

# ITAAC for Backfill Under Category I Structures

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# Agenda

- Objectives
- Recap of December 18 Outcomes
- ITAAC for Shear Wave Velocity (SWV)
- ITAAC for Backfill Compaction
- Summary

# Objectives

Obtain NRC concurrence on industry proposals:

- ITAAC for SWV in backfill under seismic Category I structures
- DCD provision for performing site-specific analyses when minimum Tier 1 SWV is not met

Ensure common understanding of ITAAC for compaction of backfill under seismic Category I structures

# December 2008 Outcomes

- No SWV ITAAC necessary for:
  - Category I structures founded on native material (soil or rock) or on concrete fill
  - Category I structures founded on a shallow ( $\leq \approx 5$  feet) soil leveling course
- For other cases, ITAAC will require field measurement and analyses of SWV in backfill under Category I structures.
- The effect of confining pressure may be considered when determining the SWV in backfill under Category I structures.

# December 2008 Outcomes

- No additional ITAAC for backfill parameters beyond SWV and compaction (i.e., those in the Vogtle COLA)
- Details of test methodology for ITAAC closure will be provided in site-specific FSAR documentation
- Agreement to discuss further
  - special cases related to backfill SWV ITAAC
  - options for avoiding unnecessary license amendments during construction

# Recommended Approach to Avoid Unnecessary Exemption Requests

- Include in DCD and COL ITAAC language on the use of site-specific analyses to demonstrate seismic design adequacy
- Example language to include in DCD Tier 1 section on Site Parameters:
  - “In the case of seismic design and soil parameters not meeting the defined conditions, site-specific soil-structure interaction analyses may be performed. The results may be used to confirm the seismic design adequacy of the certified design using approved methods and acceptance criteria.”

# Recommended Approach to Avoid Unnecessary Exemption Requests

- To establish a site-specific minimum SWV, COL applicants
  - Would submit site-specific analyses for NRC approval
  - Would not need to request a Tier 1 exemption
- If the DCD does not contain such language, COL applicants would seek it via exemption request from Tier 1 to ensure consistency with COL ITAAC on SWV

# Proposed ITAAC for SWV

## COLA Part X: ITAAC

### X.X Site-Specific ITAAC

#### X.x.2 ITAAC for Backfill Material under Seismic Category I Structures

##### Design Description

The backfill material under Seismic Category I structures meets the shear wave velocity [parameter specified in DCD Tier 1, Table X.1-1, or site-specific value]; or seismic design adequacy is demonstrated through site-specific SSI and structural analyses.

##### Inspections, Tests, Analyses and Acceptance Criteria

Table X.x.2-1 provides a definition of the inspections, tests and analyses, together with associated acceptance criteria, for the backfill under Seismic Category I structures.

# Proposed ITAAC for SWV

Table X.x.2-1 ITAAC for Backfill Material under Seismic Category I Structures

Design Commitment	Inspections, Tests and Analyses	Acceptance Criteria
<p>Shear Wave Velocity of Category I backfill material meets [Tier 1 or site-specific value]; or seismic design adequacy is demonstrated through site-specific SSI and structural analyses.</p>	<p>Field measurements and analyses of shear wave velocity in backfill will be performed. If necessary, site-specific SSI and structural analyses will be performed.</p>	<p>An engineering report exists that concludes that the shear wave velocity within the backfill material placed under Seismic Category I structures meets [Tier 1 or site-specific value]; or seismic design adequacy is demonstrated through site-specific SSI and structural analyses.</p>



Note: The applicant will replace the brackets with a specific value of SWV.

# ITAAC for SWV – Cases

- Base Case: SWV meets the DCD Tier 1 parameter
- Special Case 1: SWV not expected to meet the DCD Tier 1 parameter
- Special Case 2: Surface-founded structures
- Special Case 3: Completed backfill fails to achieve minimum SWV

# Base Case

## SWV Meets DCD Tier 1 Parameter

- No site-specific analyses necessary for COL
- Measured SWV in completed backfill meets the DCD Tier 1 parameter
- SWV testing and analyses documented in ITAAC Closure Package and made available for NRC inspection prior to ITAAC closeout

# Special Case 1

## SWV Not Expected to Meet DCD Tier 1 Parameter

- Some sites do not meet the DCD Tier 1 parameter for SWV and require use of backfill (> 5 feet).
- In this case, a site-specific SSI analysis would be performed (including any proposed backfill) to demonstrate the adequacy of the seismic design.
- With the proposed DCD provision, COL applicants do not need an Exemption from Tier 1 to use site-specific analyses.
- The SWV for backfill used in the site-specific analyses described above will establish the minimum SWV that must be met for ITAAC closure.

