



OPPD's Fort Calhoun Station Driving to Excellence

Public Meeting with the U.S. Nuclear Regulatory Commission
Containment Internal Structures



December 2, 2014

Topics for Discussion

- Plant Status
- Containment Internal Structures (CIS) Description
- Background of CIS Design Deficiency
- Spring 2015 CIS Modifications
- Operability of CIS and Code of Construction
- Fall 2016 CIS Modifications
- Next Steps
- Closing Remarks

OPPD's Fort Calhoun Station

Vision
Safe and reliable operation of Fort Calhoun Station and achievement of sustained excellence

Mission
Safe, event-free, cost-effective, nuclear production of electricity

Values

- Safety – Nuclear, Industrial, Radiological and Environmental
- Alignment
- Accountability
- Bias for Action
- Healthy Nuclear Safety Culture

OPPD

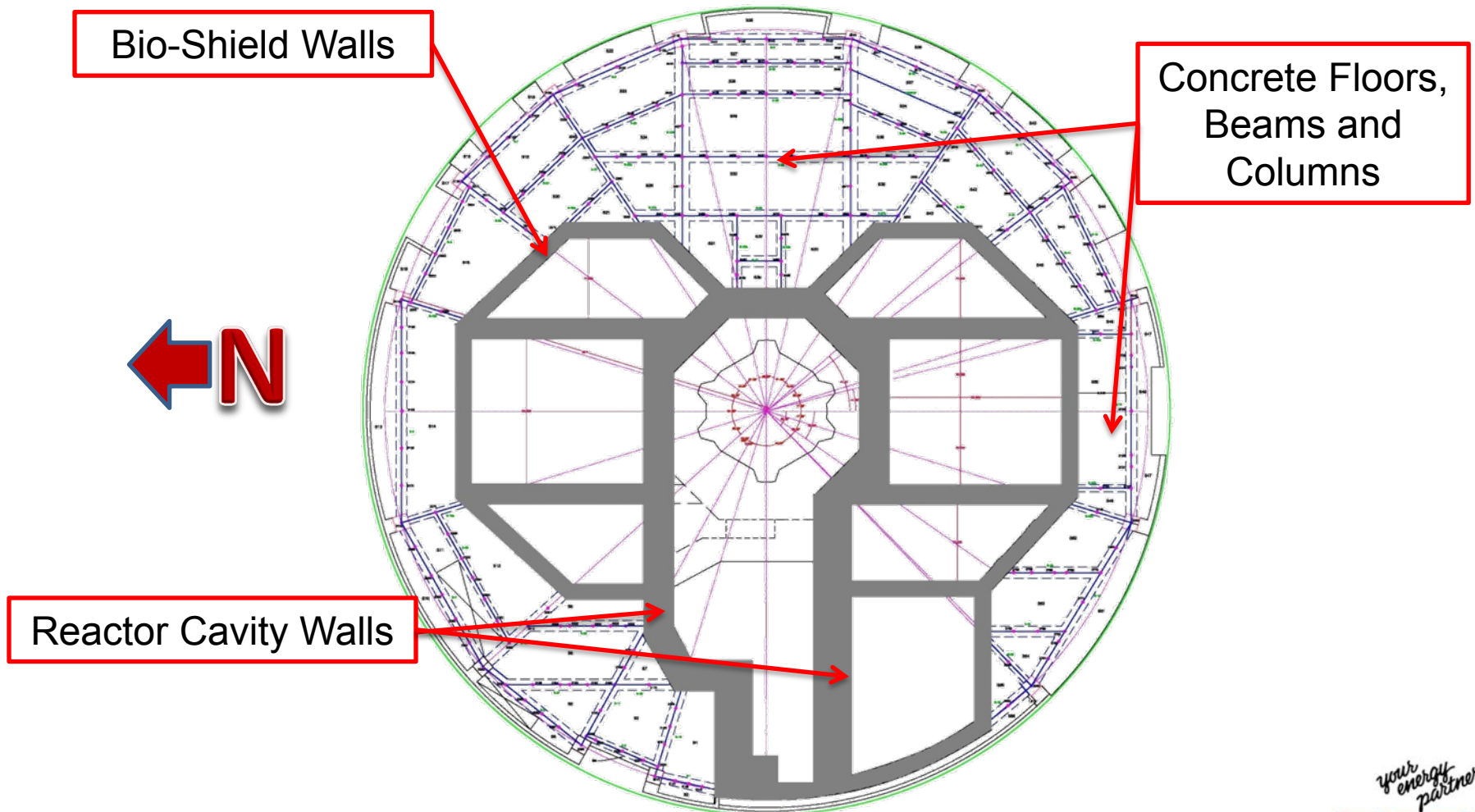


Containment Internal Structures

Elements of the Containment Internal Structures

- Internal concrete walls and the surrounding multi-level concrete floors, beams and columns **inside** of the containment building
- The internal walls form compartments and cavities that house major plant equipment and components
- The floors, beams and columns that radially surround the internal walls support additional major plant equipment and components inside the containment building
- The containment building itself is **not** part of the CIS

