



Devonport Royal Dockyard Ltd. – 14 Dock Reactor Access House

Agreement to modify the 14 Dock Reactor Access House by introduction of a Seismic Trigger System under Arrangements made under Licence Condition 20(1)

Project Assessment Report ONR-DEF-PAR-15-006
Revision 0
18 September 2015

© Office for Nuclear Regulation, 2014

If you wish to reuse this information visit www.onr.org.uk/copyright for details.

Published 08/15

For published documents, the electronic copy on the ONR website remains the most current publicly available version and copying or printing renders this document uncontrolled.

EXECUTIVE SUMMARY

Request for 'agreement' to modify the provision of the 14 Dock Reactor Access House by the introduction of a Seismic Trigger System.

Permission requested

Licence Condition 20(1) requires that “the licensee shall ensure that no modification to the design which may affect safety is made to any plant during the period of construction except in accordance with adequate arrangements made and implemented by the licensee for that purpose”. In accordance with its Licence Condition 20 arrangements, Devonport Royal Dockyard Ltd (DRDL) has requested ONR's 'agreement' to undertake the activity of installation of a Seismic Trigger System.

Background

The 14 Dock Reactor Access House Defuelling Facility, including tooling and mechanical handling equipment, is required in order to undertake defuelling of submarines at the Devonport Royal Dockyard Submarine Refit Complex. In conjunction with the Defence Nuclear Safety Regulator, a project has been established to regulate the safe design, construction, installation and commissioning of the new Reactor Access House.

As the design of the Reactor Access House developed, DRDL identified that certain components within the protection systems might not withstand the shaker table test aimed at demonstrating its safety under seismic fault conditions. DRDL therefore proposes to install a Seismic Trigger System to address this potential safety shortfall.

The safety function of the Seismic Trigger System is to prevent uncontrolled movement of the tooling and mechanical handling equipment that could lead to damage to the reactor plant during and following a seismic event. It achieves this by interrupting the electrical power supply to the equipment at a predetermined seismic acceleration.

Assessment and inspection work carried out by ONR in consideration of this request

To support this request for ONR agreement, assessment has targeted the reliability of the Seismic Trigger System to interrupt (and prevent re-energisation of) the supply of electrical power at and above a predetermined seismic acceleration.

To satisfy itself that the Seismic Trigger System, will deliver adequate reliability and integrity, technical assessments were undertaken in the specialist areas of Fault Studies and Control & Instrumentation.

Matters arising from ONR's work

ONR notes that this safety case submission has undergone DRDL due process and was presented to the DRDL Nuclear Safety Committee for consideration and advice in November 2014. The committee concluded that the document was accepted subject to incorporation of its advice and satisfactory independent peer review certification. The independent peer review certificate confirmed the safety category and found it satisfactory with no major or intermediate comments outstanding.

ONR's specialist inspectors concluded that the reliability performance target identified by the Licensee for the Seismic Trigger System was not linked to the system's classification in a manner consistent with ONR's expectations for a Class 1 system.

ONR's Fault Studies specialist inspector judged that the Design Basis Analysis in the original submission was not adequately developed. The Licensee addressed this deficiency during the assessment period by introducing a number of new claims for high consequence faults. The inspector concluded that the new claims developed confidence that the Licensee will be able to support a revised Design Basis Analysis that demonstrates a Class 2 Seismic Trigger System, together with other substantiated safety measures, will be sufficient to meet ONR's expectations.

The Control & Instrumentation specialist inspector concluded that the proposed design and construction of the Seismic Trigger System did not meet ONR's expectations for a Class 1 safety system but was generally commensurate with the requirements of a Class 2 system. The inspector has identified a number of recommendations that can be completed following the commencement of construction of the Seismic Trigger System, but prior to inactive commissioning.

