

ARTICLE L-4000 RECORDS AND REPORTS

analytical

L-4100 SCOPE

This Article contains records and report provisions for evaluations and examinations specified in [Article L-2000](#) and [Article L-3000](#).

(17) **L-4200 ANALYTICAL EVALUATION
RECORDS AND REPORTS**

The analytical evaluations specified in [Article L-2000](#) and [Article L-3000](#) shall be documented.

L-4300 EXAMINATION RECORDS AND REPORTS

(a) The reporting provisions of the Owner's Activity Report in [IWA-6230](#) shall apply to the examinations specified in [L-3400](#).

(b) The examination record retention provisions of [IWA-6300](#) shall apply to the examinations required by [L-3400](#).

(17) **SUPPLEMENT U-S2 ANALYTICAL EVALUATION CRITERIA FOR TEMPORARY ACCEPTANCE OF FLAWS IN MODERATE ENERGY CLASS 2 OR CLASS 3 VESSELS AND TANKS**

(17) **U-S2-1 SCOPE**

(a) The provisions of this Supplement apply to vessels and tanks, including heat exchangers, classified by the Owner as Class 2 or 3, and whose maximum operating temperature does not exceed 200°F (93°C) and whose maximum operating pressure does not exceed 275 psig (1.9 MPa).

(b) The provisions of this Supplement define the requirements to demonstrate the structural integrity of the vessel or tank but not the consequences of leakage. The Owner shall determine what constitutes acceptable leakage, ~~analytical~~ **analytically** evaluate the consequences of leakage, and determine system operability.

(c) The provisions of this Supplement provide procedures and criteria for analytically evaluating failure conditions for fracture and overpressure (blowout). The Owner shall verify that other potential failure modes are not relevant for the observed degradation (e.g., buckling).

(d) The evaluation period is the operational time for which the temporary acceptance criteria are satisfied (i.e., evaluation period τ_{allow}), but not greater than 26 months from the initial discovery of the condition.

(17) **U-S2-2 PROCEDURE**

The procedures for use of this Supplement are provided in this Section, and a flowchart of the overall methodology is provided as [Figure U-S2-2.1](#).

U-S2-2.1 Discovery of Degradation or Leakage

(a) Analytical evaluations and examination results shall be documented in accordance with [IWA-6300](#).

(b) Leakage shall meet the applicable leakage limits for the vessel or tank. The Owner shall determine acceptable leakage limits and analytically evaluate the consequences of leakage and system operability.

U-S2-2.2 Degradation Characterization

(a) The vessel or tank shall be examined to characterize degradation in the affected section in accordance with [IWA-3300](#), unless the alternative methods of (e) or [U-S2-2.4\(a\)](#) are implemented. The Owner shall develop the scope and methods of examination to characterize the degradation for the analytical evaluation procedures of this Supplement.

(b) If multiple degradation locations, including irregular (compound) shapes are detected, their interaction in a given cross section shall be accounted for in the analytical evaluation in accordance with [IWA-3330](#).

(c) For degradation that intersects openings in the vessel or tank (e.g., nozzle penetrations), the effect of the opening discontinuity shall be included in the analytical evaluation.

(d) Nonplanar degradation shall be projected into equivalent planar flaws in accordance with [IWA-3340](#) for analytical evaluation purposes and characterized in terms of extent of degradation in accordance with [Figure U-S2-2.2-1](#) or [Figure U-S2-2.2-2](#) for part-through-wall or through-wall degradation, respectively.

(e) The Owner shall determine methods for estimating the geometry of degradation in inaccessible or uninspectable regions, e.g., size correlated to leakage rate. If using this approach to determine a maximum flaw size, such as a size correlated to an observed leak rate, a factor of 2 shall be applied to the flaw dimensions.

U-S2-2.3 Analytical Evaluation Methodology

Degradation shall be analytically evaluated as planar in accordance with the requirements of [U-S2-2.4](#) or [U-S2-2.5](#). To prevent bursting, nonplanar part-through-wall degradation shall also be analytically evaluated in accordance with the requirements of [U-S2-2.6](#).

U-S2-2.4 Bounding Flaw Evaluation

(a) A bounding flaw length shall be assumed for analytical evaluation purposes, based on one or more of the following limiting factors:

(1) geometric limitations (e.g., overlapping welded plates in tanks that could limit degradation propagation or the ability to detect the degradation beyond a specified length)

(2) stress limitations (e.g., degradation growing into a decreasing stress field such that growth is terminated)

(3) environmental limitations (e.g., degradation growing into a nonaggressive environment)

(b) The bounding flaw shall be assumed to be a planar through-wall flaw over its entire length.

(c) An analytical evaluation shall be performed to determine acceptance of the bounding flaw. Acceptable methods for the required analytical evaluation are provided in [U-S2-4.1](#), and acceptance criteria are provided in [U-S2-6](#). For bounding flaws that do not meet the acceptance criteria, the provisions of [U-S2-2.5](#) shall be met.

(d) Bounding flaws that meet the acceptance criteria of [U-S2-6](#) shall be monitored daily to ensure that leakage does not exceed leakage limits in accordance with [U-S2-2.1\(b\)](#) and for trending purposes. If leakage limits are exceeded within the evaluation period, structural integrity shall be reconfirmed and leakage limiting measures applied, or repair/replacement activities shall be performed.