WOLF CREEK
NUCLEAR OPERATING CORPORATION

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U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555

References:
1) SLNRC 81-48, "Control of Heavy Loads," dated June 22, 1981, to H. R. Denton, USNRC from N. A. Petrick, SNUPPS
2) SLNRC 82-033, "Final SNUPPS response to Generic Letter 81-07" dated August 4, 1983, from N. A. Petrick, SNUPPS to H. R. Denton, USNRC
3) NUREG-0612, "Control of Heavy Loads," dated July 6, 1982 from Youngblood, USNRC to G. Koester, KGE
4) SLNRC 84-008, "Revision 1 to SNUPPS Report on the Control of Heavy Loads," dated January 27, 1984 to H. R. Denton, USNRC from N. A. Petrick, SNUPPS
5) SLNRC 84-0056, "Control of Heavy Loads," dated March 28, 1984, to H. R. Denton, from N. A. Petrick SNUPPS
6) NUREG-0881, "Safety Evaluation Report, Supplement 5"

Subject: Docket No. 50-482: Revision to Generic Letter 81-07, "Control of Heavy Loads"

Gentlemen:

This letter transmits a revision to Wolf Creek Nuclear Operating Corporation's (WCNOC) response to Generic Letter 81-07 (Reference 2). In Attachment I, WCNOC has revised the Reactor Building Analyses section of the Heavy Load Report to clarify control of the movement of heavy loads over the two Residual Heat Removal loops during shutdown and refueling conditions. In Attachment II, WCNOC has provided a basis for revising a commitment regarding trollying over the reactor vessel. The changes are consistent with the guidance of Reference 3.

Attachment III provides a list of commitments contained in this letter. If you have any questions concerning this matter, please contact me at (316) 364-4034, or Mr. Michael J. Angus, at (316) 364-4077.

Very truly yours,

RAMuench

Richard A. Muench

RAM/rlr

Attachments

cc: W. D. Johnson (NRC), w/a
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# Revision to Generic Letter 81-07 Response

## Historical Timeline Of WCNOC Submittals

Generic Letter (GL) 81-07, "Control of Heavy Loads," was issued on December 22, 1980. The WCNOC 6-month (Phase I) GL 81-07 response was submitted to the NRC under the cover of SLNRC 81-48, dated June 22, 1981 (Reference 1). NUREG-0612, "Control of Heavy Loads," was issued by the USNRC on July 6, 1982, and provided guidance on Phase I and Phase II requirements. The 9 month (Phase II) response was submitted to the NRC under the cover of letter SLNRC 82-033 dated August 4, 1983 (Reference 2). The Phase II response was resubmitted with additional information in letters SLNRC 84-0008 (Reference 4) and SLNRC 84-0056 (Reference 5).

The NRC reviewed the Wolf Creek Phase I and II responses and found them acceptable, as documented in Appendix K & L of Supplement 5 to NUREG-0881 (Reference 6). Wolf Creek was one of four plants selected by the NRC to have the Phase II response reviewed under a pilot program. GL 85-11 informed licensees that, based on the improvements in heavy load handling subsequent to the implementation of NUREG-0612 (Phase I), further action was not required to reduce the risks associated with the handling of heavy loads. The NRC determined that a detailed Phase II review of heavy loads was not necessary for any additional plants.

## Summary of Changes

With this submittal WCNOC is making two primary changes to our Phase II response submitted under the cover letter SLNRC 82-033. First, WCNOC is correcting a statement made in letter SLNRC-82-033 regarding RHR train operability in Modes 5 and 6 to clarify that only one train may be operable during certain conditions. Secondly, WCNOC is providing a commitment change to allow crane hook movement over an open reactor vessel during refueling outages. Both of these changes concern movement of heavy loads when the plant is not operating at power but in a shutdown mode. Each change has been evaluated under the guidance provided in NUREG-0612 and determined to be acceptable.

