ENCLOSURE 4 to AW-17-4519

APP-GW-GLY-129, Revision 0
"Updates to WCAP-17938 Resulting from Sanmen Hot Functional Testing Observations – Closed Meeting"

(Non-Proprietary)

This presentation is non-proprietary

Updates to WCAP-17938 Resulting from Sanmen Hot Functional Testing Observations – Closed Meeting

February 16, 2017

Westinghouse

Agenda

Objective:

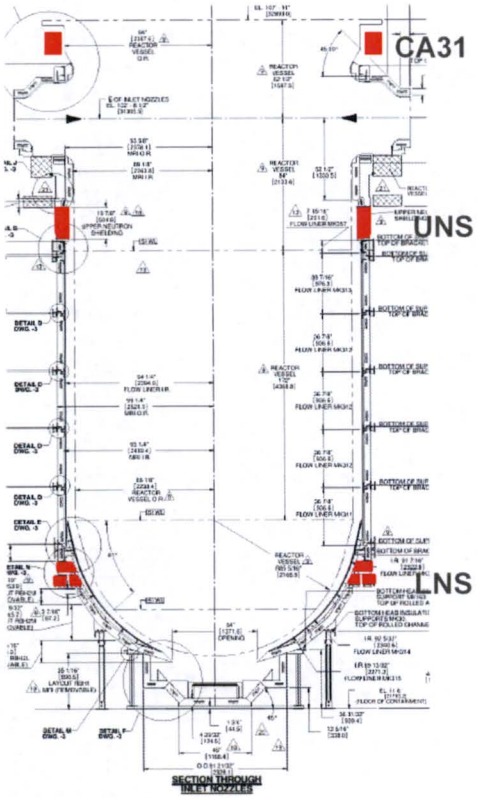
- Inform NRC Staff about Neutron Shielding observations from Sanmen & proposed revisions to WCAP-17938
- Receive and discuss NRC Staff feedback

Agenda:

- Issue Overview
- Design Assessment
- Revisions to Topical Report
- Schedule

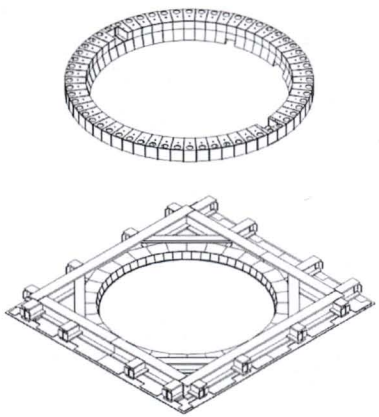
Issue Overview

Design Overview
Reactor Vessel Neutron Shielding Locations

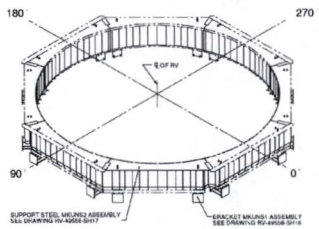


CA31

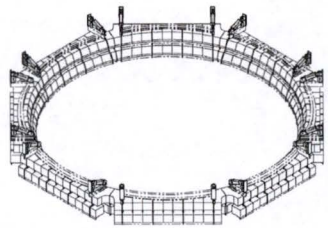
[a,c]



Upper Neutron Shield (UNS)



