

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”

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

February 16, 2017



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

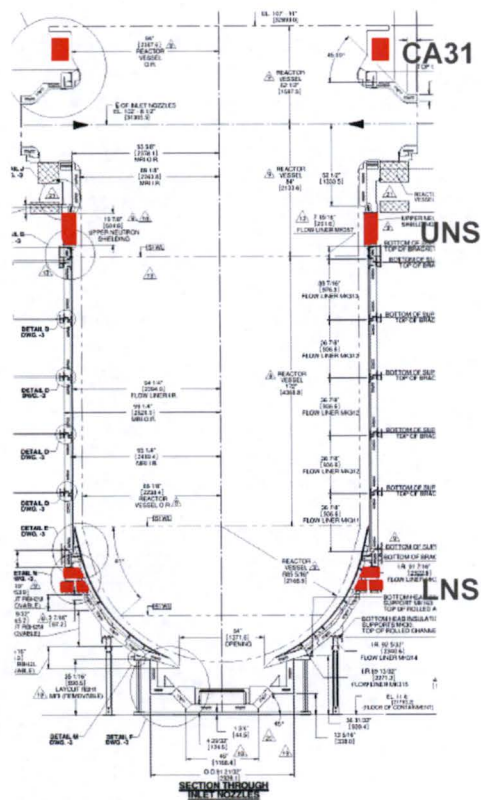


Issue Overview



Design Overview

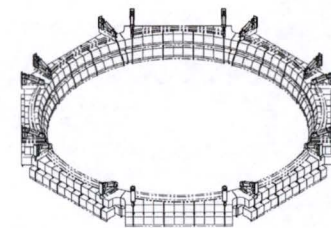
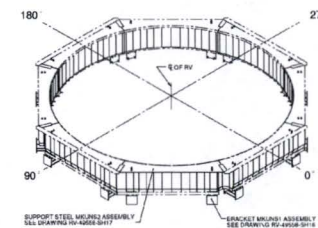
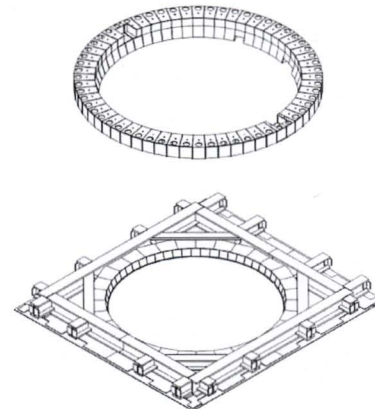
Reactor Vessel Neutron Shielding Locations



CA31

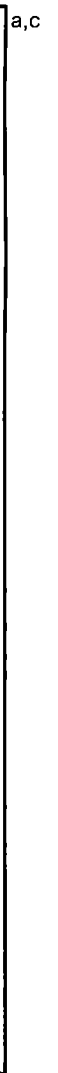
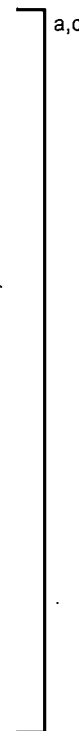
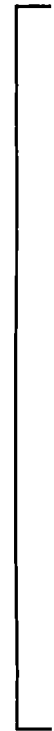
Upper Neutron Shield (UNS)

Lower Neutron Shield (LNS)



CA31 Overview

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



CA31 Problem Statement

- 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



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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.

