TECHNICAL EVALUATION REPORT

CONTROL OF HEAVY LOADS (C-10)

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNITS 1 AND 2

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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

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1. INTRODUCTION

1.1 PURPOSE OF REVIEW

This technical evaluation report documents an independent review of general load handling policy and procedures at Virginia Electric and Power Company's (VEPCO) Surry Power Station Units 1 and 2. This evaluation was performed with the following objectives:

- to assess conformance to the general load handling guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" [1], Section 5.1.1
- to assess conformance to the interim protection measures of NUREG-0612, Section 5.3.

1.2 GENERIC BACKGROUND

Generic Technical Activity Task A-36 was established by the Nuclear Regulatory Commission (NRC) staff to systematically examine staff licensing criteria and the adequacy of measures in effect at operating nuclear power plants to ensure the safe handling of heavy loads and to recommend necessary changes in these measures. This activity was initiated by a letter issued by the NRC staff on May 17, 1978 [2] to all power reactor licensees, requesting information concerning the control of heavy loads near spent fuel.

The results of Task A-36 were reported in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The staff's conclusion from this evaluation was that existing measures to control the handling of heavy loads at operating plants, although providing protection from certain potential problems, do not adequately cover the major causes of load handling accidents and should be upgraded.

In order to upgrade measures for the control of heavy loads, the staff developed a series of guidelines designed to achieve a two-part objective using an accepted approach or protection philosophy. The first portion of the objective, achieved through a set of general guidelines identified in NUREG-0612, Section 5.1.1, is to ensure that all load handling systems at

nuclear power plants are designed and operated such that their probability of failure is uniformly small and appropriate for the critical tasks in which they are employed. The second portion of the staff's objective, achieved through guidelines identified in NUREG-0612, Sections 5.1.2 through 5.1.5, is to ensure that, for load handling systems in areas where their failure might result in significant consequences, either (1) features are provided, in addition to those required for all load handling systems, to ensure that the potential for a load drop is extremely small (e.g., a single-failure-proof crane), or (2) conservative evaluations of load handling accidents indicate that the potential consequences of any load drop are acceptably small. Acceptability of accident consequences is quantified in NUREG-0612 into four accident analysis evaluation criteria.

A defense-in-depth approach was used to develop the staff guidelines in order to ensure that all load handling systems are designed and operated so that their probabilities of failure are appropriately small. The intent of the guidelines is to ensure that licensees of all operating nuclear power plants perform the following:

- define safe load travel paths, through procedures and operator training, so that, to the extent practical, heavy loads are not carried over or near irradiated fuel or safe shutdown equipment
- provide sufficient operator training, handling system design, load handling instructions, and equipment inspection to ensure reliable operation of the handling system.

Staff guidelines resulting from the foregoing are tabulated in Section 5 of NUREG-0612. Section 6 of NUREG-0612 recommended that a program be initiated to ensure that these guidelines are implemented at operating plants.

1.3 PLANT-SPECIFIC BACKGROUND

On December 22, 1980, the NRC issued a letter [3] to VEPCO, the Licensee for Surry Power Station, requesting that the Licensee review provisions for handling and control of heavy loads at Surry Units 1 and 2, evaluate these provisions with respect to the guidelines of NUREG-0612, and provide certain additional information to be used for an independent determination of

conformance to these guidelines. VEPCO responded to this request on November 16, 1981 [4], December 22, 1981 [5], and March 22, 1982 [6].

A draft technical evaluation report based upon these submittals was prepared and informally transmitted to the Licensee for review and comment. On August 12, 1982, a telephone conference call was conducted with representatives of the NRC and VEPCO to discuss unresolved issues. As a result of this call, additional information was forwarded by VEPCO on September 1, 1982 [7], October 18, 1982 [8], July 26, 1983 [9], and March 30, 1984 [10] and is incorporated into this technical evaluation.

