(DRAFT)

ENCLOSURE 1

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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Prepared by

Franklin Research Center
20th and Race Streets
Philadelphia, PA 19103

Author: F. W. Vosbury

FRC Group Leader: I. H. Sargent

Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: F. Clemenson

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Franklin Research Center
A Division of The Franklin Institute
The Benjamin Franklin Parkway, Phila., Pa. 19103 (215) 448-1000

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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.

Mr. E. W. Vosbury and Mr. I. H. Sargent contributed to the technical preparation of this report through a subcontract with WESTEC Services, Inc.

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:

- o 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
- o 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, FRC, and VEPCO to discuss unresolved issues. As a result of this call, additional information was forwarded by VEPCO on September 1, 1982 [7] and October 18, 1982 [8] 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:

- o Guideline 1 - Safe Load Paths
- o Guideline 2 - Load Handling Procedures
- o Guideline 3 - Crane Operator Training
- o Guideline 4 - Special Lifting Devices
- o Guideline 5 - Lifting Devices (Not Specially Designed)
- o Guideline 6 - Cranes (Inspection, Testing, and Maintenance)
- o 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	--	NC	--	--	--	--	C
b. Upper Internals and Lifting Rig	52	C	C	--	NC	--	--	--	--	C
c. ISI Tool	10	C	C	--	--	C	--	--	--	C
d. RCP Motor/ Sling	41	C	C	--	--	C	--	--	--	--
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.
NC = Licensee action is not in compliance 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 Exchanger	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	--	NC	--	--	--	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	--	NC	--	--	--	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	--	NC	--	--	--	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	--	--	--	--

- Reactor containment polar cranes
- Reactor containment annulus monorails
- Reactor containment jib cranes
- New fuel crane (fuel building)
- Motor-driven platform (fuel building)
- Fuel building trolley
- Decontamination building crane
- 6-Ton monorail system (auxiliary building)
- 10-Ton monorail system (auxiliary building)
- Filter cartridge removal monorails (auxiliary building)
- 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:

- Reactor cavity manipulator cranes
- Neutron detector carriages
- Drumming room monorails
- Hoist area monorail (auxiliary building)
- Machine shop jib crane
- Machine shop monorail system
- Turbine building cranes
- Condensate polishing building monorail system (elevation 64 feet)
- Condensate polishing building monorail system (elevation 42 feet)
- 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' [9]."

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' [10]. 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 Licensee has stated that the reactor vessel head lifting device, internals lifting rig, and the reactor coolant pump motor sling were designed and fabricated prior to the issuance of ANSI N14.6-1978 or ANSI B30.9-1971. These devices were designed and built to current industry standards using good engineering practices. The Licensee has contacted the lifting devices supplier, Westinghouse, and has requested verification that these lifting devices conform to the above listed standards. This information is expected to be available by the end of March 1983.

The reactor vessel head lifting device and the internals lifting rig are inspected prior to each refueling and at each containment maintenance period if they are needed and have been idle for a period of more than six months or

if over a year has passed since the last inspection. The reactor coolant pump motor sling is inspected prior to each refueling and at each containment maintenance period if it is to be used and more than one month has passed since the last inspection.

Special handling devices used to lift the new fuel containers, irradiated specimens, and spent fuel shipping casks are supplied by the particular cask supplier. The Licensee will verify the conformance of these lifting devices to ANSI N14.6-1978 and ANSI B30.8-1971 with equipment suppliers.

b. Evaluation

Insufficient information has been provided by the Licensee to evaluate compliance with Guideline 4 of NUREG-0612 although a commitment has been made to obtain verification from Westinghouse that these lifting devices conform to ANSI N14.6-1978.

In evaluating the information obtained from Westinghouse, the Licensee should address the imposition of static and dynamic loads when assessing design stresses.

The intent of Guideline 4, in addition to determining that special lifting devices have been designed and fabricated in a manner consistent with high reliability, is also to ensure that appropriate steps are taken to ensure that these devices are inspected, tested, and maintained to ensure continued reliability. Guidance for a program to support this goal is contained in Section 5 of ANSI N14.6.

c. Conclusion and Recommendations

Surry Power Station does not satisfy the requirements of Guideline 4 of NUREG-0612. The Licensee should implement an acceptance and continuing compliance testing program in accordance with Section 5 of ANSI N14.6-1978 prior to the next use of these devices. Further, the Licensee should provide a design comparison of the special lifting device designs relative to the criteria in ANSI N14.6-1978.

