in Tables IWB-2500-1 (B-A) through IWB-2500-1 (B-Q), IWC-2500-1 (C-A) through IWC-2500-1 (C-H), IWD-2500-1 (D-A) through IWD-2500-1 (D-B), IWE-2500-1 (E-A) through IWE-2500-1 (E-G), IWF-2500-1 (F-A), and IWL-2500-1 (L-A) through IWL-2500-1 (L-B). If a component must be examined in a high radiation area, remotely controlled equipment may be advisable.

(b) When preparation of a surface for nondestructive examination is required, the preparation shall be by a mechanical method. Such surfaces shall be blended into the surrounding area as may be required to perform the examination. The wall thickness shall not be reduced below the minimum thickness required by design. Nonmandatory Appendix D may be used for such surface preparation.

(c) All nondestructive examinations of the required examination surface or volume shall be conducted to the maximum extent practical. When performing VT-1, surface, radiographic, or ultrasonic examination on a component with defined surface or volume, essentially 100% of the required surface or volume shall be examined. Essentially 100% coverage is achieved when the applicable examination coverage is greater than 90%; however, in no case shall the examination be terminated when greater than 90% coverage is achieved, if additional coverage of the required examination surface or volume is practical. Nonmandatory Appendix S provides guidance that may be used for evaluating examination coverage.

(15) IWA-2210 VISUAL EXAMINATION

Visual examination shall be conducted in accordance with the requirements of Section V, Article 9, except that the angle of view requirements for direct visual only apply to VT-1, and the requirements for illumination, distance, and resolution demonstration shall be in accordance with Table IWA-2211-1.

IWA-2211 VT-1 Examination

(a) VT-1 examination is conducted to detect discontinuities and imperfections on the surface of components, including such conditions as cracks, wear, corrosion, or erosion.

(b) The VT-1 examination procedure shall be demonstrated capable of resolving characters in accordance with Table IWA-2211-1.

(c) Direct visual examination distance requirements shall be as specified in Table IWA-2211-1.

(d) Illumination for examinations shall meet the requirements specified in Table IWA-2211-1.

(e) It is not necessary to measure illumination levels on each examination surface when the same portable nonbattery-powered light source (e.g., drop light) or similar installed lighting equipment is demonstrated to provide the illumination specified at the maximum examination distance.

non-battery-powered

(f) When battery powered lights are used, the adequacy of illumination levels shall be checked before and after each examination or series of examinations, not to exceed 4 hr between checks.

(g) Remote visual examination may be substituted for direct examination. The remote examination procedure shall be demonstrated capable of resolving characters as specified in Table IWA-2211-1. Additionally, the remote examination system shall have the capability of distinguishing and differentiating between the colors applicable to the component examination being conducted.

IWA-2212 VT-2 Examination (15)

(a) VT-2 examination is conducted to detect evidence of leakage from pressure-retaining components, as required during the conduct of system pressure test.

(b) VT-2 examination shall be conducted in accordance with Article IWA-5000.

(c) As indicated in Table IWA-2211-1, there are no illumination, distance, and resolution demonstration requirements for VT-2.

IWA-2213 VT-3 Examination

(a) VT-3 examination is conducted to determine the general mechanical and structural condition of components and their supports by verifying parameters such as clearances, settings, and physical displacements; and to detect discontinuities and imperfections, such as loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion. VT-3 includes examination for conditions that could affect operability or functional adequacy of constant load and spring-type supports.

(b) The VT-3 examination procedure shall be demonstrated capable of resolving characters as specified in Table IWA-2211-1.

(c) There are no direct visual examination distance requirements provided the examiner can resolve the characters specified in Table IWA-2211-1.

(d) Illumination for examinations shall meet the requirements specified in Table IWA-2211-1.

(e) It is not necessary to measure illumination levels on each examination surface when the same portable nonbattery-powered light source (e.g., drop light) or similar installed lighting equipment is demonstrated to provide the illumination specified at the maximum examination distance.

(f) When battery-powered lights are used, the adequacy of illumination levels shall be checked before and after each examination or series of examinations, not to exceed 4 hr between checks.

(g) Remote visual examination may be substituted for direct examination. The remote examination procedure shall be demonstrated capable of resolving characters in accordance with Table IWA-2211-1. Additionally, the

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where

da/dN = fatigue crack growth rate, in./cycle
ΔK = stress intensity factor range, $\left(\text{ksi}\sqrt{\text{in.}}\right)$
T_K = [(T−32)/1.8] + 273.15, k
T = metal temperature, °F
T_R = loading rise time, sec
ΔK_{th} = ~~1.10~~ 1.00 $\left(\text{ksi}\sqrt{\text{in.}}\right)$

When T_R < 1 sec, set T_R = 1 sec

(SI Units)

$$C = 9.10 \times 10^{-6} \text{ for } \Delta K \geq \Delta K_{th}$$

$$C = 0 \text{ for } \Delta K < \Delta K_{th}$$

$$n = 2.25$$

$$S_R = 1.0 \text{ for } R < 0$$

$$S_R = 1 + e^{8.02(R - 0.748)} \text{ for } 0 \leq R < 1.0$$

$$S_T = e^{-2516/T_K} \text{ for } 150°\text{C} \leq T \leq 343°\text{C}$$

$$S_T = 3.39 \times 10^5 e^{\left[(-2516/T_K) - 0.0301 T_K\right]} \text{ for } 20°\text{C} \leq T < 150°\text{C}$$

$$S_{\text{ENV}} = T_R^{0.3}$$

where

da/dN = fatigue crack growth rate, mm/cycle
ΔK = stress intensity factor range, $\left(\text{MPa}\sqrt{\text{m}}\right)$
T_K = T + 273.15, k
T = metal temperature, °C
T_R = loading rise time, sec
ΔK_{th} = 1.10 $\left(\text{MPa}\sqrt{\text{m}}\right)$

When T_R < 1 sec, set T_R = 1 sec.

(2) For Type 304L and Type 316L stainless steels and associated weld metals,

(U.S. Customary Units)

$$C = 6.75 \times 10^{-7} \text{ for } \Delta K \geq \Delta K_{th}$$

$$C = 0 \text{ for } \Delta K < \Delta K_{th}$$

$$n = 2.25$$

$$S_R = 1.0 \text{ for } R < 0 \text{ and } 0 \leq R \leq 0.7$$

$$S_R = 1 + 1.5(R - 0.7) \text{ for } 0.7 < R \leq 1.0$$

$$S_T = e^{-2516/T_K}, \text{ for } 300°\text{F} \leq T \leq 650°\text{F}$$

$$S_T = 3.39 \times 10^5 e^{\left[(-2516/T_K) - 0.0301 T_K\right]}, \text{ for } 70°\text{F} \leq T < 300°\text{F}$$

$$S_{\text{ENV}} = T_R^{0.3}$$

where

da/dN = fatigue crack growth rate, in./cycle
ΔK = stress intensity factor range, $\left(\text{ksi}\sqrt{\text{in.}}\right)$
T_K = [(T−32)/1.8] + 273.15, k
T = metal temperature, °F
T_R = loading rise time, sec
ΔK_{th} = 1.00 $\left(\text{ksi}\sqrt{\text{in.}}\right)$

When T_R < 1 sec, set T_R = 1 sec.

(SI Units)

$$C = 1.39 \times 10^{-5} \text{ for } \Delta K \geq \Delta K_{th}$$

$$C = 0 \text{ for } \Delta K < \Delta K_{th}$$

$$n = 2.25$$

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