2. EVALUATION AND RECOMMENDATIONS

This section presents a point-by-point evaluation of load handling provisions at Surry Power Station Units 1 and 2 with respect to NRC staff guidelines provided in NUREG-0612. Separate subsections are provided for both the general guidelines of NUREG-0612, Section 5.1.1 and the interim measures of NUREG-0612, Section 5.3. In each case, the guideline or interim measure is presented, Licensee-provided information is summarized and evaluated, and a conclusion as to the extent of compliance, including recommended additional action where appropriate, is presented. These conclusions are summarized in Table 2.1.

2.1 GENERAL GUIDELINES

The NRC has established seven general guidelines which must be met in order to provide the defense-in-depth approach for the handling of heavy loads. These guidelines consist of the following criteria from Section 5.1.1 of NUREG-0612:

Guideline 1 - Safe Load Paths
Guideline 2 - Load Handling Procedures
Guideline 3 - Crane Operator Training
Guideline 4 - Special Lifting Devices
Guideline 5 - Lifting Devices (Not Specially Designed)
Guideline 6 - Cranes (Inspection, Testing, and Maintenance)
Guideline 7 - Crane Design.

These seven guidelines should be satisfied by all overhead handling systems and programs in order to handle heavy loads in the vicinity of the reactor vessel, near spent fuel in the spent fuel pool, or in other areas where a load drop may damage safe shutdown systems.

2.1.1 Overhead Heavy Load Handling Systems

a. Summary of Licensee Statements and Conclusions

The Licensee's review of load handling systems at Surry Station indicates that the following load handling systems are subject to compliance with NUREG-0612:

Table 2.1. Surry Power Station - NUREG-0612 Compliance Matrix

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
1. Reactor Containment Polar Crane	125/15	--	--	R	--	--	C	C	--	--
a. RV Head and Lifting Device	122.5	C	C	--	R	--	--	--	--	C
b. Upper Internals and Lifting Rig	52	C	C	--	R	--	--	--	--	C
c. ISI Tool	10	C	C	--	--	C	--	--	--	C
d. RCP Motor/ Sling	41	C	C	--	R	--	--	--	--	--
e. Reactor Cavity Inner Seal	12.2	C	C	--	--	C	--	--	--	C
f. CRDM Missile Shield	36.5	C	C	--	--	C	--	--	--	C
g. Stud Carriers (Full)	3.6	C	C	--	--	C	--	--	--	C
h. Operating Floor Removable Plug (#1)	13	C	C	--	--	C	--	--	--	--
i. Octagonal Floor Plug (Elev. 18'-4")	31.5	C	C	--	--	C	--	--	--	--

C = Licensee action complies with NUREG-0612 Guideline.
-- = Not applicable.
R = Licensee has proposed revisions/modifications designed to comply with NUREG-0612 Guideline.

Table 2.1 (Cont.)

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
j. Polar Crane Bottom Block and Hook	2.4	C	C	--	--	--	--	--	--	--
k. Containment Recirc. Spray Cooler	23.7	C	C	--	--	C	--	--	--	--
l. Regenerative Heat Exchanger	2.4	C	C	--	--	C	--	--	--	--
m. RHR Exchange	12.8	C	C	--	--	C	--	--	--	--
n. RHR Pump Motor	2.4	C	C	--	--	C	--	--	--	--
o. Recirc. Spray Pump Motor	1.3	C	C	--	--	C	--	--	--	--
2. RC Annulus Monorail	5	--	--	R	--	--	C	C	--	--
a. Miscellaneous Loads	5	C	C	--	--	C	--	--	--	--
3. RC Jib Cranes	8	--	--	R	--	--	C	C	--	--
a. Miscellaneous Loads	8	C	C	--	--	C	--	--	--	--
4. New Fuel Crane	5	--	--	R	--	--	C	C	--	--
a. New Fuel Container (Full)	3.3	C	C	--	R	--	--	--	C	--

Table 2.1 (Cont.)

