TECHNICAL EVALUATION REPORT

CONTROL OF HEAVY LOADS (C-10)

TOLEDO EDISON COMPANY

DAVIS-BESSE NUCLEAR POWER STATION UNIT 1

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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. C. Bomberger 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 Toledo Edison Company's Davis-Besse Nuclear Power Station Unit 1. This evaluation was performed with the following objectives:

- o 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
- o 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 provided to control the handling 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 part 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 so that their

probability of failure is uniformly small and appropriate for the critical tasks in which they are employed. The second part 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 to ensure that all load handling systems are designed and operated so that their probability of failure is 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 Toledo Edison, the Licensee for Davis-Besse Nuclear Power Station, requesting that the Licensee review provisions for handling and control of heavy loads at Davis-Besse Unit 1, 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. Toledo Edison responded to this

request on February 1, 1982 [4]. A draft technical evaluation report (TER) was prepared based on this information and was informally transmitted to the Licensee for review and comment. On November 15, 1982, a telephone conference call was conducted with representatives of NRC, FRC, and Toledo Edison to discuss unresolved issues. As a result of this call, additional information was submitted by the Licensee on January 31, 1983 [5], May 2, 1983 [6], May 6, 1983 [7], December 16, 1983 [8], and July 23, 1984 [9]. This TER is based on information provided in References 4 through 9.

2. EVALUATION AND RECOMMENDATIONS

This section presents a point-by-point evaluation of load handling provisions at Davis-Besse Nuclear Power Station Unit 1 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 followed in order to provide a 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 procedures used 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. The Licensee's assessment of the extent to which these guidelines have been satisfied and an independent evaluation of this assessment are contained in Sections 2.1.1 through 2.1.8 of this report.

Table 2.1 Davis-Besse Unit 1/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. Polar Crane	180(25)	--	--	C	--	--	C	C	--	C
Reactor Plenum Assembly	59.9	C	C	--	C	--	--	--	--	C
Reactor Vessel Head (RVH)	165	C	C	--	C	--	--	--	--	C
Internals Indexing Fixture	15.6	C	C	--	C	--	--	--	--	C
Plenum Assembly Lifting Rig	9.3	C	C	--	C	--	--	--	--	C
Automatic Reactor Inspection Device	16	C	C	--	--	C	--	--	--	C
I-Beam D-Ring Grating Supports	6	C	C	--	--	C	--	--	--	C
D-Ring Grating Sections	--	C	C	--	--	C	--	--	--	C
Steam Generator Removable Supports	7	C	C	--	--	C	--	--	--	C
Reactor Missile Shields	47.3	C	C	--	C	--	--	--	--	C

C = Licensee action complies with the NUREG-0612 Guideline.
-- = Not applicable.

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
Polar Crane Load Block	5.6	C	C	--	--	C	--	--	--	C
Steel Working Platform	2.4	C	C	--	--	C	--	--	--	C
20" S/G Snubbers	3.5	C	C	--	--	C	--	--	--	C
Irradiated Specimen Cask	3	C	C	--	--	C	--	--	--	C
Letdown Coolers	3.5	C	C	--	--	C	--	--	--	C
Equipment Hatch Covers	5-16	C	C	--	--	C	--	--	--	C
CPT Hatch Covers	4	C	C	--	--	C	--	--	--	C
Motor Removal Hatches	2.5	C	C	--	--	C	--	--	--	C
Plenum Assembly Stand	3	C	C	--	--	C	--	--	--	C
Core Support Barrel Stand	3.3	C	C	--	--	C	--	--	--	C
RVH Lifting Rig	6	C	C	--	--	C	--	--	--	C
RCP Rotating Element	2	C	C	--	--	C	--	--	--	C
RCP Motor	51	C	C	--	--	C	--	--	--	C
RCP	42	C	C	--	--	C	--	--	--	C
Core Support Assembly	112	C	C	--	--	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
2. Component Cooling Water Pump Monorail	3	--	--	C	--	--	C	C	--	--
CCW Pumps	2.7	C	C	--	--	C	--	--	--	--
CCW	2.4	C	C	--	--	C	--	--	--	--
3. Spent Fuel Cask Crane	140(20)	--	--	C	--	--	C	C	C	--
Pool Divider Gate	4	C	C	--	--	C	--	--	C	--
4. Intake Gantry Crane	15	--	--	C	--	--	C	C	--	--
Service Water Pump (SWP)	3.9	C	C	--	--	C	--	--	--	--
SWP Motor	4.3	C	C	--	--	C	--	--	--	--
Circ Water Makeup Pump	2.9	C	C	--	--	C	--	--	--	--
Makeup Pump Motor	1.8	C	C	--	--	C	--	--	--	--
Rooftop Hatch Covers	1.4	C	C	--	--	C	--	--	--	--
Dilution Pump	4.7	C	C	--	--	C	--	--	--	--
Dilution Pump Motor	1.5	C	C	--	--	C	--	--	--	--
Diesel Fire Pump	2.6	C	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
Diesel Fire Pump Motor	1.8	C	C	--	--	C	--	--	--	--
Screen Wash Pump	1.8	C	C	--	--	C	--	--	--	--
Screen Wash Pump Motor	0.7	C	C	--	--	C	--	--	--	--
5. Reactor Service Crane	5	--	--	C	--	--	C	C	--	--
6. Containment Equipment Jib Cranes	--	--	--	C	--	--	C	C	--	--