The Licensee has raised a Category 1 Forward Action Plan against Hold Point 3 (Reactor Access House First Nuclear Use) that requires the Pre-Operation Safety Report Fault Schedule to fully incorporate all of the additional claims and supporting evidence. ONR's recommendations have been issued to the Licensee as a set of requirements to be addressed prior to release of the 14 Dock Reactor Access House Hold Point 2b for the start of inactive commissioning. The Fault Studies and Control & Instrumentation specialist inspectors support the issue of a Licence Instrument.

DNSR has confirmed that they have no objections to ONR issuing a Licence Instrument.

Conclusions

This report presents the findings of the ONR's assessment of DRDL's safety case to modify the provision of the 14 Dock Reactor Access House by the introduction of a Seismic Trigger System.

The licensee's submission and engineering substantiation did not initially meet ONR expectations. However, the Licensee's further submissions developed ONR's confidence that these can be completed in a manner that will meet ONR's regulatory expectations.

The licensee has undertaken to improve the Design Basis Analysis and track the development of outstanding substantiation work by raising a Forward Action Plan, for the work to be completed before the start of inactive commissioning of the 14 Dock Reactor Access House.

Based upon the outcome from the specialist assessments I consider it would be disproportionate to withhold permission, I therefore support the issue of a licence instrument agreeing to the installation of a Seismic Trigger System under DRDL's arrangements made under Licence Condition 20(1).

Recommendation

This Project Assessment Report recommends that the Propulsion Sub-programme Delivery Lead:

- Accepts this Project Assessment Report.
- If the Project Assessment Report is acceptable, issue Licence Instrument No. 559 under arrangements made under Site Licence Condition 20 of Schedule 2 to Nuclear Site Licence No. 50B thereby agreeing to the installation of a Seismic Trigger System.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
AR	Assessment Report
C&I	Control and Instrumentation
DBA	Design Basis Analysis
DNSR	Defence Nuclear Safety Regulator
DRDL	Devonport Royal Dockyard Limited
HOW2	(ONR) Business Management System
LC	Licence Condition
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PCSR	Pre-construction Safety Report
PSA	Probabilistic Safety Assessment
RAH	Reactor Access House
RGP	Relevant Good Practice
SAP	Safety Assessment Principle(s)
SFAIRP	So far as is reasonably practicable
SRC	Submarine Refit Complex
SSC	Structure, System and Component
STS	Seismic Trigger System
TAG	Technical Assessment Guide (ONR)

TABLE OF CONTENTS

1	PERMISSION REQUESTED.....	6
2	BACKGROUND.....	6
3	ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST	6
4	CONCLUSIONS	8
5	RECOMMENDATIONS	8
	REFERENCES	9
	APPENDIX A – COLLATION AND SENTENCING OF RECOMMENDATIONS ARISING FROM ONR ASSESSMENT.....	10

1 PERMISSION REQUESTED

1. Licence Condition 20(1) requires that “the licensee shall ensure that no modification to the design which may affect safety is made to any plant during the period of construction except in accordance with adequate arrangements made and implemented by the licensee for that purpose”. In accordance with its Licence Condition 20 arrangements, Devonport Royal Dockyard Ltd (DRDL) has requested ONR's 'agreement' to undertake the activity of installation of a Seismic Trigger System (STS).

2 BACKGROUND

2. The 14 Dock Reactor Access House (RAH) Defueling Facility, including tooling and mechanical handling equipment, is required in order to undertake the defueling of submarines at the Devonport Royal Dockyard Submarine Refit Complex (SRC).
3. As the design of the Reactor Access House developed, DRDL identified that certain components within the protection systems might not withstand the shaker table test to demonstrate its seismic performance. DRDL therefore introduced a Seismic Trigger System to address this potential safety shortfall based on that implemented in the existing 9 Dock Seismic Monitoring and Triggering System.
4. This report presents the findings of the assessment of the Modification to Design of Plant Under Construction Report for Introduction of a STS to the Submarine Refit Complex (SRC) for the 14 Dock RAH.
5. The Licensee requested ONR's 'agreement' under Licence Condition 20(4) ahead of the formal Regulator assessment period for the RAH Defueling Regulator Hold Point SRC_RAH_1c (agreement to transport the SRC RAH, its crane and tooling/defuel plant within 14 Dock on the DRDL Licensed Site), as required under its arrangements.
6. ONR notes that this safety case submission has undergone DRDL due process and was presented to the DRDL Nuclear Safety Committee (NSC) for consideration and advice in November 2014 [Ref. 4]. The committee concluded that the document was accepted subject to incorporation of the NSC advice and satisfactory Independent Peer Review certification. The IPR certificate confirmed the safety category and found it satisfactory with No major or intermediate comments outstanding [Ref. 4].