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
b. Removable Slabs	1	C	C	--	--	C	--	--	--	--
5. Motor Drive Platform and Hoist	1.8	--	--	R	--	--	C	C	--	--
a. Fuel Pool Gates	1.8	C	C	--	--	C	--	--	C	--
6. Fuel Building Trolley	125/10	--	--	R	--	--	C	C	--	--
a. Spent Fuel Shipping Cask	12.5 (Max)	C	C	--	--	--	--	--	C	--
b. Bottom Block and Hook	2.4	C	C	--	--	--	--	--	--	--
c. Spent Resin Shipping Container and Cask	3.7	C	C	--	--	C	--	--	C	--
d. Irradiated Specimen Shipping Cask	11.3	C	C	--	--	--	--	--	C	--
7. Decon Building Crane	5	--	--	R	--	--	C	C	--	--
a. Miscellaneous Loads	5	C	C	--	--	C	--	--	--	--
8. Six-Ton Monorail System	6	--	--	R	--	--	C	C	--	--

Table 2.1 (Cont.)

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
a. Component Cooling Water Pump	2.7	C	C	--	--	C	--	--	--	--
b. Component Cooling Water Pump Motor	3.2	C	C	--	--	C	--	--	--	--
c. Charging Pump	1.3	C	C	--	--	C	--	--	--	--
d. Charging Pump Motor	2.1	C	C	--	--	C	--	--	--	--
e. Removable Slab	4.5 (Max)	C	C	--	--	C	--	--	--	--
9. Ten-Ton Monorail System	10	--	--	R	--	--	C	C	--	--
a. Removable Slab	8.5 (Max)	C	C	--	--	C	--	--	--	--
10. Filter Cartridge Removal Monorail	2	--	--	R	--	--	C	--	--	--
a. Miscellaneous Loads	2	C	C	--	--	C	--	--	--	--
11. Unit #1 Switchgear Room Monorail	2	--	--	R	--	--	C	--	--	--
a. Motor-Generator Set Motor	2	C	C	--	--	C	--	--	--	--

- o Reactor containment polar cranes
- o Reactor containment annulus monorails
- o Reactor containment jib cranes
- o New fuel crane (fuel building)
- o Motor-driven platform (fuel building)
- o Fuel building trolley
- o Decontamination building crane
- o 6-Ton monorail system (auxiliary building)
- o 10-Ton monorail system (auxiliary building)
- o Filter cartridge removal monorails (auxiliary building)
- o Unit 1 switchgear room 2-ton monorail (service building).

The Licensee has also identified several other load handling systems that have been excluded from satisfying the criteria of NUREG-0612 due to physical separation from safe shutdown equipment or irradiated fuel, or insufficient load handling capacity:

- o Reactor cavity manipulator cranes
- o Neutron detector carriages
- o Drumming room monorails
- o Hoist area monorail (auxiliary building)
- o Machine shop jib crane
- o Machine shop monorail system
- o Turbine building cranes
- o Condensate polishing building monorail system (elevation 64 feet)
- o Condensate polishing building monorail system (elevation 42 feet)
- o CW intake structures trash rakes.

b. Evaluation and Conclusion

The Licensee's conclusions regarding the applicability of NUREG-0612 are consistent with the general guidelines in Section 5.1.1.

2.1.2 Safe Load Paths [Guideline 1, NUREG-0612, Section 5.1.1(1)]

"Safe load paths should be defined for the movement of heavy loads to minimize the potential for heavy loads, if dropped, to impact irradiated

fuel in the reactor vessel and in the spent fuel pool, or to impact safe shutdown equipment. The path should follow, to the extent practical, structural floor members, beams, etc., such that if the load is dropped, the structure is more likely to withstand the impact. These load paths should be defined in procedures, shown on equipment layout drawings, and clearly marked on the floor in the area where the load is to be handled. Deviations from defined load paths should require written alternative procedures approved by the plant safety review committee."

a. Summary of Licensee Statements and Conclusions

The Licensee has provided safe load paths for the movement of heavy loads at Surry Power Station which follow, to the extent practical, structural floor members, beams, etc., such that if a load is dropped, the structure is most likely to withstand the impact. These load paths, in the form of sketches, are being incorporated into lifting (operating or mechanical maintenance) procedures and will be incorporated in existing station drawings. Safe load paths will be clearly marked on the floor in the area where the load is to be handled.

