

Condition -Based Qualification

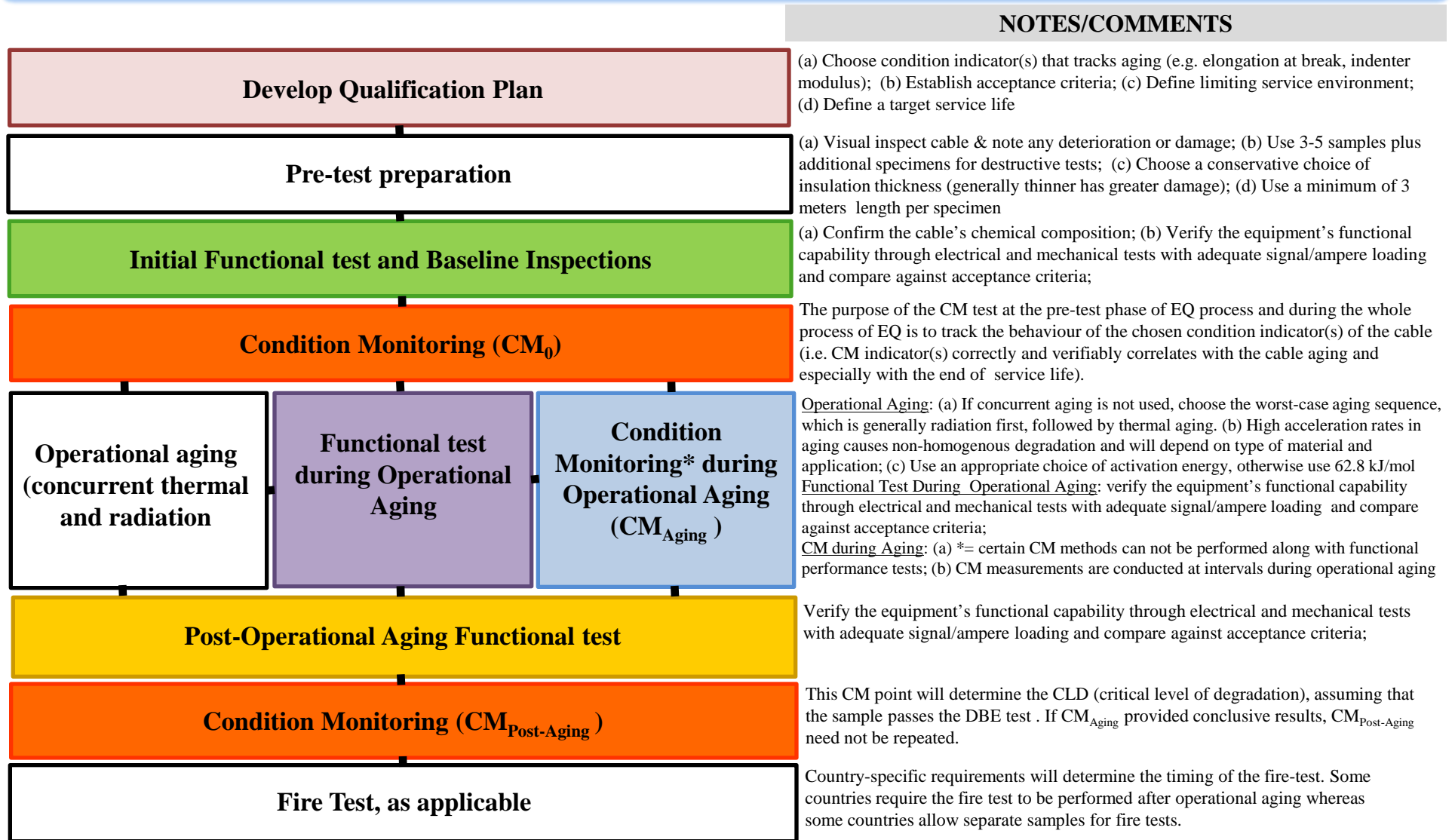
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