



Mobile crane operations adjacent to 9 Dock

**Acknowledgement to Implement Modification NED-MNC-290-15091, Justification for
mobile crane operations adjacent to 9 Dock**

Project Assessment Report ONR-OPF-PAR-16-002
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EXECUTIVE SUMMARY

Title

Acknowledgement to implement modification NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock

Permission Requested

Licence condition 22(1) requires that “*the licensee shall make and implement adequate arrangements to control any modification or experiment carried out on any part of the existing plant or processes which may affect safety.*” Devonport Royal Dockyard Ltd (DRDL) (the Licensee) wrote to the Office for Nuclear Regulation (ONR) in April 2016 (Ref. 1) requesting acknowledgement to implement modification NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock under change request (CR) 15091 (Ref. 2).

Background

DRDL’s “Category A” submission (Ref. 3) which presents a Licence Condition (LC) 22 modification to PSC-290 to justify operation of mobile cranes adjacent to the 9 Dock facility, specifically at 8 Dock, 10 Dock and 4 Basin North. The submission presents limits and conditions for mobile crane operations at 8 Dock East, 8 Dock West 10 Dock East, 10 Dock West and 4 Basin North. For mobile crane operations at 10 Dock East, the safety justification reads across the assessment and outputs from a recent justification relating to mobile crane operations at 5 Basin Arm, specifically in relation to the hazard to dockside cranes, cognisant of differences between the two facilities.

The scope of DRDL’s hazard assessment is limited to the configuration of the facility and submarine during initial stages of the submarine’s deep maintenance period docking. For subsequent stages which have not been covered, coincident mobile crane operations at 10 Dock East are therefore prohibited. A future site wide mobile crane submission will consider later stages of the docking.

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

ONR has carried out assessment work which focussed on the adequacy of the proposed modifications to the 9 Dock plant safety case and potential interactions between the mobile cranes and the submarine or the 9 Dock dockside cranes. This has comprised:

- Consideration of the limits and conditions derived by the safety case to ensure that no operations should pose a direct hazard to the submarine and that the potential interaction zones with the 9 Dock cranes are understood and appropriately restricted.
- Interactions on site to gain evidence that DRDL has adequate arrangements in place to ensure that mobile crane operations in 8 & 10 Dock and 4 Basin North are carried out in accordance with the limits and conditions of the 9 Dock safety case.
- Review of DRDL’s internal assurance process to confirm that the submission has undergone internal due process, including: independent peer review, and scrutiny through management safety and nuclear safety committees.

Matters arising from ONR’s work

From undertaking a process of assessment and inspection:

- I am satisfied that this safety case modification (Ref. 3) has identified limits and conditions in the interests of safety and if correctly implemented these will ensure risks from mobile crane operations at 8 & 10 Dock and 4 Basin North to the 9 Dock facility to be very low.

- I am satisfied that the licensee has adequate arrangements in place to implement the identified limits and conditions of operation to ensure that the risk to operations at 9 Dock remains low.
- I have satisfied myself that the licensee submission has undergone due process and no significant safety concerns have been identified.

The intervention targeted these areas and concluded that these aspects of the proposed modification were adequate and that there were no matters identified from the intervention by ONR that would preclude ONR acknowledging DRDL's modification document (Ref. 3).

Conclusions

This project assessment report concludes that the "Category A" modification, NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock (Ref. 3) presents an acceptable basis for implementing the proposed modifications to the 9 Dock safety case.

Recommendation

ONR's Superintending Nuclear Inspector for the Propulsion sub-programme is requested:

- If the project assessment report is acceptable, to sign Licence Instrument No. 562 (Ref. 14) under arrangements made under Site Licence Condition 22(1) of Schedule 2 to Nuclear Site Licence No. 50B which acknowledges DRDL's request to implement modification NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock.

