AN INTERNATIONAL CODE

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XI

RULES FOR INSERVICE INSPECTION OF NUCLEAR POWER PLANT COMPONENTS

ASME Boiler and Pressure Vessel Committee
on Nuclear Inservice Inspection

The American Society of Mechanical Engineers
Three Park Avenue • New York, NY • 10016 USA

NONMANDATORY APPENDIX C
EVALUATION OF FLAWS IN PIPING

ARTICLE C-1000
INTRODUCTION

C-1100 SCOPE

This Article provides the general scope and application of the evaluation methodology for flawed pipe.

(a) This Appendix provides a method for determining the acceptability for continued service of piping containing flaws that exceed the acceptance standards of IWB-3514 or IWC-3514. The evaluation methodology is based on the following conditions that govern pipe failure.

(1) Limit load (fully plastic) analysis of the pipe cross-section which is reduced by the flaw area, for ductile materials when the ability to reach limit load is assured.

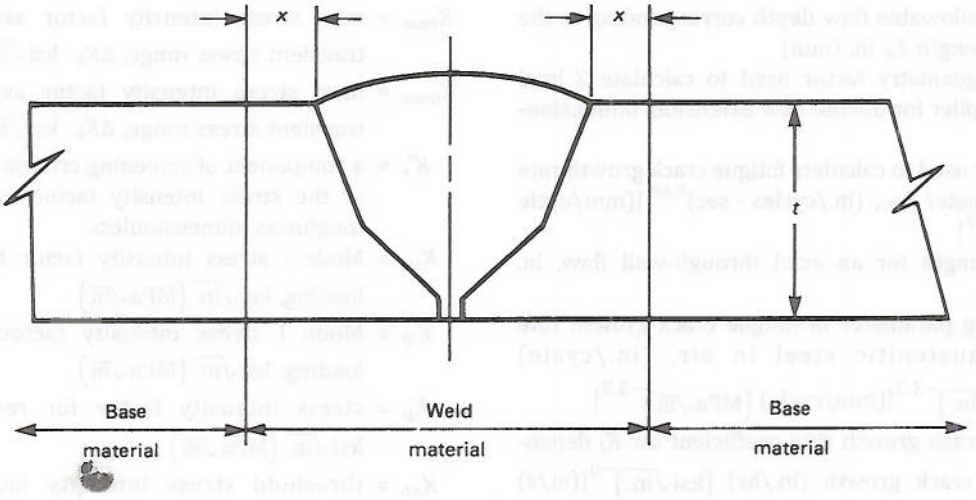
(2) Elastic–plastic fracture mechanics when ductile flaw extension occurs prior to reaching limit load.

(3) Linear elastic fracture mechanics for brittle fracture conditions. The procedures are applicable to flaws in weld materials or base material as defined in Fig. C-1100-1.

(b) This Appendix provides a screening procedure to determine the failure mechanism based on metal temperature, applied loads, flaw size, and material properties. Flaws are evaluated by comparing the maximum flaw dimensions at the end of the evaluation period with the allowable flaw size, or by comparing the applied pipe stress with the allowable stress for the flaw size at the end of the evaluation period.

(c) This Appendix also provides procedures for flaw modeling and evaluation. Flaw growth analysis is based on fatigue. When stress corrosion cracking (SCC) is active, the growth shall be added to the growth from fatigue. The flaw acceptance criteria of C-2600 include structural factors on failure for the three failure mechanisms described in (a). The acceptance criteria shall be used to determine acceptability of the flawed piping for continued service for a specified evaluation time period or to determine the time interval until a subsequent inspection.

Figure C-1100-1
Weld Material–Base Material Interface Definition for Flaw Location



x = lesser of $t/2$ or 0.5 in. (13 mm)