In Attachment I, WCNOC has revised the Reactor Building Analyses section of the Heavy Load Report, Section 2.4, to accurately reflect Modes 5 and 6 Residual Heat Removal (RHR) requirements as stated in our Technical Specifications and to clarify control of the movement of heavy loads over the two RHR trains. The original submittal stated that both trains of RHR are operable in Mode 5 pursuant to WCNOC Technical Specifications. WCNOC Technical Specifications require only one train if the Reactor Coolant System (RCS) loops are filled and at least two steam generates contain a water level as specified in Technical Specifications.

To incorporate this change and allow movement of heavy loads in Containment during Mode 5 under Technical Specifications conditions, WCNOC evaluated the effects of a heavy load drop on the RHR system with only one train operable. Should the impacted line break on an operating train of RHR, the RCS fluid would be non-flashing; however, the accident could cause drain down of the RCS to the bottom of loop pipe level and loss of the operating RHR pump if the return line is ruptured. If the ruptured RHR return line is from the only operable (and operating) train, RHR would be lost until the out-of-service train of RHR could be restored. WCNOC concluded that under worst case conditions and assuming no administrative controls that other Emergency Core Cooling Equipment and inventory would be available to keep the core cool and from boiling. However, WCNOC has established administrative controls which will not allow the movement of heavy loads over the only operable RHR return line. Similar administrative controls are in place for Mode 6. The changes are consistent with the guidance of NUREG-0612 (Reference 3).

In Attachment II, WCNOC changed its commitment relating to crane hook travel over an open reactor vessel. Letter SLNRC 82-033 stated that crane hook travel would not be allowed over an open reactor vessel once the reactor upper internals are removed, except during required vessel serving activities. WCNOC revised Section 1.0 to state that once the upper internals have been removed and fuel is in the reactor vessel, crane hook travel will be prohibited over the open vessel except for the occasional need for reversing the orientation of the main/auxiliary hoists and for required vessel servicing activities. When there is fuel in the vessel, administrative procedures will restrict use of the hoist controls when traveling over the open vessel to reverse the hoist orientation and the only item attached to either hook may be the load cell linkage attached to the main hook. The drop of the load block/hook is not considered credible because redundant and independent limit switches provided on the polar crane main and auxiliary hoists ensures that two-blocking accidents are prevented. Pre-operational inspections include the main and auxiliary hoists wire rope and frequent demonstrations that the primary upper limit switch is operable. The stresses in the hoist system are extremely low due to the weight of the load block/hook/linkage compared to the capacity of the crane. In addition, when there is fuel in the vessel, raising or lowering the hook while traveling over the open reactor vessel will not be allowed. This change is consistent with the guidance of NUREG-0612 (Reference 3).

**Revised Section 2.4.1**

(This information supersedes that provided in SLNRC 82-033, pages 20-23)

**2.4.1 ANALYSES OF THE REACTOR BUILDING**

A review of the heavy loads drop analyses, decay heat removal and maintenance of cold shutdown conditions inside the reactor building was performed and resulted in no design changes to the plant. This review resulted in identifying a condition where if only one RHR train was operable and the postulated drop ruptured that train's return line, criterion IV of Section 5.1 of NUREG-0612 would not be satisfied for the RHR decay heat removal function as required by Section 5.1.3. The following discussions describe the analyses of each crane and load drop inside the reactor building.

**Polar Crane During Cold Shutdown** - The polar crane can be used during cold shutdown to lift any load not associated with the reactor coolant pressure boundary inside the containment. The plant conditions and operable systems are assumed to be in accordance with the Technical Specifications which require both RHR trains to be operable during Mode 5 with loops not filled. Only one operable RHR train is required if the loops are filled and at least two steam generators contain a water level specified in the Technical Specifications. The RHR system is the only operating system directly required for the mainterance of cold shutdown conditions. The steam generators' secondary side integrity is not required for heat removal. The accumulators have been isolated. The primary system has been cooled to less than 200° F, and the pressure boundary is intact before the postulated drop occurs. Therefore, a pipe rupture due to postulated load drops during cold shutdown will result in non-flashing break flow.