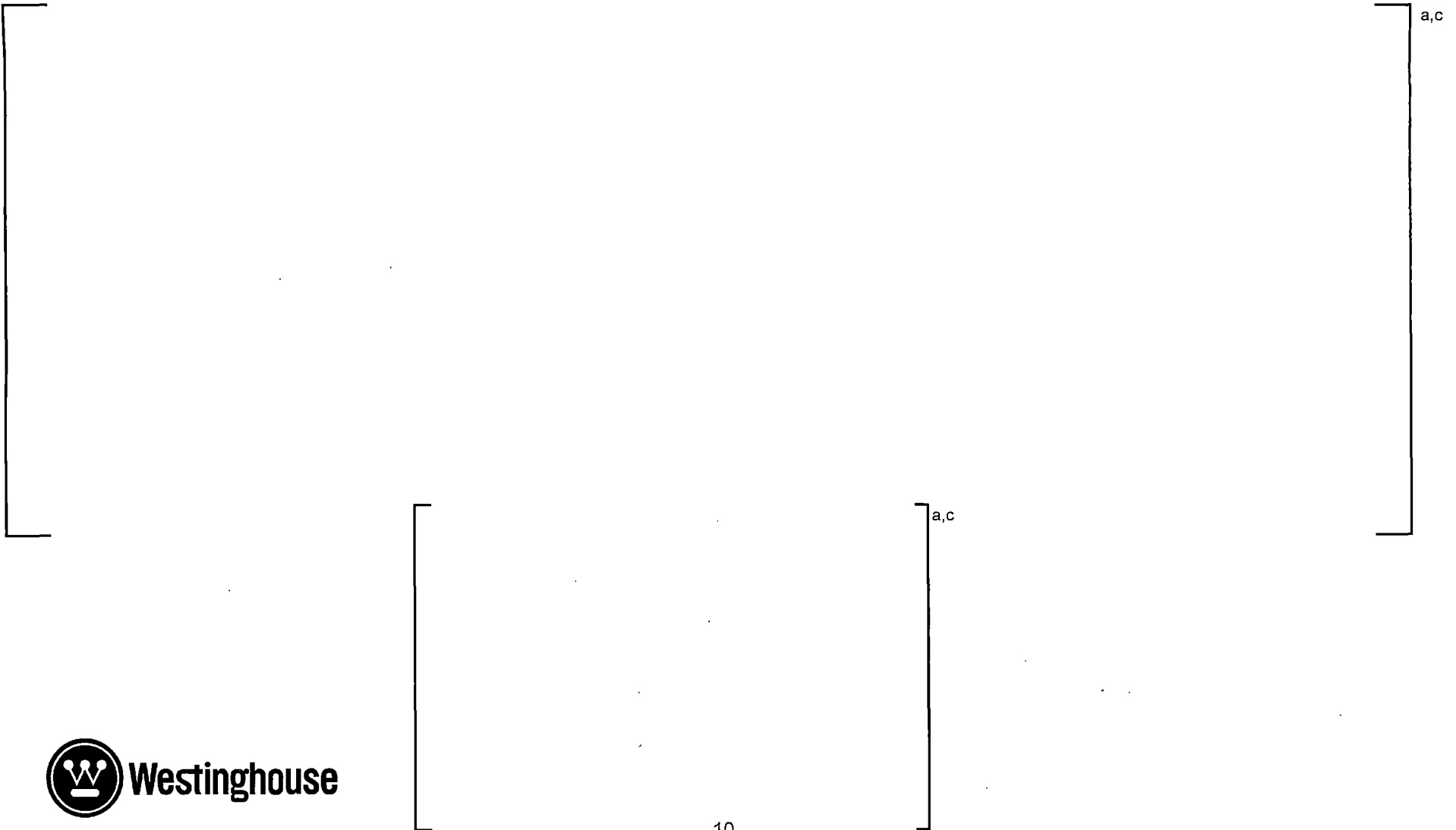
a,c

a,c

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



MN20 Summary of Inspection Results



Design Assessment



CA31 New Design

New shield block configuration

- Reconfigured existing neutron blocks mounted on CA31



CA31 New Design

Reconfigure existing neutron block



CA31 New Design

New supplemental shielding block



CA31 New Design Shielding Material

a,c



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CA31 Debris Assessment

a,b,c



MN20 UNS Assessment

a,c



MN20 LNS Assessment

a,c



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MN20 LNS Assessment

a,c



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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



Impacts to Technical Report (TR) WCAP-17938

Revision 1

a,b,c

- Regulatory impacts remain unchanged



Schedule



Topical Report Schedule

	a,c
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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”

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Updates to WCAP-17938 Resulting from Sanmen Hot Functional Testing Observations – Public Meeting February 16, 2017



Agenda

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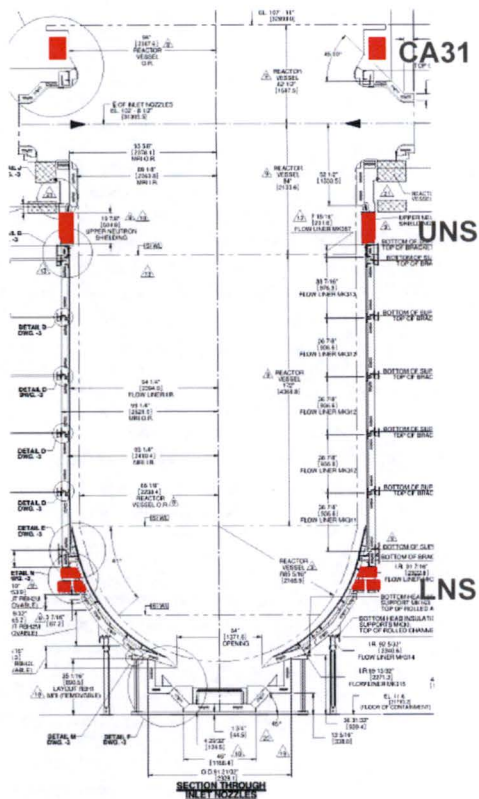


Issue Overview

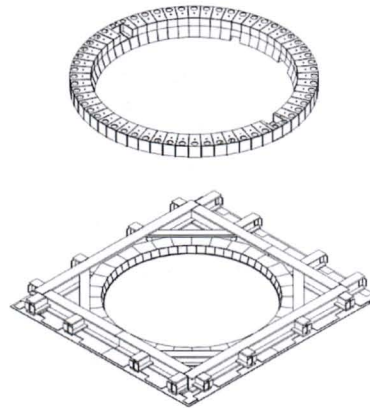


Design Overview

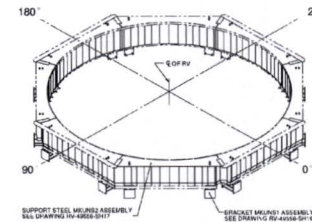
Reactor Vessel Neutron Shielding Locations



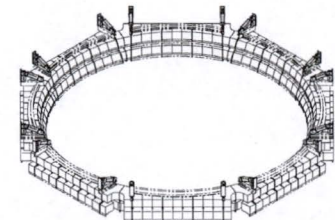
CA31



Upper Neutron Shield (UNS)



Lower Neutron Shield (LNS)



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