LIST OF ABBREVIATIONS

ACPB	Approved Crane Parking Box
ACRC	Alternative Core Removal Cooling
ALARP	As low as reasonably practicable
CR	Change Request
DAP	Duly Authorised Person
DRDL	Devonport Royal Dockyard Limited
HOW2	(Office for Nuclear Regulation) Business Management System
IOI	Identified Operating Instructions
IPR	Independent Peer Review
LC	Licence Condition
LI	Licence Instrument
█	█
ONR	Office for Nuclear Regulation
MSC	Management Safety Committee
NDA	Nuclear Decommissioning Authority
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
█	█
RAH	Reactor Access House
SAP	Safety Assessment Principle(s)
SQEP	Suitably Qualified and Experienced Persons
SRC	Submarine Refit Complex
WRL	Working Range Limiter

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1 PERMISSION REQUESTED

1. Devonport Royal Dockyard Limited (DRDL), the licensee for the Devonport Royal Dockyard Nuclear Licensed site, wrote to Office for Nuclear Regulation (ONR) in April 2016 (Ref. 1) requesting acknowledgement, as required by the arrangements to comply with licence condition 22(1), to implement a "Category A" modification (NED-MNC-290-15091) to the 9 Dock safety case to justify mobile crane operations adjacent to 9 Dock under change request (CR) 15091 (Ref. 2).

2 BACKGROUND

2. DRDL's modification (Ref. 3) states that the facilities adjacent to 9 Dock are primarily used to support surface ship dockings. Although there are fixed cranes at these facilities, mobile cranes are required for some of the lifting operations. As these facilities are not used for berthing or docking fuelled submarines there is no potential for any significant radiological or nuclear consequences at these facilities following a fault on a mobile crane. However, the potential external hazard to the 9 Dock facility from these operations has not previously been assessed. Consequently the 9 Dock plant management organisation has recently placed a temporary prohibition on the use of mobile cranes at 8 Dock West and 10 Dock East (the only docksides where the 'day to day' mobile cranes can potentially interact with the 9 Dock facility) when a submarine is present. During the development of DRDL's safety justification, the scope of this prohibition has been extended to include certain models of mobile cranes in specific locations at 4 Basin North.
3. The potential hazard to the 9 Dock facility from mobile crane operations in 8 Dock, 10 Dock and 4 Basin North depends on the mobile crane's position and its jib length (as this determines the potential interaction zone). The assessment within DRDL's safety justification focuses on the potential hazard to 9 Dock from mobile cranes at 10 Dock East. This is because, for other locations, the principal required controls, to ensure that no hazard is presented, are simply restrictions on what types of crane can be used.
4. DRDL's submission therefore assesses the GMK3050-1's remaining lifts at 10 Dock East. This potential interaction hazard is analogous to the hazard presented to the 14 Dock facility from the GMK3050-1 mobile cranes operating on the adjacent 5 Basin Arm (recently justified in NED-MNC-260-14837 (Ref. 4, assessed by ONR at Ref. 5)). Notably, the potential hazard from the mobile cranes to the 14 Dock dockside cranes are controlled by de-confliction arrangements i.e. the 14 Dock dockside cranes must be positioned outside the potential interaction zone and not used during 5 Basin Arm mobile crane operations and vice versa.
5. The latest submission (Ref. 3) introduces the following limits and conditions to control mobile crane operations at 8 & 10 Docks and 4 Basin North into the 9 Dock safety case:
 - 10 Dock East
 - o No mobile crane operations when the 9 Dock Crane (West) is not in its parked configuration in the relevant approved crane parking box (ACPB)
 - o No mobile cranes apart from GMK3050-1
 - o Only one GMK3050-1 in operation at any one time
 - o Mobile crane lifts only permitted when submarine in 9 Dock is docked down.
 - o No mobile crane lifts at 10 Dock East if [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - o No mobile crane lifts at 10 Dock East with reactor access house (RAH) in position or moving over submarine

- Max lift mass of 7.4t (to set an upper limit for any contingency lifts)
- Set working range limiter (WRL) to 0⁰ and 180⁰ (to prevent over-slewing into or over Production building)
- Independent inspection of mobile crane set-up parameters (including positioning)
- Restrict jib length <30m if possible (to minimise risk from over-slew)
- Minimise lift height
- Controls on vehicle movements