Containment Internal Structures





Containment Internal Structures

Project Background

- CIS design deficiency identified in 2012 and documented in CR 2012-04392
- Root Cause Analysis determined the design deficiency occurred during initial construction – contractor oversight and technical review of contractor’s calculations during initial construction did not identify the design deficiency
- 2013 Operability Evaluations FC08189 and FC08234 determined that CIS would function under design basis conditions supporting safe unit startup and operation



Containment Internal Structures Project Background (Cont'd)

- The Reactor Vessel Head Stand (RVHS) and Beams B-22A and B-22B supporting the Safety Injection Tanks had the lowest design margin among the deficient CIS structural elements and will be restored to full design margin during the Spring 2015 outage
 - OPPD commitments regarding the RVHS and Beams B-22A and B-22B documented in letter dated December 2, 2013 (LIC-13-0164) and confirmed in NRC Confirmatory Action Letter dated December 17, 2013 (EA 13-243)
 - “Regarding the reactor head stand, prior to the next use of the reactor head stand, OPPD will evaluate the structural design margin for the head stand and resolve any deficiencies to restore full structural design margin as described in the Fort Calhoun Station licensing basis.”
 - “Regarding Beam 22A and Beam 22B in the containment internal structures, prior to resuming power operation following the first refueling outage after restart, OPPD will restore full structural design margin as described in the Fort Calhoun Station licensing basis.”



Containment Internal Structures

Modification of RVHS – Spring 2015 Outage

OPPD will take the following actions to restore the design margin and to bring the RVHS into full compliance with the original design basis:

- Demolish the four existing concrete pedestals comprising the RVHS
- Install a steel structure redistributing the RVHS loads to existing adjacent walls and concrete columns