Polar crane heavy load drops outside of the secondary shield wall will generally not affect safe shutdown or continued decay heat removal, due to the physical separation of the RHR system and its power supplies. Check valves in the RHR injection lines prevent drain down of the RCS in the event of an injection line rupture. However, the RHR return lines from loops 1 (RHR train A) & 4 (RHR train B) present a special concern, as discussed below.

Each return line in containment has two isolation valves, one inside the shield wall and one outside the shield wall. The inner valve operators are supplied power from the "B" train bus and the outer operators from the "A" bus. A heavy load drop outside of the shield wall near loop 1 that is assumed to penetrate all three floor levels, could rupture the "A" RHR return line and also damage the power supplies to both isolation valves. In this event, it would not be possible to remotely isolate the Reactor Coolant System (RCS) from the ruptured line. If the "A" train RHR is the only operating RHR system, the RHR pump would quickly be damaged due to pump cavitation and the RCS level would drain down to the bottom of loop level. If both trains of RHR were operating, the consequences would be similar except the "B" train RHR pump would be shut down in time to prevent damage and be available for recovery, assuming it is not in a reduced inventory condition as discussed below.

The power supplies to the two isolation valves in the "B" train are horizontally separated. Therefore, if both emergency buses were available or only the "B" train bus is available, the break of a "B" train RHR return line outside of loop 4 could be remotely isolated using the "B" train valve. If the "A" train bus is the only bus available, then the break could not be remotely isolated and drain down of the RCS could occur. However, the "A" train RHR pump would be secured and be available for recovery, assuming that it is not operating in a reduced inventory condition.

In the worst case scenario, assuming no administrative controls, (for either train of RHR return line, when it is the only operable and operating RHR train), RHR would be lost until the out-of-service train of RHR or affected operable RHR pump could be restored. The RCS fluid would drain onto the containment floor and would cease when the fluid level reached the bottom of loop pipe level. Other ECCS equipment and inventory would be available to keep the core covered and from boiling through Off Normal Procedures. However, administrative controls in procedures will not allow the movement of heavy loads over the only operable RHR return line. This will ensure that the above scenario does not occur.

Heavy load drops inside of the secondary shield walls could potentially impact a Class 1 branch line or loop piping. Should the impacted line break on an operating train of RHR, the RCS fluid would be non-flashing; however, the accident could cause drain down of the RCS to the bottom of loop pipe level and loss of the operating RHR pump if the return line is ruptured. If the ruptured RHR return line is from the only operable (and operating) train, RHR would be lost until the out-of-service train of RHR could be restored. Other ECCS equipment and inventory would be available to keep the core covered and from boiling through Off Normal Procedures. However, procedures will not allow the movement of heavy loads over the only operable RHR return line to prevent this scenario from occurring. (Switchover of the RHR suction from the RWST to the containment sump could be required during the long-term recovery period.)

In summary, a postulated heavy load drop on the only operable RHR "A" train return line or "B" train return line inside the shield wall could cause the loss of the decay heat removal function. To satisfy Criterion IV, the safe load paths will not allow lifting heavy loads over a single operable RHR return line.

When both trains of RHR are operable in Mode 5 administrative controls will ensure that there is a RHR pump for recovery operation during reduced inventory conditions. Reduced inventory conditions exist whenever reactor vessel water level is lower than three feet below the reactor vessel flange. Heavy load lifts over a RHR return line in a reduced inventory condition will be allowed when only one train of RHR is operating. This measure ensures that the failure of both RHR pumps will not occur from cavitation during a rapid drain down of the RCS.

Each reactor coolant pump motor and pump internals will be replaced during the lifetime of the plant. The replacement of a pump or motor will also require removal, storage, and re-installation of the three concrete access hatch covers over each pump. These lifts will involve weights that are much more significant than the typical refueling loads (excluding the head) moved around containment. They will be carefully planned and executed, since a drop from the maximum lift height required could cause a significant impact on the RCS components and on the RHR system below the floors. The consequences of a load drop would be similar to the preceding cases.