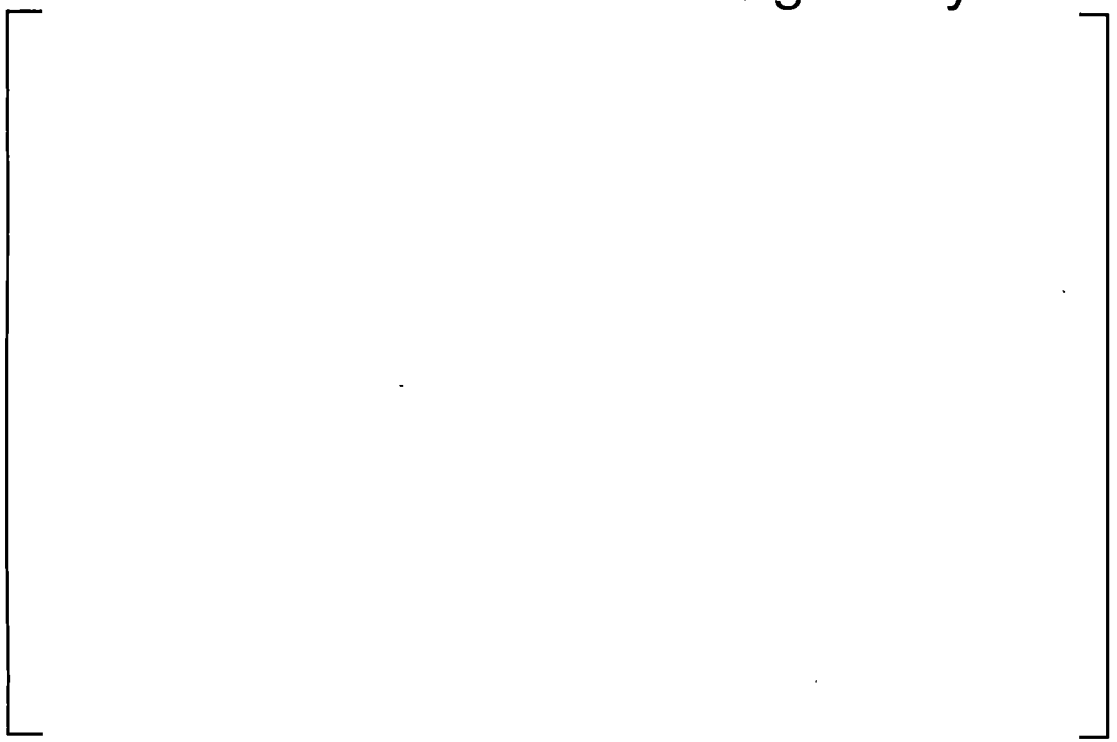
Lower Neutron Shield (LNS)



CA31 Overview

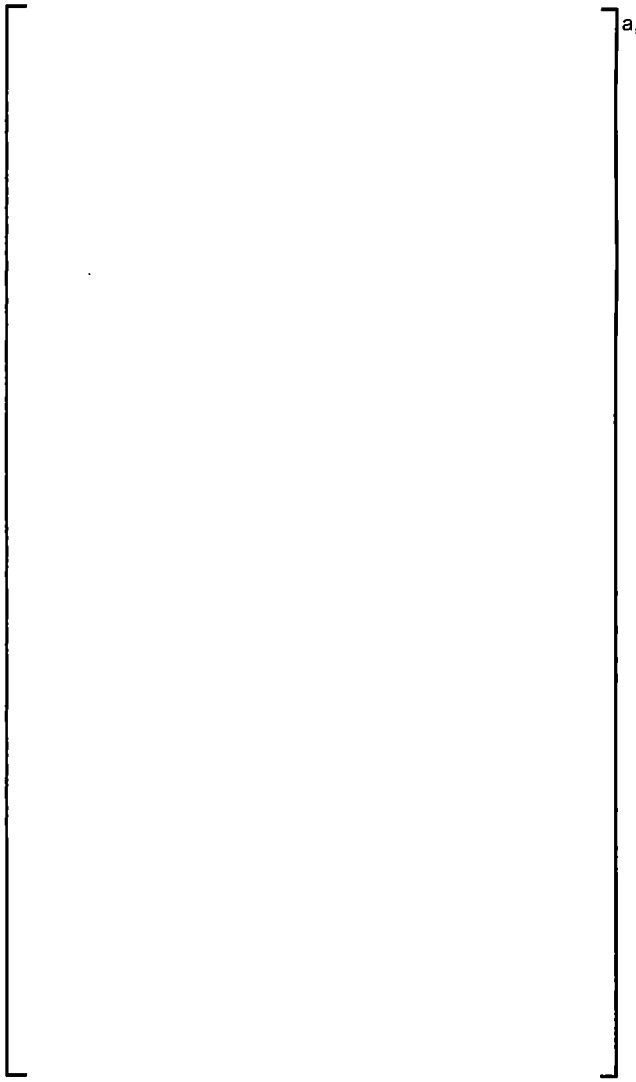
- Neutron shield blocks are integrally designed into the CA31 module that forms the floor of the refueling cavity.