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' [11]. 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 comply with 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 to the above stated station maintenance procedures, 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 shall be operationally tested and rated load tested in accordance with ANSI B30.2-1976. Crane test procedures shall 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

Surry Power Station complies 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' [12]. 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 prior to the issuance of the above referenced standards, in accordance with Electric Overhead Crane Specification #61 [13]. 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 [14] and ANSI B30.16 [15] for the remaining load handling systems meets the intent of NUREG-0612 for crane design.

c. Conclusion

Surry Power Station complies 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 will be 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.

The one-time inspection required will be performed prior to the next refueling in accordance with the above procedure.

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

b. Evaluation and Conclusion

Contingent upon completion of the one-time inspection to be performed prior to the next refueling, Surry Power Station will comply 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. A need for further Licensee action was identified in the following areas:

- VEPCO should develop a program consistent with Section 5 of ANSI N14.6-1978 to maintain the assurance of reliability of special lifting devices.

- VEPCO should complete the assessment of the design of special lifting devices in comparison with sections of ANSI N14.6-1978 affecting device load handling reliability. (VEPCO has committed to conduct this evaluation).

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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   Letter to H. R. Denton (NRC)
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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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"Overhead Hoists (Underhung)"
ANSI B30.16

ADDITIONAL INFORMATION REQUIRED FROM SURRY NUCLEAR STATION

a. RECOMMENDATION/OPEN ITEM

Virginia Electric Power Company (VEPCO) should assess special lifting devices at Surry Units 1 and 2 to determine compliance with the requirements of ANSI N14.6-1978. Such an assessment should include verification of design adequacy as well as implementation of programs that ensure continuing compliance with the criteria of ANSI N14.6-1978, Section 5.

b. EVALUATION CRITERIA

The general guidelines of NUREG-0612 specify that special lifting devices used to carry heavy loads should satisfy the requirements of ANSI N14.6-1978. In order to determine if the devices are in compliance or whether equivalence with the standard may be established, the licensee, as a minimum, should demonstrate that the following issues have been adequately addressed for each device identified:

- o adequacy of design (i.e., stress design factors, quality assurance, fabrication controls)
- o proof of workmanship and mechanical integrity (initial load test)
- o programs to ensure continuing compliance (a test and inspection program which complies with ANSI N14.6-1978, Section 5).

c. DISCUSSION

VEPCO has identified three special lifting devices to be subject to the requirements of NUREG-0612 and ANSI N14.6-1978: the reactor vessel head lifting device, the internals lifting rig, and the reactor coolant pump motor sling.

The Licensee states that these lifting devices were built and fabricated prior to the issuance of both ANSI N14.6-1978 and ANSI B30.9-1971. However, the supplier of these devices has been contacted by VEPCO to perform a verification that the devices conform to the above standards. When this information has been provided, the Licensee should evaluate the results and modify the

devices or provide suitable rationale which justifies the Licensee's position that the existing device provides a degree of reliability consistent with NUREG-0612 and ANSI N14.6-1978. In addition, VEPCO states that the devices undergo routine periodic maintenance; insufficient information has been provided to verify whether the inspection program conforms to ANSI N14.6-1978, Section 5. The intent of the NUREG-0612 guidelines, in addition to determining that special lifting devices have been designed and fabricated in a manner consistent with high reliability, is also to ensure that appropriate steps are taken to ensure that these devices are inspected, tested, and maintained for continued reliability. Therefore, the Licensee should verify that existing programs comply with the guidance of ANSI N14.6-1978, Section 5.

ENCLOSURE 3

SYNOPSIS OF ISSUES ASSOCIATED WITH NUREG 0612

The following information is provided to identify exceptions or interpretations related to verbatim compliance with NUREG 0612 Guidelines that have occurred during the course of this review. For each of the major Guidelines specific exceptions are identified, a discussion concerning the underlying objective of that Guideline is provided, and approaches felt to be consistent and inconsistent with that guideline are identified. While each such exception has been handled on a case by case basis, and has been considered in light of overall compliance with NUREG 0612 at a particular plant, the topics are of a nature general enough to be of interest to other plants.

GUIDELINE 1 SAFE LOAD PATHS

Exception 1

In the opinion of the licensee, development of individual load paths is impractical since there are a significant number of loads for which the pickup and laydown areas vary from outage to outage. Further, in some cases the location of safety related equipment combined with the design of the floor over which heavy loads are carried indicates that for a number of lifts there is no preferred load path.