Safe load path sketches will not be generated for movement of the fuel transfer canal gates in the fuel pool. Updated fuel pool maps will be used instead. These maps are more accurate than one safe load path sketch.

The review requirements for deviations from defined load paths are delineated in VEPCO's Nuclear Power Station Quality Assurance Manual and in Surry Power Station Technical Specifications. The procedure for deviations to procedures requires review by station supervisory personnel with a followup review by the Station Nuclear Safety and Operating Committee.

b. Evaluation and Conclusion

A review of the Licensee's safe load path response and drawings indicates that Surry Power Station satisfies the criteria of Section 5.1.1 of NUREG-0612. Therefore, Surry Power Station complies with Guideline 1 of NUREG-0612.

2.1.3 Load Handling Procedures [Guideline 2, NUREG-0612, Section 5.1.1(2)]

"Procedures should be developed to cover load handling operations for heavy loads that are or could be handled over or in proximity to irradiated fuel or safe shutdown equipment. At a minimum, procedures

should cover handling of those loads listed in Table 3-1 of NUREG-0612. These procedures should include: identification of required equipment; inspections and acceptance criteria required before movement of load; the steps and proper sequence to be followed in handling the load; defining the safe path; and other special precautions."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that Surry Power Station lifting procedures (mechanical maintenance and operating procedure) are being revised or have been revised to include the general guidance and evaluation requirements of Section 5.1.1(2) of NUREG-0612. A generic procedure shall be used to control the movement of heavy loads over spent fuel, fuel in the core, or equipment that may be required to achieve safe shutdown and continue decay heat removal, as required by NUREG-0612 and not covered by existing station procedures.

b. Evaluation and Conclusion

Procedural control of the movement of heavy loads at Surry Power Station is consistent with Section 5.1.1(2) of NUREG-0612 based on the Licensee's certification that lifting procedures are being revised or have been revised to include the general guidance and evaluation requirements in NUREG-0612. Therefore, Surry Power Station complies with Guideline 2 of NUREG-0612.

2.1.4 Crane Operator Training [Guideline 3, NUREG-0612, Section 5.1.1(3)]

"Crane operators should be trained, qualified, and conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976, 'Overhead and Gantry Cranes' [11]."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that Surry Power Station crane operators are trained in accordance with ANSI B30.2-1976, which complies with the requirements of NUREG-0612. Crane operators have completed a course in crane and rigging operations which provides certification that the crane operators have been trained, qualified, and instructed in proper conduct in accordance with ANSI B30.2-1976. This course was conducted by an independent contractor.

By the next refueling outage at Surry Power Station, procedures will be developed to provide for future crane operator training that will satisfy the requirements of ANSI B30.2-1976, Chapter 2-3.

b. Evaluation and Conclusion

Crane operator training, qualification, and conduct are consistent with the guidance in Section 5.1.1(3) of NUREG-0612, and Surry Power Station complies with Guideline 3 of NUREG-0612.

2.1.5 Special Lifting Devices [Guideline 4, NUREG-0612, Section 5.1.1(4)]

> "Special lifting devices should satisfy the guidelines of ANSI N14.6-1978, 'Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials' [12]. This standard should apply to all special lifting devices which carry heavy loads in areas as defined above. For operating plants, certain inspections and load tests may be accepted in lieu of certain material requirements in the standard. In addition, the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on characteristics of the crane which will be used. This is stress design factor on only the weight (static load) of the load and of the intervening components of the special handling device [NUREG-0612, Guideline 5.1.1(4)]."

a. Summary of Licensee Statements and Conclusions

The following special lifting devices in use at Surry Units 1 and 2 were identified as being subject to compliance with the criteria of NUREG-0612 and ANSI N14.6-1978:

- o reactor vessel head lifting device (RVHLD)
- o internals lifting rig (ILR)
- o reactor coolant pump motor sling (RCPLS)

The original manufacturer of these devices (Westinghouse) performed a detailed comparison of the ANSI criteria and records that document the original design, manufacture, inspection, and testing of the special lifting devices. Results of this review indicate that the devices meet the intent of the ANSI standard

for design, fabrication, and quality assurance, but are not in strict compliance with criteria for maintenance, acceptance testing, or continuing compliance.