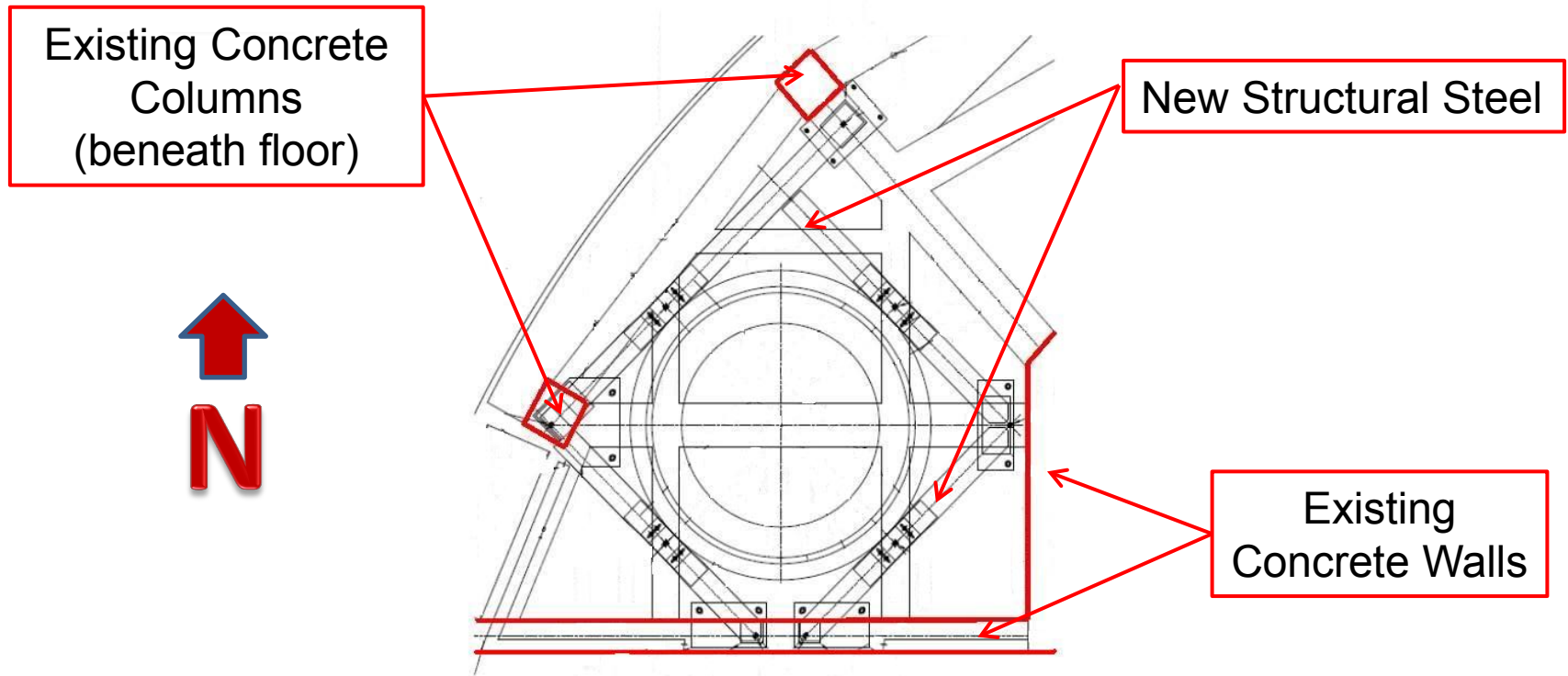
Containment Internal Structures



Existing
RVHS
Pedestals

Original Reactor Vessel Head Stand

Containment Internal Structures



New Structural Support for the Reactor Vessel Head Stand



Containment Internal Structures RVHS Modifications

New design and installation will meet current licensing basis