# Special Case 2

## Surface-Founded Structures

- Some designs include seismic Category I structures that are founded at or near the ground surface.
- The weight of the overlying Category I structure is insufficient to produce a confining pressure that results in a SWV of 1,000 fps at the foundation level.
- Site-specific SSI and structural analyses can be performed to demonstrate the seismic adequacy of those structures.
- With the proposed DCD provision, site-specific analyses may be used without an Exemption.
- The SWV for backfill used in the site-specific analyses described above will establish the minimum SWV that must be met for ITAAC closure.

# Special Case 3

## Completed Backfill Fails to Achieve Minimum SWV

- Even if all efforts have been made to ensure completed backfill meets the pre-established SWV value, there is a possibility that the measured SWV could be less than that value.
- Site-specific SSI and structural analyses may be used to show seismic design adequacy for the measured SWV.
- The analyses would be documented in the ITAAC Closure Package and made available for NRC inspection prior to ITAAC closeout.
  - Conforming changes to the FSAR would be made.
- With proposed ITAAC and DCD provision, site-specific analyses may be used to close the ITAAC without a License Amendment.

# Backfill ITAAC for SWV - Summary

- The proposed ITAAC for SWV now addresses:
  - Sites that meet the DCD Tier 1 parameter (1,000 fps)
  - Sites that perform site-specific SSI and structural analyses
  - All three “special cases” discussed at the December 2008 meeting
- Site-specific SSI and structural analyses using approved methodologies and acceptance criteria are an acceptable way to demonstrate seismic design adequacy.
  - The methodology and acceptance criteria for these analyses will be described in the FSAR.

# ITAAC for Backfill Compaction

- In August 2007, Industry proposed an ITAAC for compaction of backfill materials under Seismic Category I structures
  - Provided average and minimum compaction requirements
  - Incorporated into COLAs for sites needing backfill under Seismic Category I structures. Example:

Average Compaction (all tests)	97%
Number of compaction test results < 95% compaction	<10%
Number of compaction test results < 93% compaction	Zero

- Industry subsequently developed an ITAAC for Category I backfill compaction that is more conservative and easier to implement
  - Provides only a minimum compaction requirement, no average compaction requirement

# Proposed ITAAC for Backfill Compaction

## COLA Part X: ITAAC

### X.X Site-Specific ITAAC

#### X.x.1 ITAAC for Backfill Material under Seismic Category I Structures

##### Design Description

The backfill material under Seismic Category I structures is installed to meet a minimum of 95 percent Modified Proctor density.

##### Inspections, Tests, Analyses and Acceptance Criteria

Table X.x.1-1 provides a definition of the inspections, tests and analyses, together with associated acceptance criteria, for the backfill material under Seismic Category I structures.

# Proposed ITAAC for Backfill Compaction

Table X.x.1-1 ITAAC for Backfill Material under Seismic Category I Structures

<b>Design Commitment</b>	<b>Inspections, Tests and Analyses</b>	<b>Acceptance Criteria</b>
Backfill material under Seismic Category I structures is installed to meet a minimum of 95 percent of the Modified Proctor density.	Testing will be performed during placement of the backfill material.	A report exists that concludes the installed backfill material under Seismic Category I structures meets a minimum of 95 percent of the Modified Proctor density.

# Summary

- Site-specific SSI and structural analyses are acceptable means of demonstrating seismic design adequacy when the DCD Tier 1 parameter for SWV is not met.
- Where a site-specific analysis is performed, the methods and acceptance criteria for the alternate SWV will be described in the FSAR.
- For DCDs that include the provision for site-specific analyses, COL applicants may use site-specific SSI and other structural analyses to demonstrate seismic design adequacy without need of exemption from Tier 1.
- Minimum 95% Modified Proctor density is an acceptable measure of backfill material compaction for ITAAC.