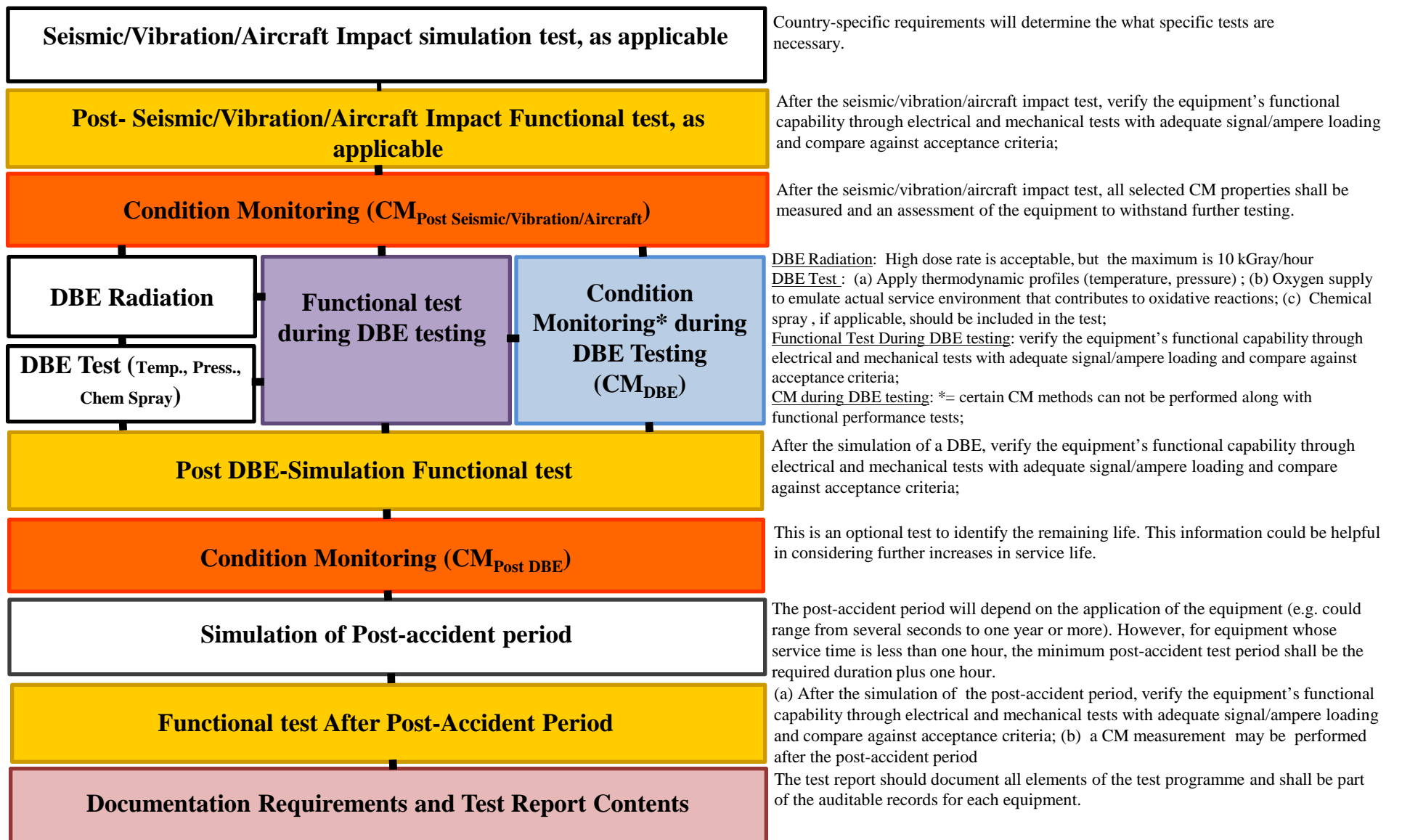
- Qualification Procedure
- Condition-based Qualification
- Benefits of Condition-based Qualification