- Design and installation of the new RVHS will meet the requirements of USAR Section 5.11 and the American Institute of Steel Construction (AISC) (1963)
- Load distributed to nearby columns and walls and not the underlying floor
- New design addresses required load combinations



Containment Internal Structures

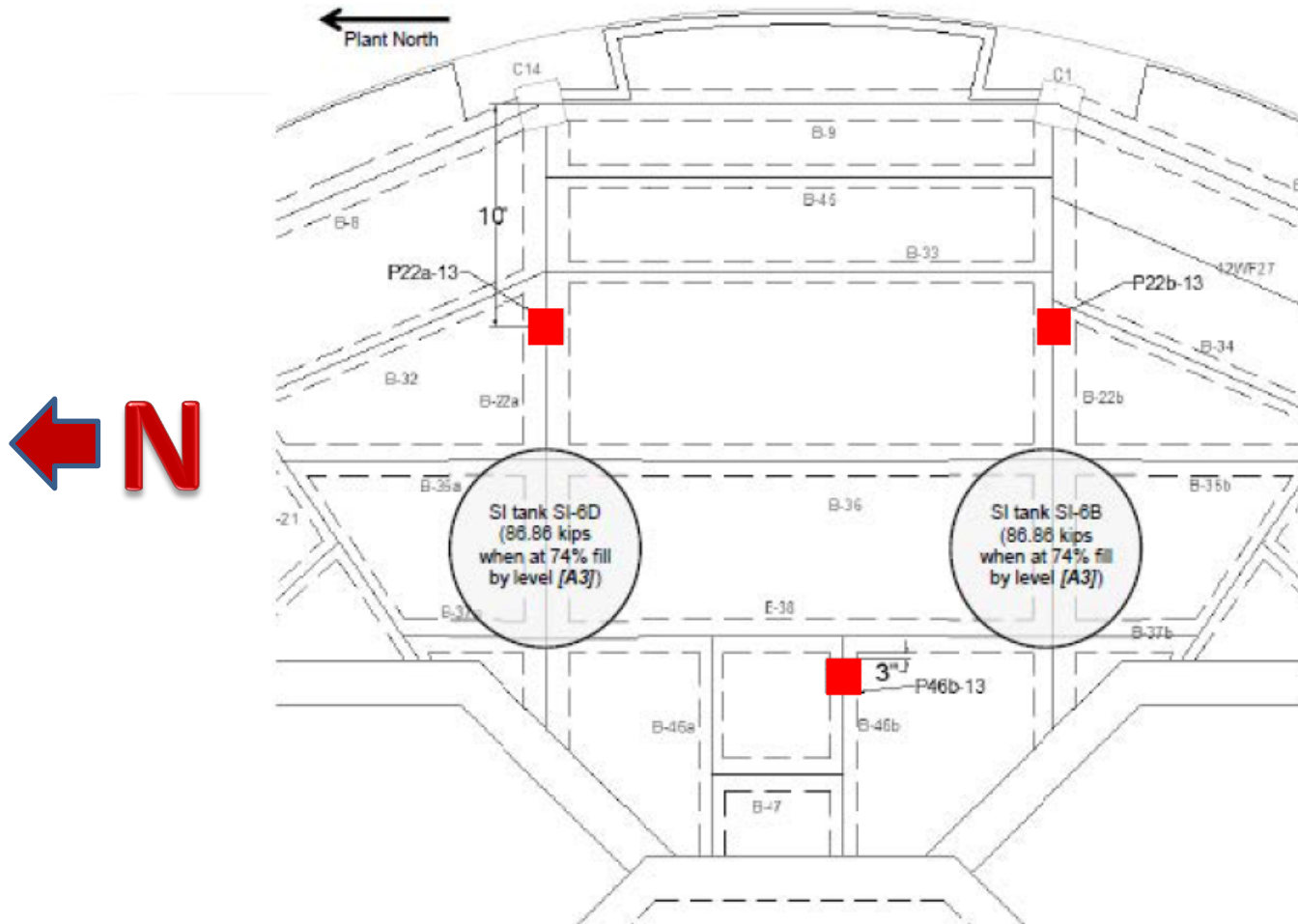
Modifications Regarding Beams B-22A and B-22B