Design, fabrication, and quality assurance requirements for these devices were defined on detailed manufacturing drawings and purchase orders. A stress report was prepared, applying the design margin criteria of 3 (yield) and 5 (ultimate) on stress, and results indicate that all devices possess acceptable limits for tensile and shear stresses with the following exceptions for the internals lifting rig: (1) tensile and shear stresses in the side plates; (2) thread shear stresses in the leg adaptor; and (3) the tensile stress at the minimum section of the engaging screw. For these exceptions, the Licensee noted that the actual margin is slightly less than specified the criterion of 3 on yield stress, whereas all components satisfy the criterion of 5 on ultimate stress. It is therefore the Licensee's opinion that existing design is adequate.

In addition, the Licensee stated that manufacturing surveillance of hold points, procedure review, and personnel qualification which adequately meet ANSI requirements were also provided by the manufacturer during the fabrication and assembly of these devices. Load tests to 100% have been performed for each of the devices, although documentation is available for the reactor vessel head lifting device only. Although load tests in excess of 100% have not been performed, the Licensee feels that such tests are not necessary since proof of workmanship can be documented through use of existing load tests, adequate design margins, and documentation of procedures that were actually used during the manufacture of these devices.

To ensure continuing compliance, the Licensee identified the following programs which will ensure the reliability of these devices. Maintenance procedures are currently in effect which require visual examinations of the special lifting devices prior to each refueling and each containment maintenance period if use of the device is anticipated. These visual inspections include inspections of all critical welds and bolted joints or connections, and results are appropriately documented. In addition, a load cell is used during lifts by the reactor vessel head lifting device and the

internals lifting rig to provide continuous monitoring to prevent overstressing of either device. To ensure an even higher level of confidence and acceptability of these devices, a nondestructive examination (NDE) program will be established. This program will include inspection and NDE of all critical welds and critical parts of the lifting devices over the in-service inspection period of 10 years. It is the Licensee's opinion that such a program is warranted based upon the limited and sole use of these special devices.

b. Evaluation

Although not in strict compliance with the criteria of ANSI N14.6-1978, it is apparent from the Licensee's response that the special lifting devices at Surry Units 1 and 2 will provide a degree of load handling reliability consistent with that specified by this guideline. Sufficient information has been provided to verify that design margins satisfy the ANSI criteria. Further, it appears that adequate records exist that prove that the devices were assembled and fabricated in a manner which provides for a quality device. It is agreed that this proof of workmanship is sufficient to preclude a need for load tests in excess of 100% of rated load.

Lastly, the Licensee's programs for scheduled periodic maintenance and inspection appear to be adequate to demonstrate the continued reliability of these devices and are in accordance with the provisions of ANSI N14.6-1978. It is also agreed that relaxation of the frequency of NDE is acceptable based upon the limited use of these devices.

c. Conclusion

Design, proof of workmanship, and programs which assure continued reliability of special lifting devices at Surry Units 1 and 2 are consistent with the criteria of Guideline 4.

2.1.6 Lifting Devices (Not Specially Designed) [Guideline 5, NUREG-0612, Section 5.1.1(5)]

"Lifting devices that are not specially designed should be installed and used in accordance with the guidelines of ANSI B30.9-1971, 'Slings'

[13]. However, in selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating identified on the sling should be in terms of the 'static load' that produces the maximum static and dynamic load. Where this restricts slings to use on only certain cranes, the slings should be clearly marked as to the cranes with which they may be used."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that lifting devices which are not specially designed (slings) are marked, maintained, stored, and inspected in accordance with ANSI B30.9-1971. Lifting procedures are reviewed prior to approval and implementation for proper selection of size, length, capacity, and rigging configuration of slings in order to meet all requirements of ANSI B30.9-1971.