Discussion

The purpose of this portion of Guideline 1 is to ensure that the paths over which heavy loads are carried have been developed and approved in advance of the lift and are based on considerations of safety. In particular it is provided to avoid the ad hoc selection of load paths by maintenance personnel since such a situation could result in the use of a load path which has been established by a process wherein considerations other than safety have taken precedence.

It is recognized that there are a class of loads which, although in excess of the weight specified for classification as a heavy load, are actually miscellaneous or maintenance related loads for which it is impractical to identify a specific laydown area which can be fixed from outage to outage. Conversely there are a number of loads for which specific laydown areas have been allocated in the original plant design and which should reasonably be expected to be carried over the same load paths during every outage. A tabulation of loads in this latter category, generally applicable to PWR's and BWR's, was provided in NUREG 0612 as Table 3-1.

A fundamental principal of NUREG 0612 is protection through defense in depth. Specifically, the first line of protection from an accident which could result in damage to spent fuel or equipment required for safe shutdown or decay heat removal is to avoid or minimize the exposure of such equipment to crane borne loads overhead. Where such exposure is minimized, rather than avoided, a second line of defense can then be provided by intervening barriers such as floors or the provision of additional lifting device redundancy or safety factors. Considering the foregoing, the use of exclusion areas, rather than safe load paths, is consistent with this guideline only under circumstances where there is no safety related equipment located beneath the area accessible to the crane hook but outside of the exclusion area. This situation has been found in buildings such as the turbine hall or screen house where safety related equipment is concentrated in a specific area within the crane path. It is unlikely to occur within containment due to the numerous safety related piping and electrical systems provided to support decay heat removal.

Approaches Consistent With This Guideline

Specific safe load paths are prepared and approved for major components for which hazardous areas are well established. For miscellaneous lifts load corridors are established such that any movement within that corridor cannot result in carrying a heavy load over spent fuel or systems required for safe shutdown or decay heat removal (regardless of intervening floors). Movement within these corridors is at the discretion of the load handling party.

Specific safe load paths are prepared and approved for major components for which hazardous areas are well established. For miscellaneous lifts detailed directions are prepared and approved for developing safe load paths which include floor plans showing the location of safety related equipment and instructions to avoid such equipment. Specific safe load paths are then prepared each time a miscellaneous lift qualifying as a heavy load is made. These individual load paths are temporary and may change from outage to outage.

Approaches Inconsistent With this Guideline.

Use of limited exclusion areas in containment which merely prohibited the carrying of heavy loads directly over the core or specific components and allow full load handling party discretion in other areas.

Exception 2

In the opinion of the licensee marking of load paths on the floor is impractical. This may be caused by the general use of temporary floor coverings which would cover the load path markings, or, due to the number of loads involved, a requirement for multiple markings which could confuse the crane operator.

Discussion

The purpose of this feature of Guideline 1 is to provide visual aids to assist the operator and supervisor in ensuring that designated safe load paths are actually followed. In the case of the operator it has the additional function of avoiding undesirable distractions while handling suspended loads (e.g., trying to read procedural steps or drawings while controlling the crane). This feature should also be seen as a provision necessary to complete a plan for the implementation of safe load paths. Specifically it provides some additional assurance that, having spent the time and effort to develop safe load paths, those paths will be followed.

Approaches Consistent With this Guideline

Rather than mark load paths a second member of the load handling party (that is, other than the crane operator) is made responsible for assuring that the designated safe load path is followed. This second person, a signalman is typically used on cab operated cranes, checks out the safe load path prior to the lift to ensure that it is clear, refers to the safe load path guidance during the lift and provides direction to the operator and that the load path is followed. To support this approach the duties and responsibilities of each member of the load handling party should be clearly defined.

Prior to a lift the appropriate load path is temporarily marked (rope, pylons, etc.) to provide a visual reference for the crane operator. In cases where the load path cannot be marked (e.g., transfer of the upper internals in a PWR) temporary or permanent match marks can be employed to assist in positioning the bridge and/or trolley during the lift.

In either case reasonable engineering judgement would indicate that in certain specific lifts marking of safe load paths is unnecessary due to physical constraints on the load handling operation (e.g., simple hoists, monorails, or very short lifts where movement is limited to one coordinate axis in addition to the vertical).

Approaches Inconsistent With this Guideline

Positions which in effect do not recognize the need for realistically providing visual aids to the crane operator and imply that, for all lifts, the operator will remember the load path from review of procedures or by reference to a drawing.