[a,c



] a,c

[a,c



] a,c

CA31 Problem Statement

[a,c

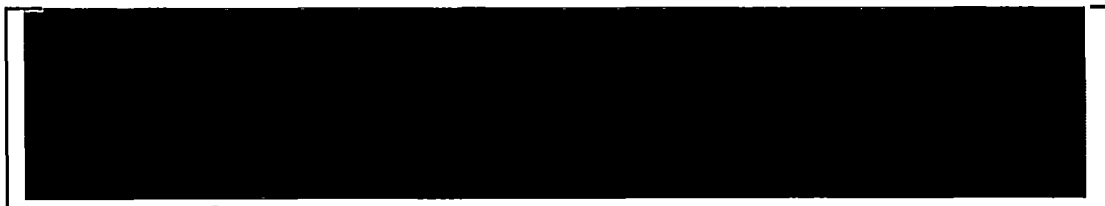
a,c]

- Volumetric expansion of shielding material was not properly considered within the design and construction
- Material off gassing was greater than expected causing internal pressurization of the shield blocks

Level I CAPAL was generated and RCA was conducted

CA31 Overview

a,c



a,c

Neutron Shielding Issue Resolution Problem Statement – MN20

- Purpose of MN20 blocks is to reduce radiation streaming from the reactor cavity annulus and into the lower reactor cavity.

a,c

[ ]

a,c

[ ]

- Inspection of LNS did not indicate any block displacement or deformation due to thermal expansion

MN20 Summary of Inspection Results

[a,c]

[a,c]