With regard to sling selection, the Licensee determined that the maximum dynamic load experienced by a sling would be not more than 10% of the rated load and therefore could be ignored in the selection of slings since the slings were designed with a safety factor of 5. In addition, the Licensee stated that none of the slings in use were restricted to certain cranes.

b. Evaluation and Conclusion

Surry Units 1 and 2 satisfy the criteria of Guideline 5. Surry Power Station satisfies the requirements of this guideline on the basis that slings are inspected and used in accordance with ANSI B30.9-1971. In addition, since the maximum dynamic load experienced by these slings is less than 10%, it is a reasonably small percentage of the static load and therefore may be disregarded.

2.1.7 Cranes (Inspection, Testing, and Maintenance) [Guideline 6, NUREG-0612, Section 5.1.1(6)]

"The crane should be inspected, tested and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' with the exception that tests and inspections should be performed prior to use when it is not practical to meet the frequencies of ANSI B30.2 for periodic inspection and test, or where frequency of crane use is less than the specified inspection and test frequency (e.g., the polar crane inside a PWR containment may only be used every 12 to 18 months during

refueling operations and is generally not accessible during power operation. ANSI B30.2, however, calls for certain inspections to be performed daily or monthly. For such cranes having limited usage, the inspections, tests, and maintenance should be performed prior to their use)."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that Surry Power Station cranes, both inside and outside of the containment, are inspected, tested, and maintained in accordance with station maintenance procedures MMP-P-CR-015 or MMP-P-CR-017. These procedures were revised in 1977 to incorporate ANSI B30.2-1976.

In addition, the fuel handling system is visually inspected and performance tested in accordance with station procedure PT 20.1 prior to refueling.

Prior to initial use, all new, reinstalled, altered, extensively repaired, or modified cranes will be operationally tested and rated load tested in accordance with ANSI B30.2-1976. Crane test procedures will be written, as required, to ensure that cranes are in compliance with ANSI B30.2-1976.

b. Evaluation

The Surry Power Station satisfies the requirements of this guideline on the basis that existing procedures have been revised to comply with ANSI B30.2-1976.

c. Conclusion

Inspection, testing, and maintenance of cranes at Surry Power Station are performed in a manner consistent with Guideline 6.

2.1.8 Crane Design [Guideline 7, NUREG-0612, Section 5.1.1(7)]

"The crane should be designed to meet the applicable criteria and guidelines of Chapter 2-1 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' and of CMAA-70, 'Specifications for Electric Overhead Travelling

Cranes' [14]. An alternative to a specification in ANSI B30.2 or CMAA-70 may be accepted in lieu of specific compliance if the intent of the specification is satisfied."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that CMAA-70 and ANSI B30.2-1976 apply to the reactor containment polar cranes, fuel building trolley, and the new fuel crane. These cranes were designed and fabricated in accordance with Electric Overhead Crane Specification #61 [15] prior to the issuance of the above reference standards. The Licensee has provided the results of a review of existing crane designs with the recommendations contained in CMAA-70 and Chapter 2-1 of ANSI B30.2-1976.

The reactor containment jib cranes were designed and fabricated in accordance with ANSI B30.16-1973 and ANSI B30.11-1973. The reactor containment annulus monorails, 6-ton and 10-ton monorail systems, decontamination building crane, new fuel crane, and motor-driven platform and hoists were designed in accordance with EOCI 61. These cranes and monorails meet the requirements of ANSI B30.11 and ANSI B30.16.

b. Evaluation

The Licensee's analysis of the crane design for the reactor containment polar cranes, the fuel building trolley, and the new fuel crane indicates that the design of these cranes is consistent with the guidance in Section 5.1.1(7) of NUREG-0612.

Since CMAA-70 applies to top running bridge and gantry type multiple girder electric overhead traveling cranes, verification of compliance to ANSI B30.11 [16] and ANSI B30.16 [17] for the remaining load handling systems meets the intent of NUREG-0612 for crane design.

c. Conclusion

Design of cranes at Surry Power Station is consistent with Guideline 7.