3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

7. The process employed by ONR in carrying out its permissioning activities is defined in ONR procedures [Ref. 1]. As in all aspects of its regulatory activities, ONR employs a sampling regime in the assessment of safety cases. Specialist inspectors have applied appropriate national and international standards, the appropriate ONR Safety Assessment Principles [Ref. 2] and ONR Technical Assessment Guides [Ref. 3]. The assessment reports produced have been internally peer reviewed prior to formal issue.
8. ONR's regulation of the 14 Dock RAH project has been in accordance with the ONR/DNSR Integrated Intervention Strategy for the Defence Propulsion sub-programme. ONR engagement has been undertaken over a period of approximately five years, including proportionate and targeted assessment of safety documentation, site licence condition compliance inspections and technical meetings with the DRDL's project team.

9. To support this 'agreement', ONR's assessment has targeted the reliability of the STS to interrupt (and prevent re-energisation of) the supply of electrical power at and above a predetermined seismic acceleration.
10. To satisfy itself that the STS will deliver adequate reliability and integrity, ONR technical assessments were undertaken in the specialist areas of Fault Studies and Control & Instrumentation.
11. Other regulatory bodies have been consulted and confirmed no objection to the granting of this permission [Ref. 9 & 10].

4 MATTERS ARISING FROM ONR'S WORK

Fault Studies

12. The Fault Studies specialist inspector's assessment focussed on the fault sequences and critical safety functions the case is demonstrating. The fault studies assessment [Ref. 6] concluded that there is a fundamental weakness in the submission as it fails to link Structure, System and Component (SSC) classification to system reliability in a manner that is consistent with ONR expectations. This appears to be a weakness in the licensee's arrangements and is captured under an existing regulatory issue.
13. As a result of this fundamental weakness in SSC classification, the Design Basis Analysis (DBA) in the original submission was inadequately developed. The Fault Studies specialist inspector influenced the licensee to address this deficiency during the assessment period by the inclusion of a number of new claims for high consequence faults. This was captured by the Licensee in a Forward Action Plan (FAP) [Ref. 8] to ensure that the necessary substantiation is undertaken at an appropriate time.
14. The Fault Studies specialist inspector has identified a number of recommendations (Appendix A) that should be addressed to ONR's satisfaction prior to the release of the forthcoming regulatory Hold Point SRC_RAH_2b. The inspector concluded that the Licensee's responses to date have developed confidence that DRDL will be able to support a revised DBA that will demonstrate that a Class 2 STS system, together with other substantiated safety measures will be sufficient to meet ONR's expectations. Based upon this conclusion, the Fault Studies specialist inspector supports the issue of a licence instrument agreeing to the modification of the 14 Dock RAH by introduction of STS.

Control & Instrumentation (C&I)

15. The C&I specialist inspector's assessment largely focussed on a review of substantiation documentation supporting the claimed performance of the safety functionality of the STS system, the associated flood detection functionality and a consideration of the engineering of the system in the context of its classification and target performance measures
16. In summary, the C&I Specialist Inspector found that, in general, valid engineering claims, arguments and evidence have been presented by the Licensee. That said, the reliability performance target identified by the Licensee for the STS system is not linked to the system's classification in a manner that is consistent with ONR's expectations a for Class 1 system. Additionally, the inspector found that the engineering substantiation presented for the STS shows that the system's engineering does not meet ONR's expectations for a Class 1 safety system.