10 Dock West & 8 Dock East

- For mobile cranes with max jib length <60m - no restriction
- For mobile cranes with max jib length between 60m and 68m – required to restrict jib length to <60m
- No mobile cranes with max jib length >68m

8 Dock West

- No mobile cranes operations permitted on the west side of 8 Dock

4 Basin North

- GMK3050-1 only may be used within the interaction zone (Zone 1) – with restriction on 9 Dock East 43t crane
- GMK3050-1 may be used outside Zone 1 with no restrictions
- GMK4100L (or other crane model with maximum jib length up to 60m) may only be used outside the interaction zone (Zone 2) with no restrictions.
- GMK5220 (or other crane model with maximum jib length of 60-68m) may only be used outside the interaction zone (Zone 3) with no restrictions.
- If the [REDACTED]
[REDACTED]
[REDACTED] then:
 - No mobile crane lifting operations are permitted within Zones 1 and 2.
 - Outside of Zone 2, lifting operations shall only be permitted using the GMK3050-1 mobile crane (or other mobile crane models that have a maximum jib length not exceeding 38m).

6. These limits and conditions provide a framework for mobile crane operations at 8 & 10 Dock and 4 Basin North which DRDL state will ensure negligible risk to the 9 Dock facility from operations at these locations.

7. DRDL have provided the following ALARP (as low as reasonably practicable) statement:

- The potential external hazard to 9 Dock from activities in the adjacent Docks cannot be completely eliminated.
- Reading across the controls that are claimed in the submarine refit complex (SRC) facility (which have previously been shown to be ALARP) is the preferred means to manage this analogous potential interaction hazard at 9 Dock.
- Efforts have been made to complete surface ship refit lifts before a submarine was transferred to 9 Dock. Significantly, none of the remaining lifts require the GMK4100L mobile crane on 10 Dock East which avoids potential impact energies directly onto the submarine greater than 3MJ. However, a GMK3050-1 mobile crane is required at 10 Dock East for the remaining lifts and to allow the boat to undock.
- No further risk reduction measures are required to control the interaction hazard.
- These operations potentially increase the predicted public risk in PSC-290 by 0.4% to 6.1E-6 per year. Consequently, the risk remains well below the BSL

8. DRDL state that this “Category A” Licence Condition (LC) 22 submission (Ref. 3) is to justify mobile crane operations in 10 Dock that are required in the period between the submarine’s arrival to 9 Dock and the neighbouring surface ship departure from 10 Dock. For subsequent stages which have not been covered, coincident mobile crane operations at 10 Dock East are therefore prohibited. A future site wide mobile crane submission will consider later stages of the submarine’s deep maintenance period docking.
9. DRDL notes that their modification document (Ref. 3) has undergone independent peer review (IPR) (Ref. 6) and has been considered and accepted by the management safety committee (MSC) (Ref. 7) and their nuclear safety committee (NSC) (Ref. 8).

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

10. Due to the nature of the licensee’s submission and the risk posed by the proposed activities ONR has carried out a limited scope assessment and inspection programme. This intervention programme is aimed at gaining suitable confidence that the risks of mobile crane operations in 8 & 10 Dock and 4 Basin North to the 9 Dock facility are suitably low and are appropriately controlled. The assessment and inspection activities can broadly be broken down into three areas, these are:
 - Consideration of the limits and conditions derived by the safety case to ensure that no operations should pose a direct hazard to the submarine and that the potential interaction zones with the 9 Dock cranes are understood and appropriately restricted.
 - Interactions on site to gain evidence that DRDL has adequate arrangements in place to ensure that mobile crane operations in 8 & 10 Dock and 4 Basin North are carried out in accordance with the limits and conditions of the 9 Dock safety case.
 - Review of DRDL’s internal assurance process to confirm that the submission has undergone internal due process, including: independent peer review, and scrutiny through management safety and nuclear safety committees.

An overview of the assessment and inspection work carried out to gain confidence in these three areas is summarised in the following subsections.

