

SECTION .0500 - NON-STANDARD BOILERS AND PRESSURE VESSELS

13 NCAC 13 .0501 GENERAL REQUIREMENTS

(a) All aspects of a nonstandard boiler or pressure vessel including, but not limited to, its installation, repair, alteration, inspection, appurtenances, and operation shall conform to the ASME Code and the National Board Inspection Code and the Rules in this Chapter, except for the design criteria for the boiler or pressure vessel proper and pressure piping.

(b) Replacement parts for the boiler or pressure vessel shall conform to the ASME Code and the Rules in this Chapter.

(c) An inspector shall determine the maximum allowable working pressure for a nonstandard boiler or pressure vessel in accordance with the Rules in this Chapter.

(d) The maximum allowable working pressure on the shell of a nonstandard boiler or pressure vessel shall be determined by the strength of the weakest course computed from the thickness of the plate, the tensile strength of the material, the efficiency of the longitudinal joint, inside diameter of the weakest course and the factor of safety set by the Rules in this Chapter.

(e) For cylindrical pressure parts subject to internal pressure:

$$(TStE)/(RFS) = \text{maximum allowable working pressure, psig.}$$

(f) Design variables:

- (1) TS = ultimate tensile strength of shell plate; if unknown, it shall be taken as 45,000 psi;
- (2) t = minimum thickness of shell plate of weakest course, in inches;
- (3) E = efficiency of longitudinal joint depending upon construction;
 - (A) values for riveted joints are determined by calculated riveted efficiency; and
 - (B) values for fusion welded joints and riveted joints are determined pursuant to the following table:

WELD JOINT DESIGN	EFFICIENCY
Single lap weld	0.40
Double lap weld	0.50
Single butt weld	0.60
Double butt weld	0.75

RIVETED JOINT DESIGN	EFFICIENCY
Single lap	0.58
Double lap	0.74
Double butt and strap	0.82
Triple butt and strap	0.84
Quadruple butt and strap	0.94

(4) R = inside radius of weakest course of shell, in inches, provided the thickness does not exceed 10 percent of the radius; if the thickness is over 10 percent of the radius, the outer radius shall be used;

(5) FS = factor of safety allowed by the Rules in this Chapter.

(g) The maximum allowable working pressure for cylindrical nonstandard boilers and pressure vessels subject to external pressure, flat or formed heads, and non-circular boilers and pressure vessels shall be determined by the most applicable rules for new construction in the ASME Code.

(h) The maximum allowable working pressure for cast iron boilers, including boilers having cast iron shells or heads and steel or wrought iron tubes, shall be not greater than 30 psig for water service and 15 psig for steam service.

(i) Replacement parts, repair, and alteration of nonstandard boilers and pressure vessels shall be as required for ASME stamped boilers and pressure vessels of similar design.

History Note: Authority G.S. 95-69.11; 95-69.14; Eff. May 29, 1981; Amended Eff. July 1, 2006; January 1, 1995; Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