**Polar Crane During Refueling** - During refueling, the polar crane is utilized to remove the reactor vessel head, (Refer to Section 2.3 above). Should a heavy load drop impact an operating RHR line, loop piping or a Class 1 branch line, the effects would be no more severe than the cases discussed above for the cold shutdown mode.

When both trains of RHR are operable, controls will ensure that there is a RHR pump for recovery during reduced inventory conditions. These controls will allow lifting a heavy load over any of the RHR return lines only while one RHR train is operating. Lifting over the operable RHR train return line, when only one train is operable, will be prevented by administrative procedure.

**Polar Crane During Hot Standby and Hot Shutdown** - The polar crane will be used during hot standby and hot shutdown (Modes 3 and 4) to minimize critical path outage times for cold shutdowns and refuelings, and to assist with maintenance that can be performed in a hot plant condition. Planned usage includes activities such as crane inspections, operability checks, and movement of tools and equipment required for the cold shutdown/refueling outage. It is anticipated that most lifts during Modes 3 and 4 will be of light loads and will allow unrestricted movement.

The lifting of heavy loads during Modes 3 and 4 is expected to be infrequent. The significance of the operation and the importance of proper rigging and restricted load movement will be stressed to those involved with heavy load lifts. Both the main and auxiliary hooks are provided with independent and redundant limit switches which preclude the possibility of a two-blocking event. Minimum practical lift heights will be used throughout the load movement process. Certain anticipated heavy load movements have been analyzed, and restricted areas and safe load paths have been defined. These include but are not limited to the hydrogen mixing fans, excess letdown exchanger and reactor coolant drain tank heat exchanger hatches. However, all specific loads and load paths cannot be defined at this time. For these cases, safe load path considerations will be based on comparison with analyzed cases, previously defined safe movement areas, and previously defined restricted areas. For example, since integrity of the primary side pressure boundary is important during Modes 3 and 4, the area inside the secondary shield wa. . will be avoided if practical. In addition, when in Mode 4, if only one train of RHR is operable, the movement of any heavy load over that operable RHR train return line will be prohibited unless previously evaluated.

During Modes 3 and 4, containment integrity will be maintained in accordance with plant Technical Specifications, which allow various combinations of RCS loops and ECCS/RHR trains to be operable. A breach of either the primary or secondary side pressure boundaries will not result in radioactivity releases that are a significant portion of 10 CFR 100 limits. The time of use of the polar crane during these modes is a small percentage of total plant operation time. The time for lifting heavy loads is a still smaller percentage. Postulated load drops would result in consequences that are economic rather than public safety concerns. Therefore, the relative small risk involved, coupled with load path considerations and procedures and training, justifies the use of the polar crane during Modes 3 and 4.

Should the primary system or refueling pool boundary leak or rupture at any location, sufficient water is available to ensure that adequate net positive suction head (NPSH) is available for switchover to recirculation from the containment sump.

**Containment Jib Cranes (HKF03A-D) During all Modes** - The containment jib cranes (3-ton capacity) may be utilized to remove the hydrogen mixing fans from their bottom skirts. The hydrogen mixing fans are located directly above the reactor coolant pumps on slabs which are removable for access to the RC pumps. An analysis has been performed to ensure that the removable slabs would not fail, (refer to Appendix A for the worst-case analysis). The jib crane use for the fan or any other load within the jib capacity in cold shutdown or refueling would be enveloped by the preceding discussion for the polar crane.

The removable slabs which support the hydrogen mixing fans can only be removed by the polar crane during Modes 5 and 6 under conditions previously discussed in this section. The consequences of a drop of any of the slabs are enveloped by the preceding discussions of polar crane use during cold shutdown.

