

## FITTINGS and PROOF TESTING per ASME Section VIII, Division 1

As per TSSA Fitting Guideline, clause 2.7-(B) for "**Non-standard**" fittings, the product could be qualified/validated by detailed calculations or a Proof Test performed in accordance with ASME Section VIII, Division 1, Clause UG-101. Non-standard fittings are defined as "unlisted components" in the ASME B31.3 Standard, Clause 304.7.2 (c) and also in the ASME B31.1, Clause 104.7.2 (c). These Standards (ASME B31.3 or ASME B31.1) could be considered for the purpose of the design qualification/validation of a fitting. This would be convenient way to qualify any product made of **NON-ASTM material** (such as EN material, DIN, BS material specification or any "Unlisted material" as stated in B31.3, Clause 323.1.2), and thus demonstrate compliance with a North American Standard.

For **each model/series and each material** of the product, as a minimum **3 (three)** proof tests would be required covering the smallest product size in the range, the largest and the intermediate size.

In most cases, the proof test should follow the ASME Section VIII UG-101(m)(2), (j)(2) and (k) requirements. This means that the **required burst pressure** based on the minimum **safety factor** of 4 (four) would have to be **further increased** depending on the actual material and the maximum operating temperature. The required burst pressure "B" should be adjusted by these factors: S-avg/S-min (specimen average tensile strength/minimum tensile), S-test/S-design (at maximum operating temperature), f (only for casting) and "E" (only if the pressure parts are welded).

**In lieu of the actual tensile** strength correction factor S-avg/S-min, when laboratory specimen testing is not possible, we will consider calculation based on the slightly higher starting Safety Factor instead of Code required value of four (4). For example:

- a) For the **steel, brass, etc. material other than cast** (product forms such as forgings, plates, bars, rods, etc), the minimum starting Safety Factor **(SF) would be 4.5** instead of 4.0.
- b) For the **CAST steel, brass, etc. material other than cast iron and ductile iron**, the minimum starting Safety Factor **(SF) would be 5.6** instead of 4.0. This SF = 5.6 would include assumed cast factor  $f = 0.8$ .
- c) For the **CAST IRON products** the minimum Safety Factor **(SF) would be 7.5** instead of 6.67 (per ASME Section VIII, Division 1, Clause UCI -101)
- d) For the **DUCTILE IRON products** the minimum Safety Factor **(SF) would be 7.0** instead of  $5/0.8 = 6.25$  (per ASME Section VIII, Division 1, Clause UCD -101). This SF (7.0) would include assumed cast factor  $f = 0.8$ .

The other correction factors, however, such as for the maximum operating temperature (if proof test is performed at the ambient temperature) and welding as applicable, would still have to be applied.

A copy of the **Proof Test Report** with supporting UG-101 calculation shall be submitted to TSSA for review. Proof testing could be performed in manufacturer's shop, or any qualified shop in Ontario/Canada or abroad, however all Proof Tests must be witnessed **by an Authorized third party Inspector**. This can be a Canadian/US jurisdictional inspector, an NBI (National Board Inspection Code) inspector, etc. Pressure Vessel manufacturers that have an ASME certification usually employ NBI inspectors that have NBI commission certificate. The Proof test could be witnessed also by an Inspector employed by the applicant's ISO Registrar such as TUV, Lloyd's Register, QMI, BSI, etc.

The Proof Test Report must identify: Model and/or Part number for the tested item, nominal size, calculation of the required proof test pressure using tensile strength based on either the MTR reports (Material Test Reports) or the actual test specimens, ASME/ASTM material specification (or equivalent to the ASME/ASTM specification, but supported by a copy of the **published** mechanical strength and chemistry properties) of the tested fitting, the actual proof test pressure recorded, etc. Report could be just one sheet with necessary information, signatures and the name of the third party inspector.

It is strongly advisable to send us a draft of the proposed proof test before the actual testing to clarify **required burst test pressure** and avoid misunderstandings and/or misinterpretation of the ASME Section VIII UG-101 requirements.