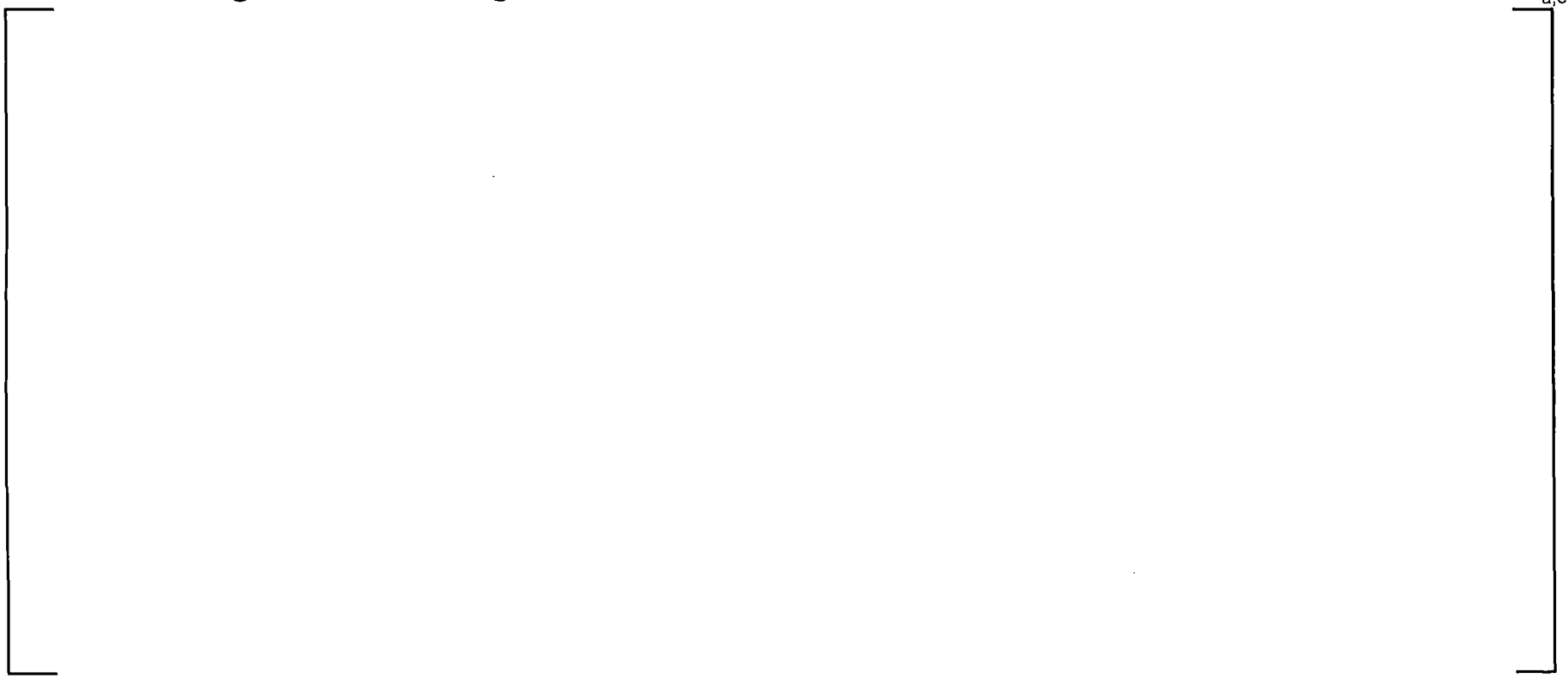
Design Assessment

CA31 New Design

New shield block configuration

- Reconfigured existing neutron blocks mounted on CA31

a,c



CA31 New Design

Reconfigure existing neutron block

a,c

CA31 New Design

New supplemental shielding block

a,c

a,c

CA31 New Design Shielding Material

a,c

CA31 Debris Assessment

a,b,c

MN20 UNS Assessment

[a,c]

MN20 LNS Assessment

a,c

MN20 LNS Assessment

a,c

Westinghouse

APP-GW-GLY-129 Revision 0

LNS design is less susceptible to the effects of thermal expansion

Revisions to Topical Report

Impacts to Technical Report (TR) WCAP-17938 Revision 1

- The overall premise, objectives, and conclusions of the TR do not change.
- The TR will continue to provide an integrated assessment of AP1000 in-containment cables and the suitability of non-metallic insulation (NMI) in the reactor cavity

[a,c]

Impacts to Technical Report (TR) WCAP-17938 Revision 1

a,b,c

- Regulatory impacts remain unchanged

Schedule

Topical Report Schedule

[ ] a,c

ENCLOSURE 5 to AW-17-4519

APP-GW-GLY-127, Revision 0
"Updates to WCAP-17938 Resulting from Sanmen Hot Functional Testing Observations - Public Meeting"

(Non-Proprietary)

This presentation is non-proprietary

Updates to WCAP-17938 Resulting from Sanmen Hot Functional Testing Observations – Public Meeting

February 16, 2017

Westinghouse

Agenda

Objective:

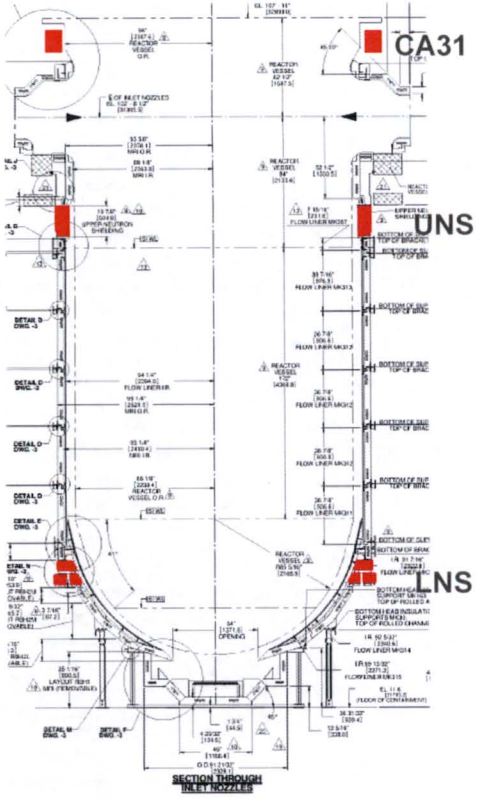
- Inform NRC Staff about Neutron Shielding observations from Sanmen & proposed revisions to WCAP-17938
- Receive and discuss NRC Staff feedback