Spring 2015 Outage

OPPD will take the following actions to address the design margin deficiency for Beams B-22A and B-22B:

- Install two precast concrete support columns under Beams B-22A and B-22B
- Install one precast concrete support column under Beam B-46B

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Location of New Support Columns



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Column Specifications

- Modification design/construction code is ACI 318-1963 (original construction code)
- Columns are 18” wide x 18” deep x approximately 16’ tall
- Concrete compressive strength is 8,000 psi (includes shrink reducing admixtures)
- Rebar – Eight No. 9 rebar with No. 4 stirrups every five inches
- Columns are fabricated in two sections to support installation
- Each section weighs approximately 2,500 pounds

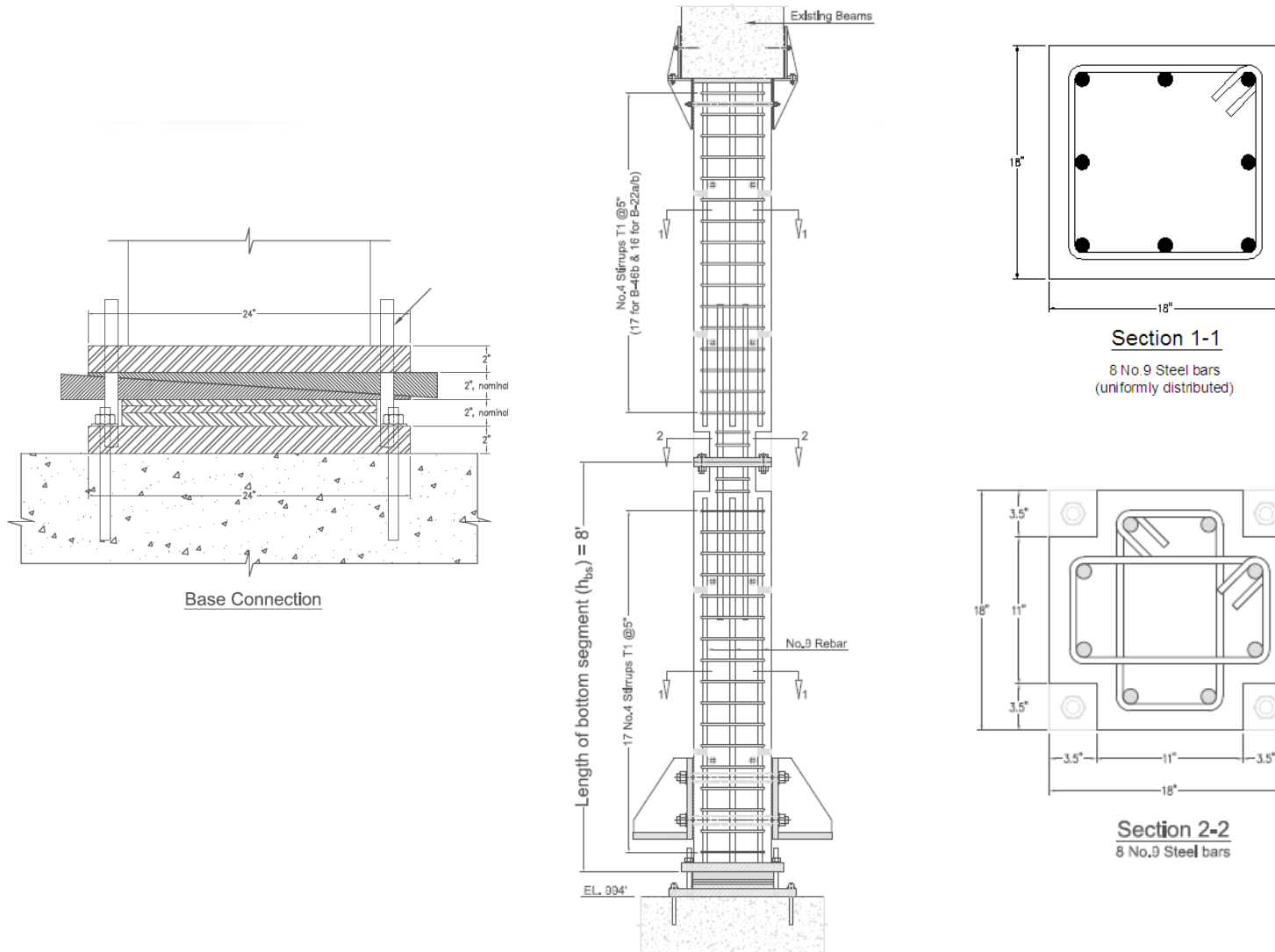


Containment Internal Structures

Column Specifications

- Column working stress design load capacity is 714,000 pounds
- Columns will be pre-loaded to address existing beam stresses
 - B-22A and B-22B pre-load is 80,000 pounds
 - B-46B pre-load is 40,000 pounds
- Restores design margin for required load combinations for Beams B-22A, B-22B and B-46B

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Containment Internal Structures

Column Loading Precautions

- Hydraulic jacks and calibrated pressure gauges will be used to ensure a desired load is applied across all columns
- Pre-load will be applied in small increments across all three columns simultaneously
- A wait period and physical inspection will be conducted before successive incremental pre-load applications



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Column Loading Process

- Jacks are mounted under the jacking plates
- Jack travel and under-jack shims are used to limit movement to no more than 1/16 inch
- The loading steps will be repeated until the full pre-load has been applied
- Tapered shims will secure columns in final position
- The jacks will be released allowing full load to be placed on the shims



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Operability


- Spring 2015 modifications will restore full design margin for the RVHS and Beams B-22A and B-22B consistent with the current licensing basis
- Operability Evaluations FC08189 and FC08234 will remain in effect after the Spring 2015 outage
 - Remaining identified CIS design deficiencies will be addressed during Fall 2016 outage
 - The pre-load applied on the columns restoring design margin for Beams B-22A and B-22B installed in the Spring 2015 outage will reduce during the 2015-2016 operating cycle due to concrete shrinkage and creep
 - Beams B-22A and B-22B will remain operable throughout the operating cycle with enhanced design margin
 - The pre-load on those beams will be reapplied during the Fall 2016 outage restoring full design margin



Containment Internal Structures

Code of Construction

- In accordance with the current licensing basis, the CIS is a Class I structure designed to withstand the required load combinations of both working stress and no loss of function (ultimate strength) per American Concrete Institute (ACI) Code 318 (1963)
- OPPD is developing a License Amendment Request to:
 - Adopt ACI-318 (1971)
 - Revise USAR Section 5.11
- Expected submittal date for the license amendment request is first quarter 2015



Containment Internal Structures

Fall 2016 Outage Scope

All remaining identified CIS design deficiencies will be addressed prior to restart following the Fall 2016 outage

- Utilizing the anticipated revision to the licensing basis, the following modifications will be made during the Fall 2016 outage to restore full design margin and compliance with the licensing basis
 - Install six additional columns utilizing the same design and installation approach
 - Four columns at the 994' elevation
 - Two columns at the 1045' elevation
 - Resolve 68 piping and cabling interferences associated with column installation



Containment Internal Structures

Next Steps

- Engineering Change Packages for the Spring 2015 outage work regarding the RVHS and Beams B-22A and B-22B will be available for NRC review by mid-January 2015
- Submit the License Amendment Request to revise USAR Section 5.11 and adopt ACI-318 (1971)
- Perform engineering analyses and develop modifications to be installed during the Fall 2016 outage

Closing Remarks

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