Exception 3

Obtaining written alternative procedures approved by the plant safety review committee for any deviations from a safe load path is considered too cumbersome to accommodate the handling of maintenance loads where laydown areas may have to change or load paths altered as a result of unanticipated maintenance requirements.

Discussion

The purpose of this portion of this guideline is to ensure that deviations from established safe load paths receive a level of review appropriate to their safety significance. In general it is highly desirable that once safe load paths are established they are retained and kept clear of interference rather than routinely deviated from. It is recognized, however, that issues associated with plant safety are the responsibility of an individual licensee plant safety review committee (or equivalent) and the details of their excercizing this responsibility should be within their jurisdiction.

Approach Consistent With this Guideline

A plant safety review committee (or equivalent) delegates the responsibility for approving temporary changes to safe load paths to a person, who may or may not be a member of that committee, with appropriate training and education in the area of plant safety. Such changes are reviewed by the safety review committee in the normal course of events. Any permanent alteration to a safe load path is approved by the plant safety review committee.

Approach Inconsistent With this Guideline

Activities which in effect allow decisions as to deviations from safe load paths to be made by persons not specifically designated by the plant safety review committee.

GUIDELINE 2 LOAD HANDLING PROCEDURES

No significant exceptions to this guideline have been encountered. Occasionally a question arises concerning the need for individual procedures for each lift. In general, it was not the purpose of this guideline to require separate procedures for each lift. A reasonable approach is to provide separate procedures for each major lift (e.g., RV head, core internals, fuel cask) and use a general procedure for handling other heavy loads as long as load specific details (e.g., load paths, equipment requirements) are provided in an attachments or enclosures.

GUIDELINE 3 CRANE OPERATOR TRAINING

Exception

The only exception occassionally encountered with respect to this Guideline other than fairly minor, site unique, exceptions has been a desire to deviate from the requirement of ANSI B30.2-3.1.7.o for testing of all controls before beginning a new shift. In some cases a licensee has qualified a commitment in this area by noting that only crane controls "necessary for crane operation" will be tested at the start of a shift.

Discussion

This requirement (ie. not a recommendation) of ANSI B30.2 is important since crane control system failures are relatively significant contributors to load handling incidents. The only reason that can be seen for an exception in this area is a general aversion to the word "all". Specifically, it appears that some licensees fear that a commitment to this requirement will force them to test all control type devices (eg. motor overloads, load cells, emergency brakes) rather than just those features generally known as controls (ie. hoist, bridge, and trolley motion controllers).

Approaches Consistent With this Guideline

Exceptions that clearly indicate that all normal controls (hoist, bridge, and trolley motion controllers) will be tested at the start of each shift and that the purpose of not committing to "all" controls is to avoid a misunderstanding concerning other control devices.

Approaches Inconsistent With This Guideline

A response that implies that a decision to test or not test a normal control will be made by the crane operator on the basis of what type of lift or direction of motion he expects for the forthcoming shift.

Exception 1

Some licensees have indicated that their special lifting devices were designed and procured prior to the publication of ANSI N14.6 and therefore are not designed in accordance with that standard. This fact is sometimes combined with a reference to the title of that standard to reach a conclusion that the standard is not applicable.

Discussion

The purpose of this section is to ensure that special lifting devices were designed and constructed under controlled conditions and that sufficient documentation is available to establish existing design stress margins and support future maintenance and repair requirements. ANSI N14.6 is an existing standard that provides requirements supporting this goal for lifting device applications where the consequence of a failure could be similar to that which could be expected in the event of the failure of a special lifting device carrying a load within the jurisdiction of NUREG 0612. Consequently it seems appropriate that for special lifting devices subject to NUREG 0612 it should be able to be demonstrated that, from a design standpoint, they are as reliable as a device for which ANSI N14.6 was developed.

Approaches Consistent With This Guideline

Although not originally specified to be designed in accordance with ANSI N14.6 the special lifting device in question was provided by a reactor vendor, in accordance with appropriate quality assurance and quality control procedures, for a specific application associated with power plant components provided by that vendor. Based on either the review of the original stress report or, if such a stress report is unavailable, the preparation of a new stress report, the licensee has determined that margins to material yield and ultimate strength are comparable to those specified in ANSI N14.6. Although not required of the lifting device vendor, the licensee has reviewed the design of the lifting device and prepared a list of critical components whose repair or replacement should be performed under controlled conditions.