**Secondary Shield Wall Area Jib Crane (HKF05) During Cold Shutdown And Refueling** - The jib crane (3-ton capacity) located near the pressurizer will be used during cold shutdown and refueling to handle components located in the pressurizer compartments. The discussions of cold shutdown operation of the polar crane are also applicable to this jib crane. Rupturing of the reactor coolant pressure boundary at the pressurizer during cold shutdown would be no more severe than potential ruptures caused by polar crane drops. Core cooling would not be interrupted. During refueling, the water level of the reactor coolant system is below the pressurizer normal level, and there would be no effect on decay beat removal should a drop breach the pressurizer boundary.

**Containment Equipment Hatch Hoist (HKF04A and B) During Cold Shutdown** - The equipment hatch hoist is used to handle the equipment hatch during Modes 5 and 6. A drop of the hatch will not affect safe shutdown or decay heat removal. As required by the Technical Specifications, the equipment hatch must be secured in place during fuel movement or core alterations.

**Containment Building Elevator Auxiliary Monorail and Hoist(HKF31)** - The monorail and hoist are shown on Figure 3 between approximate azimuths of 32 degrees, and 42 degrees, at Elevation 2023. They may be used during all modes to handle miscellaneous equipment which, if dropped, would not affect safe shutdown or decay heat removal.

This attachment addresses commitment changes relating to crane hook travel inside containment during Modes 5 and 6.

(This information supersedes that provided in SLNRC 82-033, noted pages)

**Revised Section 1.0 paragraph b. Page 1:**

The polar crane main and auxiliary hooks are administratively controlled by procedure to prevent travel over the reactor vessel in all modes except cold shutdown and refueling. Once the upper internals have been removed and fuel is in the reactor vessel, crane hook travel will be prohibited over the open vessel except for the occasional need for reversing the orientation of the main/auxiliary hoists and for required vessel servicing activities such as irradiation sample removal described in Section 5.3.1.6 of the Wolf Creek USAR. When there is fuel in the vessel, administrative procedures will restrict use of the hoist controls when traveling over the open vessel to reverse the hoist orientation and the only item attached to either hook may be the load cell linkage attached to the main hook. The core will not be subject to crushing drops; therefore, no analysis are required. Adequate supplies of borated water are available to ensure core cooling during all modes of operation. Fuel drops inside the containment are analyzed in the Wolf Creek USAR.

**Revised Section 2.3.2 PREVENTION OF TRAVEL OVER THE VESSEL:**

Once the reactor vessel head and upper internals are removed, the polar crane main and auxiliary hooks will be administratively controlled to preclude travel over the open vessel while fuel is in the reactor except for the occasional need for reversing the orientation of the main/auxiliary hoists and for required vessel servicing operations such as irradiation sample removal. When there is fuel in the vessel, administrative procedures will restrict use of the hoist controls when traveling over the open vessel to reverse the hoist orientation and the only item attached to either hook may be the load cell linkage attached to the main hook. All heavy loads handled inside the containment may be moved to or from the equipment hatch without the necessity of traveling over the open vessel.

**Revised Section 2.3.4 COMPLIANCE TO NUREG-0612 ACCEPTANCE CRITERIA:**

Compliance to Acceptance Criteria I, II, and III of NUREG-0612 is ensured for the identified cranes in the vicinity of the reactor vessel.

Polar Crane - Wolf Creek USAR Section 9.1.4.2.3.1 provides a detailed description of the refueling sequence phases. As noted therein, once cold shutdown is achieved during a refueling outage, the reactor coolant system is prepared for the refueling process, and the polar crane and refueling machine are checked for proper operation. The polar crane will not normally be utilized for lifting of significant loads until the core has been borated to cold shutdown conditions and cooled to cold conditions. (Some maintenance operations that require use of the polar crane can be performed while the plant is being cooled down or heated up.)