3.1 LIMITS AND CONDITIONS OF OPERATION

11. DRDL’s modification document (Ref. 3) introduces a number of limits and conditions required in the interests of safety. These relate to activities in 8 & 10 Dock and 4 Basin North. Examination of these limits and conditions shows that they essentially relate to:
 - Prohibiting the use of mobile cranes at 8 Dock West.
 - Limiting the jib length of the mobile cranes at 8 Dock East and 10 Dock West.
 - Prohibiting the use of all but a single Grove GMK3050-1 mobile crane at 10 Dock East.
 - Limiting the maximum load that can be lifted by a GMK3050-1 mobile crane at 10 Dock East.
 - Ensuring that when a mobile crane is in use on 10 Dock East the 9 Dock cranes are positioned so they cannot interact with each other.
 - Ensuring that when a mobile crane is in use on 4 Basin North they are positioned so they cannot interact with the 9 Dock facility.

DRDL's submission introduces 11 new identified operating instructions (IOIs). These IOIs will implement the limits and conditions of the safety case, as described above.

12. ONR's fault analysis specialist has undertaken a technical assessment (Ref. 9) which considers whether the licensee has undertaken an appropriate fault analysis process for the use of mobile cranes in 8, 10 Dock & 4 Basin North and whether appropriate limits and conditions of operation have been identified.
13. ONR's fault analysis assessment (Ref. 9) identified that:
 - Mobile crane operations on 8 Dock East and 10 Dock West have limited potential to interact with operations at the 9 Dock facility and the licensee has introduced limits prohibiting the use of a mobile crane with jib lengths greater than 60m, provided this limit is adhered to there is little possibility of interactions between mobile cranes in these locations and the 9 Dock facility.
 - Mobile crane operations on 8 Dock West have the potential to interact with the 9 Dock facility and no current operations require a mobile crane, as such mobile crane operations in this location have been prohibited.
 - Mobile crane operations on 10 Dock East also have the potential to interact with the 9 Dock facility and are required to support the refit and undocking of the neighbouring surface ship, therefore DRDL has restricted the mobile cranes allowed in this facility to a single GMK3050-1 crane such that no permitted mobile crane can interact with the submarine directly, restricting the maximum load such that the load is below the submarine withstand and introducing de-confliction arrangements such that the mobile crane cannot interact with the 9 Dock installed cranes.
 - DRDL has introduced limits and conditions at 4 Basin North introducing a zonal scheme such that mobile cranes permitted within each zone will not be physically able to interact with the 9 Dock facility.
14. ONR's fault analysis specialist assessor concluded (Ref. 9) that DRDL's limits and conditions provide a framework for mobile crane operations which if correctly implemented should ensure negligible risk to the 9 Dock facility from mobile crane operations at 8 & 10 Dock and 4 Basin North. As such, the specialist fault analysis inspector sees no reason not to allow DRDL to conduct mobile crane operation at 8 & 10 Dock and 4 Basin North in line with the identified limits and conditions.

3.2 IMPLEMENTATION OF LIMITS AND CONDITIONS AT 8 & 10 DOCK

To gain confidence that the proposed modification will be adequately implemented on site 1 sought assurance (Ref. 10) on a number of points relating to implementation and the licensee's administrative controls to ensure that the identified limits and conditions would be adhered to. DRDL confirmed via email (Ref. 10) that the arrangements at 8 & 10 Dock and 4 Basin North will be comparable to the arrangements implemented at 5 Basin X Berth. ONR has previously considered the use of the GMK3050-1 mobile crane at 5 Basin X Berth (Refs. 4 & 11). These two previous assessments have not identified any substantial concerns with the use of a GMK3050-1 mobile crane at 5 Basin X Berth. Further, ONR has recently undertaken a human factors inspection (Ref. 12) on the use of mobile cranes at 5 Basin X Berth which judged that fundamental requirements in relation to the adequacy and implementation of LC23 and LC24 arrangements in relation to safe operation of mobile cranes are met, although some procedural weaknesses were noted, this has been progressed via regulatory issue 3673.