17. The inspector is of the opinion that the proposed engineering is generally commensurate with the requirements of Class 2 system. The Licensee's DBA provided in the submission indicated that this shortfall in engineering is significant for a range of faults involving substantial radiological consequences. In response, the Licensee has proposed a Forward Action Plan (FAP) [Ref.8] to conclude improvements to DBA analysis, and track the development of outstanding substantiation work.
18. The C&I specialist inspector's has identified a number of recommendations (Appendix A) that should be addressed to ONR's satisfaction prior to the release of the forthcoming regulatory hold-point SRC_RAH_2b. The inspector is of the opinion that the Licensee's submission provides sufficient confidence that these can be completed in a way that will meet ONR's technical regulatory expectations, following commencement of construction of the STS. The inspector concluded that it would be disproportionate to recommend against the issuing of an LC20 agreement for installation of the STS system (including flood detection) from a C&I assessment perspective and supports the issue of a licence instrument agreeing to the proposed activity

5 CONCLUSIONS

19. This report presents the findings of the ONR's assessment of DRDL's safety case to modify the provision of the 14 Dock Reactor Access House by the introduction of a Seismic Trigger System.
20. The licensee has undertaken to improve the Design Basis Analysis and track the development of outstanding substantiation work by a Forward Action Plan, to be completed prior to the start of inactive commissioning of the 14 Dock Reactor Access House (Hold Point 3).
21. The licensee's submission and engineering substantiation did not meet ONR expectations. However, the additional information submitted by the licensee during the assessment has addressed the most significant shortfalls and has given ONR confidence that the outstanding regulatory issues can be completed in a manner that will meet ONR's technical regulatory expectations. The collation and sentencing of ONR's recommendations arising from specialist assessments is given in Appendix A, and regulatory issues will be updated to monitor close out.
22. Based upon the outcome from the specialist assessments I consider it would be disproportionate to withhold permission, therefore I support the issue of a licence instrument agreeing to the modification of the 14 Dock Reactor Access House by the introduction of a Seismic Trigger System.

6 RECOMMENDATIONS

23. This Project Assessment Report recommends that the Propulsion Sub-programme Delivery Lead:
 - Accepts this Project Assessment Report.
 - If the Project Assessment Report is acceptable, issue Licence Instrument No. 559 under arrangements made under Site Licence Condition 20 of Schedule 2 to Nuclear Site Licence No. 50B thereby agreeing to installation of a Seismic Trigger System.

REFERENCES

1. ONR HOW2 Guide - Purpose and Scope of Permissioning - NS-PER-GD-014 Revision 4. July 2014. <http://www.onr.org.uk/operational/assessment/index.htm>
2. Safety Assessment Principles for Nuclear Facilities. 2014 Edition. Revision 0. ONR. January 2008. <http://www.onr.org.uk/saps/saps2014.pdf>
3. Office for Nuclear Regulation (ONR) Permissioning inspection - Technical assessment guides. http://www.onr.org.uk/operational/tech_asst_guides/index.htm
4. DRDL Letter: SRC Safety Case / 220, Addendum 2 – RAH Defuel – Application for Agreement to undertake the activity of installation of a Seismic Trigger System (STS) under the arrangements made under Licence Condition 20(1). CDMS 000108718-01, Unique No. 23743R, 16th January 2015 (TRIM Ref:2015/40456)
5. DRDL Document: Modification to Design of Plant Under Construction, Introduction of a Seismic Trigger System, SRC Facility Safety Case / 220, Addendum 2 – RAH Defuel, NED-MNC-220-14121, Revision 01, Version 1.6, January 2015 (DRDL Doc Ref: 220/ND14/000064108/SR/1/1.6) (TRIM Ref: 2015/347552)
6. ONR-DEF-AR-15-007: Fault Studies Assessment of the Proposed Installation of a Seismic Trigger System for 14 Dock RAH Defueling (TRIM Ref: 2015/304195)
7. ONR-DEF-AR-15-008: Control and Instrumentation Engineering Assessment of the Introduction of a Seismic Trigger System and Associated Modifications to SRC Facility Safety Case 220 (TRIM Ref: 2015/298104)
8. DRDL Document: FAP220(2)-MNC-14121-01 - 14 Dock RAH Defuelling - Seismic Trigger System (STS) LC20 Safety Justification, Approved 3rd July 2015 (TRIM Ref: 2015/295822)
9. ONR Document: DRDL 14 Dock RAH – Status of Requirements to Annexes to ONR Letter 71238 to DRDL (TRIM Ref: 2015/74819)
10. EA email: DRDL - 14 Dock RAH / Defuelling : Introduction of a Seismic Trigger System - Environment Agency no objection (TRIM Ref: 2015/344086)