2.2 INTERIM PROTECTION MEASURES

The NRC has established six interim protection measures to be implemented at operating nuclear power plants to provide reasonable assurance that no heavy loads will be handled over the spent fuel pool and that measures exist to reduce the potential for accidental load drops to impact on fuel in the core or spent fuel pool. Four of the six interim measures of the report consist of Guideline 1, Safe Load Paths; Guideline 2, Load Handling Procedures; Guideline 3, Crane Operator Training; and Guideline 6, Cranes (Inspection, Testing, and Maintenance). The two remaining interim measures cover the following criteria:

1. Heavy load technical specifications
2. Special review for heavy loads handled over the core.

Licensee implementation and evaluation of these interim protection measures are contained in the succeeding paragraphs of this section.

2.2.1 Technical Specifications [Interim Protection Measure 1, NUREG-0612, Section 5.3(1)]

"Licenses for all operating reactors not having a single-failure-proof overhead crane in the fuel storage pool area should be revised to include a specification comparable to Standard Technical Specification 3.9.7, 'Crane Travel - Spent Fuel Storage Building,' for PWR's and Standard Technical Specification 3.9.6.2, 'Crane Travel,' for BWR's, to prohibit handling of heavy loads over fuel in the storage pool until implementation of measures which satisfy the guidelines of Section 5.1 [of NUREG-0612]."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that Surry Technical Specification 3.10 prohibits the movement of heavy loads exceeding 110% of the weight of a fuel assembly (not including fuel handling tools) over spent fuel.

b. Evaluation

NUREG-0612 defines a heavy load as any load whose weight is greater than the combined weight of a single spent fuel assembly and its handling tool.

Considering the typical weight of spent fuel assemblies and handling tools, designation of 110% of the weight of a fuel assembly as a heavy load is consistent with the guidance in NUREG-0612.

c. Conclusion

Surry Power Station complies with Interim Protection Measure 1.

2.2.2 Administrative Controls [Interim Protection Measures 2, 3, 4, and 5, NUREG-0612, Sections 5.3(2)-5.3(5)]

"Procedural or administrative measures [including safe load paths, load handling procedures, crane operator training, and crane inspection]... can be accomplished in a short time period and need not be delayed for completion of evaluations and modifications to satisfy the guidelines of Section 5.1 [of NUREG-0612]."

a. Evaluation

The specific requirements for load handling administrative controls are contained in NUREG-0612, Section 5.1.1, Guidelines 1, 2, 3, and 6. The Licensee's compliance with these guidelines has been evaluated in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7, respectively, of this report.

b. Conclusions and Recommendations

Conclusions and recommendations concerning the Licensee's compliance with these administrative controls are contained in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7 of this report.

2.2.3 Special Review for Heavy Loads Handled Over the Core [Interim Protection Measure 6, NUREG-0612, Section 5.3(6)]

"...special attention should be given to procedures, equipment, and personnel for the handling of heavy loads over the core, such as vessel internals or vessel inspection tools. This special review should include the following for these loads: (1) review of procedures for installation of rigging or lifting devices and movement of the load to assure that sufficient detail is provided and that instructions are clear and concise; (2) visual inspections of load bearing components of cranes, slings, and special lifting devices to identify flaws or deficiencies that could lead to failure of the component; (3) appropriate repair and

replacement of defective components; and (4) verify that the crane operators have been properly trained and are familiar with specific procedures used in handling these loads, e.g., hand signals, conduct of operation, and content of procedures."

a. Summary of Licensee Statements and Conclusions

For Surry Unit 2, the Licensee has stated that the only heavy loads carried over the reactor when the reactor is fueled are the reactor components. Each heavy load is covered by its own unique procedure. The crane load block does not have a lift procedure since it is an integral portion of the crane; however, it has been identified as a potential heavy load drop. To ensure that the crane load block is not dropped, the existing redundant limit switches are performance-tested prior to use.