Approaches Inconsistent With This Guideline

No information is available concerning the original design but it is probably allright because the device has been used for ten years and never failed.

The device was built before the publication of ANSI N14.6, does not carry shipping containers of nuclear material weighing more than 10,000 pounds, and thus need not comply with ANSI N14.6.

Exception 2

No 150% overload test has been performed and, in the opinion of the licensee, such a test is impractical.

Discussion

The performance of a load test in excess of the load subject to NUREG 0612 is an important contributor to the ability to assess the overall reliability of a device. Such a test supplements design reliability by demonstrating that the device was properly fabricated or assembled and that a portion of the design safety margin has been demonstrated. Such proof of workmanship is particularly important for a fairly complicated device. It is recognized, however, that the specification of a 150% overload test is somewhat arbitrary and that, in some cases, the nature of the device is such that the liklihood of workmanship shortcomings is remote.

Approaches Consistent With This Guideline

The licensee has evaluated the lifting device in question and has determined that design stress margins are substantial. Further it has been established that the device itself is uncomplicated and principally put together with mechanical joints such that an assembly error is highly unlikely. The use of welded joints is severly limited and where employed were performed in accordance with substantial quality controls (eg AWS D1.1) including NDE. The device has been tested to 100% of rated load.

Although a 150% overload test has not been performed the lifting device has been subjected to a manufacturer recommended overload to demonstrate proof of workmanship (typically 120-125%).

Approaches Inconsistent With This Guideline

See this topic for Exception 1 above.

Exception 3

The requirement of ANSI N14.6 for an annual 150% load test or full NDE is excessive. Both the load test (due to the inability to make the test lift within containment) and the NDE (due to the need to remove protective coatings) are impractical and not justified by the infrequent use of these devices.

Discussion

A continuing inspection program to assure the continued maintenance of safety margins incorporated in the original design of the device is important to demonstrate the reliability of special lifting devices. It is recognized, however, that some devices employed in a nuclear power plant, particularly those associated with refueling, are used under conditions of control and at frequencies of use that are substantially less severe than that possible for the type of lifting device for which ANSI N14.6 was originally prepared. Consequently a reasonable relaxation of the inspection interval seems appropriate.

Approaches Consistent With This Guideline

Overload tests will be conducted but at a longer interval, 5 years, between tests to be consistent with the number of operational lifts required.

NDE of load bearing welds will be conducted at 5 year intervals or, alternatively, load bearing welds will be examined through a program that ensures that all welds will be examined over a normal inservice inspection interval of 10 years in a manner similar to that specified in the B&PV Code for Class 2 Component Supports.

Approach Inconsistent With This Guideline

Continuing inspection will be limited to an annual visual examination of the device.

Exception

Licensees have taken exception to the requirement to select slings in accordance with the maximum working load tables of ANSI B30.9 considering the sum of static and dynamic loads. Most commonly it is the licensees position that the approximate factor of safety of five on rope breaking strength inherent in these tables adequately accomodates dynamic loading.

Discussion

The intent of this portion of this Guideline, which also applies to special lifting devices under Guideline 4, is to reserve the ANSI B30.9 safety factors for accomodating sling wear and unanticipated overloads and avoid a reduction of this safety factor as a result of the routine dynamic loads inherent in hook/load acceleration and deceleration. While it is acknowledged that, for operating characteristics typical of cranes employed at nuclear power plants, these dynamic loads are unlikely to be substantial, such a determination cannot be made generically. Typically the actual dynamic load due to hook/load acceleration or deceleration is a function of design hook speeds and the type of hoist control system employed. It should also be recalled that ANSI B30.9 is a general industrial standard which applies to all load handling devices and does not in itself provide for any additional conservatism in consideration of the potential consequences of a load handling accident at a nuclear power plant. Based on this, it is considered reasonable that individual licensees evaluate the potential contribution of dynamic loading in their operations and if such dynamic loading is indeed significant accomodate it in their procedures for sling selection.

Approach Consistent With This Guideline

The licensee has evaluated the potential routine dynamic loading for lifting devices not specially designed and found them to be a relatively small fraction (typically 5-15%) of static load. This estimate has been made on the basis of either calculated acceleration and deceleration rates or through use of the industrial standard for impact loading of cranes specified in CMAA-70. In either case having verified that routine dynamic loading of a specific hoist is indeed small the licensee has drawn the conclusion that revised selection criteria to accomodate such minor additional loads will not have a substantial effect on overall load handling reliability.