15. ONR's 9 Dock site inspector has engaged DRDL (Ref. 13) on the arrangements for the implementation of the limits and conditions identified within their modification document (Ref. 3). ONR's 9 Dock site inspector noted that a number of outstanding issues require follow up during routine interventions with regards to approval of the plant

operating procedures and completion of the suitably qualified and experienced persons (SQEP) / duly authorised person (DAP) training. ONR's 9 Dock site inspector stated that he was content that the licensee has adequate controls and arrangements in place to implement the above modification to allow use of mobile crane operations on 8 & 10 Dock and 4 Basin North areas in accordance with their arrangements. An embargo on the use of mobile cranes within 8 Dock West, 10 Dock East and 4 Basin North remains in place until permission has been granted by ONR. DRDL further informed ONR's site inspector that a further CR for the justification to use mobile cranes at other locations on the Devonport site will be produced and submitted to ONR later this year.

16. As the arrangements at 8 & 10 Dock and 4 Basin North will be comparable to the arrangements implemented at 5 Basin X Berth which has already been permissioned by ONR (Ref. 11), ONR's site inspector is content with the current implementation of the arrangements local to 9 Dock, I have not identified any concerns with regard to the implementation of the proposed modification to the 9 Dock safety case.

3.3 DRDL DUE PROCESS OF THE MODIFICATION DOCUMENT

17. The submission (Ref. 3) has gone through DRDL's internal processes, including IPR, MSC and NSC (Ref. 6, 7 and 8). ONR sampled the IPR, MSC & NSC minutes to assess the adequacy of that part of DRDL's due process.
18. The IPR (Ref. 6) noted two outstanding concerns with regard to the submission, one relating to the robustness of controls over operation of mobile cranes adjacent to 9 Dock and the other relating to use of cranes on 4 Basin North. The NSC chairman responded to the IPR comment on controls (at Ref. 8) by stating that in his view it is acceptable that an IOI can extend beyond a facility boundary, provided that suitable controls are in place to make the IOI robust and practicable. Further, in response to concerns over 4 Basin North mobile cranes, DRDL's project officer stated (Ref. 6) that controls will be included as new IOIs (this has been implemented within the final submission considered by ONR (Ref.3)). Ref. 8 notes that the IPR recorded a satisfactory outcome and an IPR Certificate has been issued.
19. The MSC raised a number of comments on both the modification document (Ref. 3), primarily points of clarification, and had further concerns with the designation of controls that are outside the boundary of 9 Dock as 9 Dock IOIs. DRDL stated at the MSC meeting (Ref. 7), that a high level implementation strategy was agreed where by 9 Dock would sign-off lift checklists (for IOI compliance), 9 Dock dockside management organisation will act as focal point for de-confliction controls, all IOIs will have an appropriate DAP, procedures to be updated and training required. The MSC endorsed the proposed modification document (Ref. 7).
20. The NSC minutes also recorded (Ref. 8) concerns with regard to the implementation and control of mobile cranes on non-nuclear facilities. At this meeting DRDL's plant manager stated that he categorically understood the implementation challenge and requirements. Training had been developed and the DAPs were quite clear on their understanding of their responsibilities. Further, he explained that training of all parties, 9 Dock, 8 and 10 Dock, 4 Basin North lifts and in particular crane provision managers under the lifting services manager had taken place. To manage the operations a card exchange system was in development and would be tested in a number of dry runs prior to any operational use. The NSC committee accepted NED-MNC-290 (Ref. 3) subject to incorporation of committee advice and any provenance checks (Ref. 8).
21. The examination of DRDL's internal processes has provided confidence that the submission (Ref. 3) has been through robust internal challenge. Therefore, I conclude that the submission has gone through an adequate level of internal due process.

4 MATTERS ARISING FROM ONR'S WORK

22. From undertaking a process of assessment and inspection:

- I am satisfied that this safety case modification (Ref. 3) has identified limits and conditions in the interests of safety and if correctly implemented these will ensure risks from mobile crane operations at 8 & 10 Dock and 4 Basin North to the 9 Dock facility to be very low.
- I am satisfied that the licensee has adequate arrangements in place to implement the identified limits and conditions of operation to ensure that the risk to operations at 9 Dock remains low.
- I have satisfied myself that the licensee submission has undergone due process and no significant safety concerns have been identified.

