

ERRATA TO APPENDIX R

$FP(FR)_{break}$ = probability (dimensionless) or rate (per yr) for the failure mode of breaks

$CCDF(CCDP)_{leak}$ = conditional core damage frequency or core damage probability given a small leak

$CCDF(CCDP)$

$_{disabling\ leak}$ = conditional core damage frequency or core damage probability given a disabling leak

$CCDF(CCDP)_{break}$ = conditional core damage frequency or core damage probability given a break

Similar calculations apply to the calculation of LERF for piping segments.

(b) Initiating Event Consequence CDF Calculations

$$CDF_{PB} = FR_{PB} * CCDP_{IE}$$

where

CDF_{PB} = CDF from piping failure (events/yr)

FR_{PB} = piping failure rate (no deterministic inservice inspection) (events/yr)

$CCDP_{IE}$ = conditional core damage probability (dimensionless)

$$FR_{PB} = FP_{EOL} / EOL$$

where

FP_{EOL} = failure probability at end of life (EOL)

(c) Mitigating System Consequence CDF Calculations

$$CDF_{PB} = FP_{PB} * CCDF_{PB}$$

where

CDF_{PB} = Core Damage Frequency from a piping failure (in events/yr)

$CCDF_{PB}$ = Conditional CDF with segment failed (= 1) (in events/yr)

FP_{PB} = piping failure probability (dimensionless)

$$CCDF_{PB} = CDF_{PB=1} - CDF_{BASE}$$

where

$CDF_{PB=1}$ = new total plant CDF with surrogate component = 1 (in events/yr)

CDF_{BASE} = base total plant CDF (events/yr)

(1) Continuously Operating Systems

$$FP_{PB} = FR_{PB} * T_m$$

where

FR_{PB} = the failure rate (in events per unit time)

T_m = ~~is~~ the total defined mission time (24 hr for most PRAs)

$$FR_{PB} = FP_{EOL} / (EOL\ yr * 8760\ hr/yr)$$

(2) Standby Systems

$$FP_{PB} = \frac{1}{2} (FR_{PB}) T_i + (FR_{PB}) T_m$$

T_m = ~~is~~ the total defined mission time (24 hr for most PRAs)

where

FR_{PB} = the failure rate (in events per unit time)

T_i = the interval between tests that would identify a piping failure

~~the total defined mission time (24 hr for most PRAs)~~

(d) Initiating Event and System Degradation Consequence CDF Calculations

$$CDF_{PB} = FR_{PB} * CCDP_{IE,SEG=1}$$

where

CDF_{PB} = Core Damage Frequency from a piping failure (events per yr)

$CCDP_{IE,SEG=1}$ = conditional core damage probability for the initiator with mitigating system component assumed to fail (initiating event and mitigating system component = 1)

FR_{PB} = piping failure rate (in events per yr)

4.2.5 Calculate Piping Segment Risk Importances.

The FMEA technique shall be used to rank piping segments within the selected systems on the basis of core damage frequency and large early release frequency. Relevant plant information that is used for initial formulation of the FMEA shall be realistic and shall reflect current plant operational practices. The FMEA technique shall include at least the following information.

(a) Piping Segment. A location and boundary description of the segment that includes consideration of the number of structural elements being evaluated only, usually welds, but may include elements such as elbows, flow reducers, and fittings, within the segment, and their nominal pipe size.

(b) Degradation Mechanism. Identification of the full range of potential degradation mechanisms, such as mechanical fatigue, thermal fatigue, stress corrosion cracking, and flow accelerated corrosion (FAC), that may occur within the piping segment, and the identification of the particular structural elements where these failures are most likely to occur.

(c) Failure Probability. Estimates of the failure probability of a piping segment under consideration assuming no inservice inspection. Failure rates (on demand, per hour, or per year) are required inputs to the risk-importance calculations. The piping segment failure rate is analogous to the active component failure rates that are used in the PRA, where the rate is the number of observed failures divided by the number of years.

Historical or service data, expert judgment, or validated PFM calculations shall be used to estimate the limiting piping segment failure probabilities. The PFM calculations shall be the primary method used to estimate failure probabilities unless the piping materials and operating characteristics assessed are not compatible. When using expert

Errata: passed

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