

ARTICLE XXVII-2000

METHODS AND REQUIREMENTS FOR ANALYSES

XXVII-2100 INTRODUCTION

For components that are part of a system (e.g., valve in a piping system), a system analysis shall be used to determine the loads on the component and a component analysis shall be used to determine the stresses and strains within the component. When components are not part of a system, only a component analysis is required.

The stresses, strains, deformations, and collapse loads determined by the component analysis are compared to the acceptance criteria provided herein.

XXVII-2200 SYSTEM ANALYSIS

A system analysis, when required, shall be performed to determine loads on a component.

(a) A system analysis may be performed using either elastic analysis methods or inelastic analysis methods, unless prohibited by the Design Specification or the design rules referencing this Appendix.

(b) A system analysis shall consider applicable dynamic effects.

(c) Geometric nonlinearities shall be included, if applicable.

(d) If all loads on a component are determined independent of system behavior (e.g., pressure only or a free-standing containment), then a system analysis is not required.

(e) The Design Specification for the components shall indicate what type of system analysis is used to derive the loads specified in the Design Specification.

XXVII-2300 COMPONENT ANALYSIS

A component analysis shall be performed to determine ~~the stresses, strains, deformations, and collapse loads within the component.~~

(a) A component analysis may be performed using either elastic analysis methods or inelastic analysis methods, unless prohibited by this Appendix, the Design Specification, or the design rules referencing this Appendix.

(b) A component analysis shall consider applicable dynamic effects within the component.

(c) Loads applied in the component analysis shall include those determined by a system analysis, if applicable, and additional loads, as applicable.

XXVII-2310 ELASTIC COMPONENT ANALYSIS

(a) An elastic component analysis may be performed with loads determined from either an elastic system analysis or an inelastic system analysis.

(b) The stresses on a bolted joint shall be based on an elastic component analysis. However, stresses in other portions of the component need not be calculated on an elastic basis.

XXVII-2320 INELASTIC COMPONENT ANALYSIS

An inelastic component analysis may be performed with loads determined from either an elastic system analysis or an inelastic system analysis. In addition, the following requirements apply:

(a) Geometric nonlinearities shall be included, if applicable.

(b) If an elastic system analysis and an inelastic component analysis are used together, a reevaluation of the elastic system analysis shall be performed. The reevaluation shall ensure the loads have not been significantly altered due to load redistributions, stress redistributions, and changes in geometry of the system or component. Conditions where an elastic system analysis may be used with an inelastic component analysis include, but are not limited to, the following:

(1) The plastic deformation is highly localized.

(2) The changes in geometry are not significant.

(3) Bounding solutions are established such that they conservatively account for redistribution of loads and stresses due to plasticity.

insert: the stresses, strains, deformations, or collapse loads, when required, within the component.

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n from Section
ture coincident
with the loading under consideration.

(b) When the allowable stresses in this Appendix are determined, the following shall apply:

(1) The design stress intensity, S_m ; the yield strength, S_y ; and the ultimate tensile strength, S_u , shall be based on material properties given in Section II, Part D, Subpart 1, at temperature.

(2) If the materials of construction are from an approved Code Case, the material properties from the Code Case shall be used.