2.1.1 Overhead Heavy Load Handling Systems

a. Summary of Licensee Statements and Conclusions

The Licensee reviewed all overhead handling systems in use at Davis-Besse Unit 1 and identified those systems which must be addressed within the scope of NUREG-0612 on the basis that they could carry heavy loads over the core, over spent fuel, or over safety-related equipment. These handling systems are listed in Table 2.2.

Determination of those systems which have been excluded from compliance was also completed by the Licensee. Identification of excluded systems as well as the reasons for exclusion are provided in Table 2.3.

b. Evaluation and Conclusion

The Licensee's evaluation of overhead handling systems and the determination of those systems which must comply with NUREG-0612 is consistent with the intent of NUREG-0612. Exclusion of handling systems from NUREG-0612 compliance is acceptable if (1) no equipment required for safe shutdown or decay heat removal is located in close proximity; (2) the handling systems are used for sole-purpose lifts, do not carry loads over other safety-related equipment, and are used only when the respective components have been placed out of service; or (3) handling of components over safety-related equipment is performed only after the system/equipment has been placed out of service in accordance with Technical Specifications or existing administrative procedures.

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."

Table 2.2. Handling Systems Subject to NUREG-0612 Compliance

Containment polar crane/auxiliary hoist
Reactor service crane
Containment equipment jib cranes
Spent fuel shipping cask crane/auxiliary hoist
Component cooling pump monorails
Intake structure gantry crane

Table 2.3. Handling Systems Excluded from Compliance with NUREG-0612

A. Excluded on the basis that no safe shutdown equipment is located in proximity:

- o Turbine building handling systems
- o Water treatment building handling systems
- o Circulating water pump house handling systems
- o Miscellaneous auxiliary building handling systems
- o East ECCS pump room monorail
- o Startup feed pump monorail
- o Containment spray pump monorails
- o High pressure injection pump monorails
- o Letdown cooler heat exchanger monorail
- o Monorail for equipment hatch and decay heat coolers
- o Makeup pump monorails
- o Refueling canal rail removal jib crane
- o Main station exhaust fan motor monorails

B. Excluded on the basis that handling systems are sole-purpose, do not carry loads over other safety-related equipment, and are only used when the respective components have been placed out of service in accordance with plant procedures or specifications:

- o Auxiliary feed pump monorails
- o Emergency diesel generator monorails
- o Battery room monorails

C. Excluded on the basis that component handling over safety-related equipment is performed only after the plant has been safely shut down (safe shutdown components are considered to be those required to achieve and maintain hot shutdown conditions):

- o Pressurizer heater bundle monorail
- o Control rod drive maintenance jib crane

a. Summary of Licensee Statements and Conclusions

The Licensee stated that heavy load movements for the head, internals, equipment associated with the reactor, and the missile shields are made in accordance with procedures which define safe load paths for each load. For remaining miscellaneous loads, a general purpose load path has been developed which avoids the reactor cavity area. Equipment is to be moved within this load path area and is allowed to deviate for the following reasons: (1) to travel to a laydown area or to pickup equipment outside of the load path (use shortest distance) or (2) to move around equipment that is in the path and then return to the load path. In addition, the following areas have been excluded from the general load path:

- o main reactor cavity area (except as necessary for reactor maintenance, inspection, and refueling)
- o edge of the D-ring and refueling canal (to prevent loads from falling into the reactor cavity area).

Finally, each heavy load lift will be supervised by a designated individual who will be responsible for enforcing procedural requirements. Deviations from these procedures require prior approval of the plant superintendent.

b. Evaluation

Safe load paths which have been developed at Davis-Besse Unit 1 satisfy the criteria of this guideline on the basis that defined load paths exist for major loads handled within the containment and these loads paths have been incorporated into applicable procedures. In addition, use of a general load path for remaining miscellaneous loads is acceptable, based on the Licensee's information that such a load path avoids the reactor cavity area and irradiated fuel. Use of a designated individual to supervise each load movement has previously been accepted as an acceptable alternative to permanent floor markings. Lastly, deviations from approved load paths are approved in a manner consistent with that specified in this guideline.

c. Conclusion

Development of safe load paths at Davis-Besse Unit 1 has been accomplished in a manner consistent 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 identified the procedures in use or being developed for the various NUREG-0612 cranes. These procedures include the following:

