairs, T is the depth of the repair weld

7-The thickness of the head, shell, nozzle neck, or other parts as used in (1) through (6) above shall be the wall thickness of the part at the welded joint under consideration. For plate material, the thickness as shown on the Material Test Report or material Certificate of Compliance before forming may be used, at the Manufacturer’s option, in lieu of measuring the wall thickness at the welded joint.

<<Postweld Heat Treatment Guides for ASME Section VIII Div. 1 Code>>

ASME Section VIII Division 1 Rules for Construction of Pressure Vessels:

[UHT-56 (d): For PWHT of connections and attachments, use the **greatest thickness** of material at the point of attachment of the head or shell]

[UHT-56 (a): For clad or weld deposit overlaid vessels or parts of vessels, the total thickness of the material, including the clad and weld deposit overlay, shall be employed]

(IV) UW-40 (d): When pressure parts of **two different P-Numbers** are joined by welding, **engineering judgment shall be applied** when selecting PWHT temperature and holding time to produce material properties suitable for the intended service. Alternatives such as welding with buttering as described in Section IX, QW-283 may be considered.

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

(VI) UW-40 (a): The operation of PWHT shall be performed in accordance with the requirements given in the applicable Part in Subsection C using one of the procedures described in UW-40. In the procedures that follow, the volume of metal required to be heated, to meet or exceed the minimum PWHT temperature (listed in Tables UCS-56-1 through UCS-56-11), 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 minimum width of this volume is the widest width of weld plus 1t or 2 in. (50 mm) whichever is less, on each side or end of the weld [t is nominal thickness as defined in item **(III)** above].

See References and important notes on the next page.

<<Postweld Heat Treatment Guides for ASME Section VIII Div. 1 Code>>

ASME Section VIII Division 1 Rules for Construction of Pressure Vessels:

References and important notes:

Part UW (Requirements for Pressure Vessels Fabricated by Welding):
Procedures for PWHT: See UW-40

Part UCS (Requirements for Pressure Vessels Constructed of Carbon and Low Alloy Steels):
Requirements for PWHT: See UCS-56, Tables of UCS-56 and Table UCS-56.1

Part UHA (Requirements for Pressure Vessels Constructed of High Alloy Steel):
Requirements for PWHT: See UHA-32 and Tables of UHA-32

Part UHT (Requirements for Pressure Vessels Constructed of Ferritic Steels with Tensile Properties Enhanced by Heat Treatment):
Requirements for PWHT: See UHT-56 and Table UHT-56

Part UNF (Requirements for Pressure Vessels Constructed of Nonferrous Materials):
Requirements for PWHT: See UNF-56
UNF-56 For Nonferrous Materials, PWHT is not normally necessary nor desirable, except in UNF-56 (c) (d) (e) for heat treatment data for some alloys. PWHT only should be conducted by agreement between user and manufacturer.

Notes to consider in ASME Section VIII Division 1:

*****See UHT-82(f) for extra requirements of essential variables, in addition to variables in ASME Section IX, for SA-508 and SA-543 materials (P-No.11B Group 10, and P-No.11A Group 5)**

*****See UHT-82(g) for extra requirements of essential variables, in addition to variables in ASME Section IX, for SA-517 and SA-592 materials (P-No.11B Group 1, 2, 3, 4, 6, and 8)**

*****See UCS-56 (f) Weld Repair, for extra requirements of essential variables, in addition to variables in ASME Section IX, for Repair of Pressure Vessels (Groove welds)**

<<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.