

NRR-PMDAPem Resource

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Upcoming License Amendment Request



Agenda

- Introduction/Background
- License Changes to be Requested
 1. USD replaces WSD
 2. Higher concrete strength
 3. Higher rebar strength
 4. Minor clarifications
- Anticipated Questions

Background

- FCS will be permanently defueled in November 2016
 - HELB and other system produced dynamic loads will no longer be of concern
- In 2012, two latent engineering errors were discovered at FCS.
- A preliminary assessment of the auxiliary building showed design discrepancies.
- An operability determination was completed showing the auxiliary building is operable.
- Portions of the auxiliary building and intake structure will be required to meet design basis post shutdown.

License Changes to be Requested

1. Replace the WSD method with the USD method from the ACI 318-63 Code for normal operating/service conditions.
2. Use higher concrete compressive strength values for Class B concrete based on original strength test data.
3. Use higher reinforcing steel yield strength values based on original strength test data.
4. Minor clarifications include adding a definition of control fluids to the dead load section.

Replace WSD with USD

- Why the change?
 - WSD can be overly conservative in regard to member capacity.
- What is the benefit?
 - Operability determination efforts for the auxiliary building using USD do not show member overstress.
 - Reduce or eliminate the need to install future modifications.
- Where does this apply?
 - Auxiliary Building
 - Intake Structure

Replace WSD with USD

- Is there precedent?
 - USD method has been used for the design of reinforced concrete structures with safe, reliable performance for over fifty years, including its use at many other operating nuclear power reactors.
 - Arkansas Nuclear One (ANO)
 - Calvert Cliffs
 - Turkey Point
 - Watts Bar
 - Waterford

Increased Concrete Strength

- Why the change?
 - Extensive test data indicates the concrete is significantly stronger than the original minimum design requirement.
- What is the benefit?
 - 4500 psi vs. 4000 psi.
 - Increases member design strength.
 - Lowers interaction ratios.
 - Reduces potential modification requirements.
- Where does this apply?
 - Auxiliary Building
- Not allowed where structures undergo prolonged exposure to:
 - high radiation
 - excessive moisture
 - harsh chemicals

Increased Concrete Strength

- How is new strength determined?
 - 903 of 912 sample tests were found for the entirety of FCS; 342 apply specifically to the auxiliary building
 - Rolling averages for 3 and 5 consecutive samples are calculated IAW ACI 318-63 and limited to the 95% confidence level.
- Is there precedent?
 - *“The licensee utilized as-built concrete strength of 4424 psi based on 28 days concrete cylinder strength. The NRR staff had reviewed the licensee’s justification for the as-built concrete strength earlier during the review of the operability evaluation and considered the use of 28-days strength acceptable for the reconstituted design-basis calculations.”*
(ML023290377)
 - The licensee (D.C. Cook) was licensed to ACI 318-63 as is FCS.
(ML023290377)

Increased Rebar Strength

- Why the change?
 - Extensive test data indicates the rebar is significantly stronger than the original minimum design requirement.
- What is the benefit?
 - 43.8 ksi vs. 40 ksi.
 - Increases member design strength.
 - Lowers interaction ratios.
 - Reduces potential modification requirements.
- Where does this apply?
 - Auxiliary Building

Increased Rebar Strength

- How is new strength determined?
 - 184 of 202 sample tests were found for the auxiliary building
 - The new strength is limited to the 95% confidence level.
- Is there precedent?
 - *“On March 11, 2005, the NRC approved a license amendment that revised the design basis as described in the UFSAR to allow the use in control rod drive missile shield structural calculations of a reinforcing bar (i.e., rebar) yield strength value based on measured material properties, as documented in licensee rebar acceptance tests.” (ML052170089)*
 - The licensee (D.C. Cook) implemented the use of yield strength based on Certified Mill Test Report data supported by 95% confidence level. (ML043640141)

Anticipated Questions

- Should field test data be incorporated when determining concrete strength?
 - Original field samples were not well controlled. For example, some samples were reported as:
 - NOT @ AREA PLACED
 - LOST ON JOB
 - DAMAGED AT JOB SITE
 - Typically field cured samples are not as well maintained as lab cured samples.
 - ACI 318-63 requires lab tests to validate strength

Anticipated Questions

- Should in situ testing on existing concrete be used to validate concrete strength?
 - ACI 318-63 requires only lab cured samples to validate strength which are readily available.
 - Concrete compressive strength continues to increase with age when it is well maintained.
 - The auxiliary building is inspected under FCS Procedure SE-PM-AE-1001 using a frequency in line with industry standards.

Anticipated Questions

- Why use increased material strengths for the entire auxiliary building rather than increased strengths specific to each member or area of the building.
 - Exact rebar placement data was not collected during construction.
 - Using multiple strength values overcomplicates required analyses.

Summary

- Portions of the auxiliary building and intake structure will be required to meet design basis post shutdown.
- License Changes to be Requested
 1. USD replaces WSD
 2. Higher concrete strength
 3. Higher rebar strength
 4. Loading clarification

Questions?