23. The intervention sampled these areas and concluded that these aspects of the proposed modification were adequate and that there were no matters identified from the intervention that would warrant further examination by ONR.

5 CONCLUSIONS

24. This project assessment report concludes that the "Category A" modification, NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock (Ref. 3) presents an acceptable basis for implementing the proposed modifications to the 9 Dock safety case.

25. The Licence Instrument 562 (Ref. 14) "Acknowledgement to Implement Modification NED-MNC-290-15091, Justification for mobile crane operations adjacent to 9 Dock" has been prepared for consideration by ONR Superintending Nuclear Inspector. An associated QA Check Sheet has been completed (Ref. 15).

6 RECOMMENDATIONS

26. ONR's Superintending Nuclear Inspector for the Propulsion sub-programme is requested:

- If the project assessment report is acceptable, to sign Licence Instrument No. 562 (Ref. 14) under arrangements made under Site Licence Condition 22(1) of Schedule 2 to Nuclear Site Licence No. 50B which acknowledges DRDL's request to implement modification NED-MNC-290-15091, justification for mobile crane operations adjacent to 9 Dock.

7 REFERENCES

1. DRDL Letter 23799R - Request for Acknowledgement to implement modification NED-MNC-290-15091 - 28 April 2016, Trim Ref. 2016/181136.
2. DRDL Change Request CR-15091 Justification for the use of mobile cranes adjacent to 9 Dock - April 2016, Trim Ref. 2016/181132.
3. DRDL - CDMS-000120791 - NED-MNC-290-15091 - Justification for Mobile Crane Operations Adjacent to 9 Dock - April 2016, Trim Ref. 2016/181129.
4. NED-MNC-260-14837 - Modification / experiment on existing plant justification for the use of GMK3050-1 mobile crane on 5 Basin arm, November 2015, Trim Ref. 2015/460555.
5. ONR-DRDL-AR-15-005 Revision 0 - Devonport 5 Basin Arm - Justification for the Use of Grove GMK3050-1 Mobile Crane, June 2015, Trim Ref. 2015/235981.
6. DRDL - IPR - 1139-53 - 000120791 NED-MNC-290-15091 Justification for mobile crane operations adjacent to 9 Dock - 21 March 2016, Trim Ref. 2016/181138.
7. DRDL - Management Safety Committee 201 - Minutes, Draft - 15 March 2016, Trim Ref. 2016/181134.
8. DRDL - Nuclear Safety Committee (NSC) 195 – Minutes, Draft - 26 March 2016, Trim Ref. 2016/181140.
9. ONR Assessment Note - Fault Analysis Assessment of DRDL's Justification for Mobile Crane Operations Adjacent to 9 Dock, April 2016, Trim Ref. 2016/181213.
10. Email from DRDL providing information required to progress the PAR of 8 & 10 Dock mobile crane operations, 15 April 2016, Trim Ref. 2016/172384.
11. ONR-DRDL-PAR-13-010 - Request for Acknowledgement to Implement Modification NED-MNC-260-13432, Justification for the Use of the Grove GMK3050-1 at 5 Basin Non-Tidal X Berths, October 2013, Trim Ref. 2013/387612.
12. ONR-DEF-IR-15-032 - Devonport Royal Dockyard Planned interventions including routine engagement meetings and a Human Factors inspection on mobile crane control and operation. 13-17 July 15, Trim Ref. 2015/275009.
13. ONR-OPF-IR-16-010 - DRDL - 9 Dock plant management and safety representative meetings. - 20 April 2016, Trim Ref. 2016/176112.
14. Licence Instrument 562 "Acknowledgement to Implement Modification NED-MNC-290-15091, Justification for mobile crane operations adjacent to 9 Dock", Trim Ref. 2016/181156.
15. Licence Instrument 562 QA Check Sheet, Trim Ref. 2016/181158.