- Preparing a “Nuclear Energy series Report”
Assessing and Managing Cable Aging in NPPs
- Title of the Publication : Guidelines for
Qualification and Aging Management of
Electric Cables in Current and Future Nuclear
Power Generating facilities

- Visual inspection
- Measurement of initial functional properties
- Simulation of normal operational ageing
- Functional properties testing-continues through next step
- Simulation of accident and post-accident period
- Final properties measurement
- Final visual inspection

QUALIFICATION PROCESS





- Aging for Normal Operation
 - Concurrent aging
 - Number of samples
 - Test Sequence
 - Thermal aging (80 to 130 C)
 - Activation Energy (62.8 kJ/mol)
 - Radiation exposure (100 Gy/hr Operational aging; 10kGy per hr for accident)

- Temperature
- Pressure
- Time
- Spray compensation and flow rate
- Radiation
- Operating conditions
- Margins
 - Peak temperature: + 8 °C
 - Peak pressure: + 10 % of gauge
 - Radiation: + 10 % on accident dose
 - Power supply voltage: + 10 % but not exceeding cable design limits
 - Operating Time +10% min. 1 hr
 - Vibrations requirements +10% added to the acceleration
 - Frequency + 5% of rated value

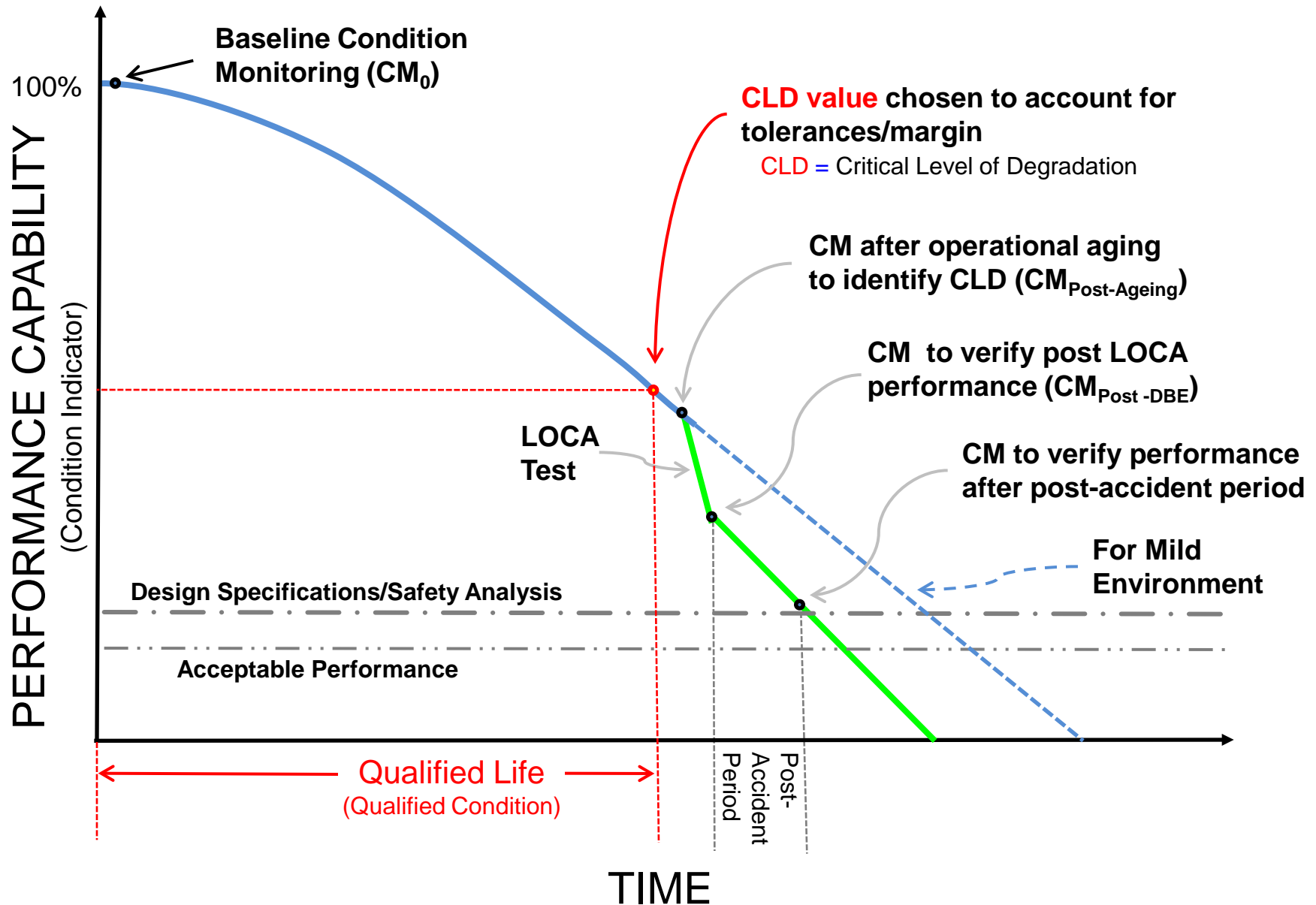
Margins in IEEE 323-1974

- The margins (8 Deg C, 10% psig. Etc.,) were intended for the following because a single successful sample test was considered adequate for qualification:
 - “Variations in commercial production”
 - “Reasonable errors in defining satisfactory performance”

Condition-Based Qualification (Qualification Monitoring)

- During the qualification test, conduct condition monitoring of critical parameters before and after operational aging
- Conduct the LOCA/accident environmental test and verify satisfactory performance again through condition monitoring
- Identify the Critical Level of Operational Degradation (CLD) that the equipment can endure LOCA test
- Manage the operational degradation to CLD with suitable condition monitoring (RG 1.211)

CONDITION-BASED QUALIFICATION



- NRC currently requires qualified life for EQ components (10 CFR 50.49)
- Condition-Based Qualification can be implemented within the provisions of the existing US Regulations.

Benefits of Condition-Based Qualification

- Greater confidence in predicting cable performance
- Obtain increased service life without any additional qualification testing if ambient conditions are less severe than design assumptions or rate of degradation is lower