In accordance with Surry Power Station preventative maintenance procedure MMP-P-CR-015, the containment cranes and the reactor head and internals lifting rigs are inspected prior to each refueling and at each containment maintenance period if they are to be used and have been idle for a period of more than six months or if the last inspection has been over one year. The reactor coolant pump motor lifting rig and wire rope slings are inspected prior to each refueling and at each containment maintenance period if they are to be used and the last inspection has been over one month. This check ensures that each device will receive an inspection prior to use. If any components are found to be defective, they are replaced, or repaired, and reinspected before use.

Surry crane operators recently passed a two-week course on crane operations.

b. Evaluation and Conclusion

Surry Power Station complies with Interim Protection Measure 6.

3. CONCLUSION

This summary is provided to consolidate the results of the evaluation contained in Section 2 concerning individual NRC staff guidelines into an overall evaluation of heavy load handling at Surry Power Station Units 1 and 2. Overall conclusions and recommended Licensee actions, where appropriate, are provided with respect to both general provisions for load handling (NUREG-0612, Section 5.1.1) and completion of the staff recommendations for interim protection (NUREG-0612, Section 5.3).

3.1 GENERAL PROVISIONS FOR LOAD HANDLING

The NRC staff has established seven guidelines concerning provisions for handling heavy loads in the area of the reactor vessel, near stored spent fuel, or in other areas where an accidental load drop could damage equipment required for safe shutdown or decay heat removal. The intent of these guidelines is twofold. A plant conforming to these guidelines will have developed and implemented, through procedures and operator training, safe load travel paths such that, to the maximum extent practical, heavy loads are not carried over or near irradiated fuel or safe shutdown equipment. A plant conforming to these guidelines will also have provided sufficient operator training, handling system design, load handling instructions, and equipment inspection to ensure reliable operation of the handling system. As detailed in Section 2, it has been found that load handling operations at Surry Station can be expected to be conducted in a highly reliable manner consistent with the staff's objectives as expressed in these guidelines.

3.2 INTERIM PROTECTION MEASURES

The NRC staff has established (NUREG-0612, Section 5.3) that certain measures should be initiated to provide reasonable assurance that handling of heavy loads will be performed in a safe manner until final implementation of the general guidelines of NUREG-0612, Section 5.1 is complete. Specified measures include the implementation of a technical specification to prohibit

the handling of heavy loads over fuel in the storage pool; compliance with Guidelines 1, 2, 3, and 6 of NUREG-0612, Section 5.1.1; a review of load handling procedures and operator training; and a visual inspection program, including component repair or replacement as necessary of cranes, slings, and special lifting devices to eliminate deficiencies that could lead to component failure. Evaluation of information provided by the Licensee indicates that measures which ensure compliance with the staff's measures for interim protection have been properly implemented at the Surry Power Station.

4. REFERENCES

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   "Control of Heavy Loads at Nuclear Power Plants"
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   Letter to all Licensees
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   Letter to H. R. Denton (NRC)
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10. W. L. Stewart (VEPCO)
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"Overhead and Gantry Cranes"
ANSI B30.2-1976

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"Standard for Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials"
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ANSI B30.9-1971

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Pittsburgh, PA
CMAA-70

15. Electric Overhead Crane Institute, 1961
"Specification for Electric Overhead Traveling Cranes"
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16. American National Standards Institute
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ANSI B30.11

17. American National Standards Institute
"Overhead Hoists (Underhung)"
ANSI B30.16

SALP INPUT

Plant: Surry, Units 1 and 2

1. Management Involvement and Control in Assuring Quality: Not Applicable

2. Approach to Resolution of Technical Issues from a Safety Standpoint: Category 2

3. Responsiveness to NRC Initiatives: Category 2

4. Enforcement: Not Applicable

5. Reporting and Analysis of Reportable Events: Not Applicable

6. Staff (Including Management): Not Applicable

7. Training and Qualification Effectiveness: Not Applicable

The following in the narrative for Items 2 and 3 above:

The initial submittal by the licensee contained various open items. The licensee has adequately addressed these open items.