

POSITIVE MATERIAL IDENTIFICATION-PMI

The purpose of PMI is to ensure that materials are correctly supplied and/or installed, as specified. This guideline is applicable to pressure-retaining equipment and piping fabricated from Cr-Mo, Cr-Ni-Mo, Ni alloy steel, Ni based alloys, and other alloys as specified in the Purchase Order and/or related documents.

Materials requiring PMI per this guideline are identified in Table 1. Components exempt from PMI are listed following Table 2. When required by the Purchase Order, PMI testing shall be performed on each alloy component of a pressure-retaining assembly. This shall include each individual segment of pipe, welds, each plate, and other base materials (i.e., forgings, fittings, furnace tubing, tube sheets, etc.) provided by the Seller. Alloy portion of clad and/or weld overlay components shall receive PMI testing, regardless of whether the cladding or overlay has been considered in the pressure calculations. Carbon steel components are exempt from PMI unless alloying elements are critical to corrosion resistance, therefore a requirement for PMI of CS will be noted in the Purchase Order. As an example, a minimum of 0.10% silicon content is critical to the corrosion resistance of carbon steels in sulfidizing environments.

Table 1: Materials and Components Requiring PMI

ITEM	VERIFICATION REQUIRED
Carbon Steels ¹ or Cast Irons	No - Unless noted in P.O.
Alloy Pressure Piping (Spools, Fittings, Straight-Run Pipe)	Yes - 100%
Alloy Pressure Vessels Components (Pressure retaining)	Yes - 100%
Alloy Valves	Yes - 100% Body, Bonnet, stem only, as designated by P.O.
Alloy Pumps	Yes - 100% Casing/Impeller only
Alloy Tubing (1/2" diameter and smaller)	No
Alloy Instrumentation, Pressure Chambers	Yes - 100%
Alloy Bolting – A193 B7/ B16, A320 L7	Yes - 1% of total studs/bolts, 1 check per heat (min.)
SS Bolting – A193/A320 B8/B8M	Yes - 1% of total studs/bolts, 1 check per heat (min.)
Alloy Heat Exchanger Tubing	Yes - 2.5% of total tubes, minimum one check per heat
Carbon steel welds (pressure retaining)	No - Unless noted in P.O.
Alloy Pressure Retaining Welds in Contact with Process Fluids	Yes - 100% of completed welds (cap or root)
304/304L Stainless steel welds	No - Unless noted in P.O.
Other SS pressure retaining welds	Yes - 100% in accordance with this specification
Alloy Weld Overlay	Yes - 100% in accordance with this specification & component specific fabrication specification.
Alloy RTJ (Ring) Gaskets	Yes - 100% (1 test per each heat)
Alloy Cladding	Yes - Once per piping component or fitting, and each shell course component (e.g., HEX channel) for equipment.

The following items are exempt from PMI, unless specifically designated for PMI by the Purchase Order:

- a) Alloy components where the alloy is installed for product purity considerations, including lube oil, and seal oil piping and tubing.
- b) 300 series stainless steel selected for Cryogenic application or specifically for resistance to Wet CO₂.
- c) Internal machinery parts.
- d) Internal instruments parts (including pressure parts of gages)
- e) Internal non-pressure retaining baffles, trays, tray clips, supports, pall-rings, support rings, etc.
- f) Electrical components.
- g) Non-pressure containing welds.
- h) Internal valve components.
- i) Alloy components that have been substituted as a “higher” alloy for Carbon Steel or substitutions such as 316 for 304 or B8M for B8.
- j) Gaskets (except RTJ gaskets).
- k) Copper alloys; Titanium and it's alloys; Brass and Bronze alloys.
- l) Off-the-shelf (e.g., “buy what they make” components)

Table 2: Critical Elements Required for PMI

Alloy Categories & Specific Alloys	Elements to be Verified
300 Series Stainless (304, 316L, 310, 321, 347, etc.)	Cr, Ni, Mo (plus: Cb or Ti for “stabilized” grades (321 & 347); Carbon may also be required if specifically noted in the P.O.; For 304 Cr, Ni shall be verified)
6-Mo (AL6XN, 254SMo, 904L, etc.)	Cr, Ni, Mo, Cu
Ni-Based (Alloy C-22, Alloy 625, Monel, etc.)	Ni, Cr, Mo, W, Cu
Low-Alloy, General (1¼ Cr-½ Mo, 2¼ Cr-1Mo, 5 Cr-1½ Mo, etc.)	Cr, Mo
Low-Alloy, 9 Chrome and Grade 91 (9 Cr-1 Mo and 9 Cr-1 Mo-V Modified)	Cr, Mo, V
400 Series Stainless (405, 410, 410S, etc.)	Cr (plus: C & Ni, for “S” grades, if specifically noted in the P.O.)
CA6NM	Cr, Ni, Mo
Duplex Stainless (2205, 3RE60, CD-4MCu, Uranus 50, etc.)	Cr, Ni, Mo, Cu
Low-Ni Steel (3½ Ni, 9 Ni, etc.)	Ni