APPENDIX A – COLLATION AND SENTENCING OF RECOMMENDATIONS ARISING FROM ONR ASSESSMENT

Specialism	No.	Recommendation	Sentencing	Action
Fault Studies	1	ONR should engage with DRDL to explore the potential for revision of their procedures to ensure that SSC classification is linked to reliability and consistent with the expectations of ONR.	To be addressed at corporate level following issue of Technical Assessment Guide – Categorisation and Classification, Version 6 – Draft incorporating external review comments. TRIM 2015/253474	Complete Issue No. 3801 has been raised by the SRC Site Inspector.
Fault Studies	2	ONR should review the ALARP position for NSC roll frame removal at the next RAH hold point, Hold Point 1c (installation), in the context of a wider range of faults for which the STS does not provide protection	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.
Fault Studies	3	DRDL should present substantiation of new claims on boronation and seismic withstand of the crane loadpath in the Category 1 FAP Ref: 220(2)-MNC-14121-01 to ONR for assessment prior to release of RAH Hold Point 2b.	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.
Fault Studies	4	The ONR EC&I inspector should assess whether the design will meet ONR requirements for a Class 2 system if he judges that Class 1 performance is not achieved.	To be addressed by C&I Inspector.	Complete See ONR-DEF-AR-15-008 (TRIM Ref: 2015/298104).
Fault Studies	5	DRDL should review the exclusion of seismic collapse of adjacent dockside structures from the fault schedule and reconsider whether SFR MNC-220-SFR3.18.011 is satisfied.	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.

Specialism	No.	Recommendation	Sentencing	Action
C&I	1	DRDL should revise their procedures to ensure that SSC classification is linked to reliability and is presented in a manner that is consistent with the expectations of ONR in this regard.	To be combined with Fault Studies Recommendation 1	Complete Issue No. 3801 has been raised by the SRC Site Inspector.
C&I	2	DRDL should fully justify the application of a Class 2 STS system in line with relevant good practice. This should be supported by development of the fault schedule (DBA) position, and substantiation of new claims as described in Category 1 FAP Ref: 220(2)-MNC-14121-01. DRDL should submit this justification to ONR for assessment prior to release of RAH Hold Point SRC_RAH_2b.	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.
C&I	3	DRDL should justify the extent of monitoring of the STS system status and the adequacy of the information provided to operators prior to the release of regulatory hold-point SRC_RAH_2b. This should include a consideration of the requirement to provide indication of the system status (e.g. indicators, alarms, HMI as necessary), via suitable means to RAH operators.	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.
C&I	4	ONR's External Hazards specialist inspector should confirm the adequacy of the seismic switch trip settings and sensor locations prior to the release of regulatory hold-point SRC_RAH_2b, as part of planned regulatory assessment of seismic aspects of the RAH safety case.	Additional scope of work to be defined in 14 Dock RAH task sheet. Confirmation of External Hazards specialist inspector's findings to be communicated to DRDL prior to Hold Point 2b for action as necessary.	Amend Task Sheet ONR-Defence-PROP-TS009 accordingly.
C&I	5	DRDL should reconsider options for improving fire protection of the STS, or further develop the ALARP arguments to explain why a fire protection system having similar functionality to the flood system cannot be implemented.	To be addressed by DRDL prior to Hold Point 2b for ONR assessment.	Amend Issue No. 1008 accordingly.