Agenda:

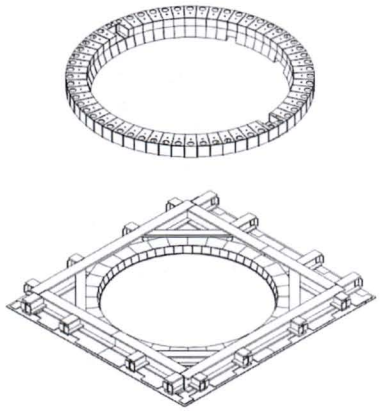
- Issue Overview
- Design Assessment
- Revisions to Topical Report

Issue Overview

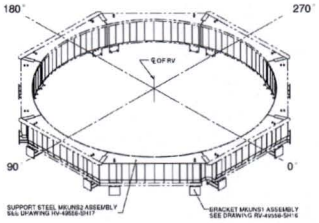
Design Overview
Reactor Vessel Neutron Shielding Locations



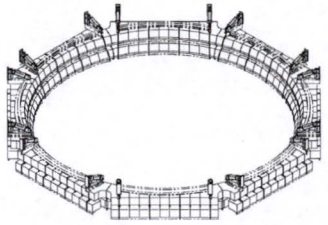
CA31



Upper Neutron Shield (UNS)



Lower Neutron Shield (LNS)



Westinghouse

Issue Overview

- CA31 Neutron shield blocks are integrally designed into the CA31 module that forms the floor of the refueling cavity
- During Hot Functional Testing high temperature plateaus, shielding material contained in CA31 volumetrically expanded and extruded out of the shield blocks into the nozzle gallery
- Volumetric expansion of shielding material was not properly considered within the design and construction
- Purpose of MN20 blocks is to reduce radiation streaming from the reactor cavity annulus and into the lower reactor cavity.
- MN20 is susceptible to the same failure mode (thermal expansion) as CA31
  - UNS and LNS contain the same shielding material
- Inspection of LNS did not indicate any block displacement or deformation due to thermal expansion

Design Assessment

Design Assessment

- CA31 shielding material has been replaced with a different material, that will not experience similar expansion issues
- Extent of Condition was performed on MN20 locations, considering laboratory testing, site inspections and analysis
- The conservative decision was made to also replace the neutron shielding material in the MN20 UNS
  - These components will no longer require non-metallic insulation
- The evaluations also determined that it was not necessary to replace the neutron shielding material in the MN20 LNS

Revisions to Topical Report

Impacts to Technical Report (TR) APP-GW-GSR-012 Revision 1

- The overall premise, objectives, and conclusions of the TR do not change.
- The TR will continue to provide an integrated assessment of AP1000 in-containment cables and the suitability of non-metallic insulation (NMI) in the reactor cavity
- Pertinent sections of the TR will be revised or enhanced to reflect the changes in shielding material
- UNS is removed from the scope of the WCAP since it is no longer a potential debris source

Impacts to Technical Report (TR) APP-GW-GSR-012 Revision 1

- Jet impingement sections of the TR will be revised to confirm NMI suitability with both types of shielding material
  - The jet impingement testing still defines the ZOI for NMI suitability equivalency
  - Locations used in jet impingement testing still remain conservative
- Sections of the TR related to in-containment cables and debris generation break size remain unchanged
- The justification from the Chemical Debris Evaluation is unchanged, due CA31 and LNS shielding blocks encapsulation
- Regulatory impacts remain unchanged