As described in Phase 1. of the refueling sequence, the head is unbolted. The RHR system, taking suction from the RWST, is used to flood the refueling canal through the open reactor vessel (the head is only raised high enough above the vessel flange to allow visual verification that the head is properly freed from the components in the core). Once the refueling canal water level is raised above the vessel flange, the head is raised as the water level is increased to a safe shielding level. At that point the head is moved horizontally (southward) within the refueling canal, raised above the canal, and finally moved to its storage stand.

Safety Evaluation Six of Wolf Creek USAR Section 9.1.4.3 provides the results of the reactor vessel head drop analyses, and is attached hereto as Appendix C for the convenience of the reader. These cases are highly conservative and have ensured that the reactor vessel and core remain intact during a head drop incident. No fuel damage results; therefore, no dose calculations are required.

A drop of the upper internals package and lifting rig would produce smaller loads on the reactor vessel, reactor vessel nozzles, and fuel assemblies than the reactor vessel head drop analyses.

A load cell linkage is connected between the main hoist hook and the head or internals rig to monitor the load during lifting and lowering to ensure no excessive loading is occurring. The load cell linkage complies with the guidelines of NUREG-0612 and ANSI N14.6 for 'special lifting devices' as documented in Appendix E. It weighs approximately 3000 pounds and has a rated capacity of 350,000 pounds. A retainer plate which fits into a "U" slot on the pin and is bolted to the linkage side plates, prevents the load cell pin from falling out of the linkage. The drop of the load cell linkage when attached to the main hoist hook without any load is not considered credible.

Redundant and independent limit switches provided on the polar crane main and auxiliary hoists ensures that two-blocking accidents are prevented. Pre-operational inspections include the main and auxiliary hoists wire rope and frequent demonstrations that the primary upper limit switch is operable. The stresses in the hoist system are extremely low due to the weight of the load block/hook/linkage compared to the capacity of the crane. In addition, when there is fuel in the vessel, raising or lowering the hook while traveling over the open reactor vessel will not be allowed. This will eliminate the chance of two-blocking of the unloaded hook. The drop of the load block/hook is not considered credible and therefore is not considered a heavy load in the SNUPPS design. The polar crane main/auxiliary hooks will be prohibited from traveling over the open vessel once the upper internals are removed and there is fuel in the vessel, except for the occasional need for reversing the orientation of the main/auxiliary hoists and for required vessel servicing operations. When there is fuel in the vessel, administrative procedures will restrict use of the hoist controls when traveling over the open vessel to reverse the hoist orientation and the only item attached to either hook may be the load cell linkage attached to the main hook. The vessel servicing components are light loads. Heavy load drops into the open vessel are not analyzed. Therefore, criticality and damaged core calculations are not required.

Drops of the reactor vessel head onto the vessel flange may damage the seal rings and allow water to leak from the refueling canal into the lower levels of the containment. The water volume of the RWST is sufficient to continue core cooling until the RHR pump suction is manually transferred to the normal suction lines located on RCS hot legs

1 and/or 4. Operation of the RHR system can continue indefinitely with the water level at the reactor vessel flange. No make-up water is required from other borated water sources. It should be noted that the fuel transfer tube gate valve remains closed during head movement; therefore, the spent fuel pool water level will not be affected by a head drop which could produce a seal leak.

Refueling Machine - Section 2.1 provides a detailed discussion of the refueling machine safety features, interlocks, and design parameters. The Wolf Creek USAR provides an analysis of a fuel handling accident inside the containment (refer to Section 15.7-4). The assumptions and methodology used in the analyses are presented therein, and the results are given in Table 15.7-8. The doses are well within one-fourth of the Part 100 limits.

**LIST OF COMMITMENTS**

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation (WCNOC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please notify the Manager Licensing & Corrective Action at Wolf Creek Nuclear Generating Station of any questions regarding this document or any associated commitments.

| COMMITMENT | Date/Event |
|---|---|
| The administrative controls stated in this letter will be incorporated into AP 14-001, "Control of Heavy Loads." The due date is contingent upon receipt of concurrence by NRC. | April 30, 1999 |