Approach Inconsistent With This Guideline

Statement to the effect that dynamic loads are accomodated in the tables of ANSI B30.9 with no indication that the licensee has assessed the actual dynamic loading imposed on cranes subject to NUREG 0612.

GUIDELINE 6 CRANE INSPECTION TESTING AND MAINTENANCE.

Exception

The only exception occasionally encountered with respect to this Guideline other than fairly minor and site-unique exceptions has been a desire to deviate from the requirement of ANSI B30.2-1.1.2.a.2 and 3.2.4 for testing of hoist limit devices before beginning a new shift. In some cases a licensee has qualified a commitment in this area by noting that this limit switch will be tested only if operations in the vicinity of the limit switch are anticipated.

Discussion

While this issue is treated somewhat ambigously in ANSI B30.2 (it is a recommendation in article 1.1.2 and a requirement in article 3.2.4) it is important since two-blocking incidents are relatively significant contributors to load handling incidents. Further it should be noted that this test has been incorporated as a requirement of OSHA in 29 CFR 1910.179.(n).(4).(i). It is recognized, however, that there may be circumstances where such a test is not prudent. First, such a test clearly should not be made with the hook under load. Consequently if a shift change is made with the hook loaded (this, by the way, is not a desireable practice and could be precluded through strict compliance with ANSI B30.2-3.2.3.j) a hoist limit switch test should not be performed. Second, there may be circumstances where the nature of forthcoming load handling operations indicates that the time (and minor risk) associated with this test is not justified. In particular if it is known that a hoist will not be used or used only in an area substantially removed from the upper travel limit, it would seem reasonable to defer the limit switch test until the start of the next shift. If such an approach is taken, however, it should be approached with care. Requirements for deferring an upper limit switch test should accomodate the uncertainty associated with maintenance plans and establish unambiguous criteria concerning what operations can be determined to be remote from upper travel limits. Such criteria should recognize that the need for upper travel limit switch protection may be preceeded by a control system failure and consequently should conservatively allow for operater response time and potential delays associated with emergency shutdown of the crane.

Approach Consistent With This Guideline

General compliance with this requirement. Certain specific provisions made for deferring upper limit switch testing under conditions that are not subject to operater interpretation.

Approaches Inconsistent With This Guideline

An approach that implies that a decision to test or not is left to the discretion of the operator or implies that such a test will be required only if operations are planned in close proximity to the hook upper travel limit.

GUIDELINE 7 CRANE DESIGN

Exception

Occasionally a licensee has indicated that the overhead electric travelling cranes employed at a site were purchased prior to the publication of CMAA-70 or ANSI B30.2-1976 and thus these standards should not be applied.

Discussion

The purpose of this Guideline is to ensure that all cranes carrying heavy loads in nuclear power plants meet certain minimum criteria in their design and, consequently, can be assumed to provide an acceptable standard of mechanical, electrical, and structural reliability. It is also recognized, however, that cranes in operating plants may have been designed and procured prior to the publication of current standards and, thus, not strictly comply with some details of these standards. In general, though, current standards have evolved from predecesor standards in existence at the time of crane procurement (EOCI 61, ANSI B30.2-1967) and, since the later standards are not revolutionary, it is likely that cranes at nuclear power plants will provide a degree of reliability equivalent to that provided by the current standards. Such a general determination canot be made, however, by the staff since nuclear power plant cranes are usually unique and provided with site specific design features. It is up to the licensee then to make a systematic comparison of their crane design with the requirements of current standards and determine if additional design features are appropriate.

Approach Consistent With This Guideline

The licensee has compared original crane procurement specifications or existing crane designs with the requirements of the referenced standards in areas effecting load handling reliability. In instances where the current standard provides additional protection against the consequences of operater error or component failure the licensee has proposed modifications which will result in a degree of load handling reliability similar to that provided in the current standard.

Approach Inconsistent With This Guideline

Positions to the effect that the cranes satisfied standards in existence at the time of procurement and what was good enough then is good enough now.

ENCLOSURE 2

Cooper
Crystal River 3
D. C. Cook 1 & 2
Dresden 2 & 3
Ft. Calhoun
Haddam Neck
Maine Yankee
Monticello
Palisades
North Anna 1 & 2
Rancho Seco
Surry 1 & 2
Trojan
Turkey Point 3 & 4
Vermont Yankee
McGuire 1 & 2
Zion 1 & 2
Duane Arnold