Polar Crane
SP 1104.46 "Polar Crane System Procedure"
SP 1504.01 "Reactor Vessel Closure Head Removal and Replacement"
SP 1505.01 "Reactor Internals Removal and Replacement"

Component Cooling Water Pump Monorail
SP 1104.13 "Component Cooling Water Pump Monorail System Procedure"

Spent Fuel Cask Crane
SP 1104.50 "Spent Fuel Cask Crane Operating Procedure"

Intake Gantry Crane
SP 1104.53 "Intake Gantry Crane System Procedure"

The Licensee stated that all lifting procedures, including those identified above, have been updated to satisfy the requirements of Section 5.1.1(2) of NUREG-0612.

b. Evaluation

The criteria of this guideline are satisfied on the basis of the Licensee's verification that load handling procedures contain the information identified in NUREG-0612.

c. Conclusion

Procedural provisions for heavy load handling at the Davis-Besse plant are consistent with Guideline 2.

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' [10]."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that procedures for the qualification and training of crane operators are contained in Davis-Besse Administrative Directive AD 1844.06, which requires that crane operators be qualified to criteria essentially identical to the provisions of ANSI B30.2-1976, Chapter 2-3. This general directive is implemented at Davis-Besse Unit 1 by training/examining prospective operators and documenting successful qualification on specific qualification cards for each crane. Training and examination of prospective operators are performed by designated instructors.

These procedures and practices were reviewed against the provisions of ANSI B30.2-1976, Chapter 2-3. A number of minor changes were made by the Licensee to the procedures and the qualification card process to ensure that all items pertinent to operator training, qualification, and conduct were adequately addressed. No exceptions to ANSI B30.2-1976 are taken by the Licensee.

b. Evaluation

Programs implemented by the Licensee satisfy the criteria of this guideline on the basis that no exceptions are taken with Chapter 2-3 of ANSI B30.2-1976.

c. Conclusion

Provisions for crane operator training and qualification at Davis-Besse Unit 1 are consistent Guideline 3.

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' [11]. 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 identified the following special lifting devices to be used in lifts over the reactor vessel:

1. Head and internals handling fixture
2. Turnbuckle pendants and head lifting pendants
3. Internal handling adapter, pendants, and spreader ring
4. Internals indexing fixture pendants
5. Missile shield lifting harness.

In addition, no cask or lifting device has yet been selected for spent fuel equipment.

For the lifting devices identified above, a detailed comparison of ANSI N14.6-1978 was limited to Sections 3.2 and 5 for the following reasons:

a. All of the devices described above were designed by Babcock and Wilcox prior to the existence of ANSI N14.6-1978. In this regard, there are a number of sections in the standard that are difficult to apply in retrospect. These sections are those entitled Designer's Responsibilities (Section 3.1); Design Considerations (Section 3.3); Fabricator's Responsibilities (Section 4.1); Inspector's Responsibilities (Section 4.2); and Fabricator's Considerations (Section 4.3). These sections have not been reviewed item by item for the purpose of identifying and justifying exceptions.

b. Certain sections of ANSI N14.6-1978 are judged as not pertinent to the load handling reliability of the devices and have not been addressed for the purpose of identifying and justifying exceptions. These sections are Section 1.0, Scope; Section 2.0, Definitions;

Section 3.4, Design Considerations to Minimize Decontamination Effects in Special Lifting Device Use; Section 3.5, Coatings; and Section 3.6, Lubricants.

c. Section 6 of ANSI N14.6-1978 is applicable to lifting devices used for critical loads as defined in Section 2 of the standard. None of the loads lifted by the lifting devices identified above have as yet been determined to be critical loads. Such determination would require an analysis of the consequences of various load drops. Since such analyses have not yet been performed, and are not required to be performed until the 9-month report to the NRC, it is premature to designate certain loads as critical loads and, accordingly, to apply the requirements of Section 6 of ANSI N14.6-1978 to their designated lifting devices.

The detailed comparison of special lifting devices with the requirements of Sections 3.2 and 5 of ANSI N14.6-1978, as supplemented by NUREG-0612, indicates that load bearing components of these lifting devices have actual structural margins that are, in general, significantly higher and, with one exception, meet the ANSI stress design factors. All parts of the missile shield lifting harness were found to meet ANSI design criteria with the exception of two 3-inch pins (which will be replaced with higher strength material) and the 1-inch side plates (which meet yield strength criteria but have a factor of safety on ultimate of 4.83). Therefore, it is the Licensee's opinion that no modification of this device is necessary for the side plates. The Licensee further stated that these devices comply with the standards, with the following exceptions:

Exception 1: Section 5.3.7 of ANSI N14.6-1978 specifies that visual inspections by maintenance or nonoperating personnel be performed at intervals of three months or less. Since these devices are stored in a specific location under a controlled environment and are not subject to any other uses, the Licensee believes that current procedures requiring inspections (visual, dimensional, and nondestructive examination) prior to each use are sufficient to meet the intent of these standards.

Exception 2: There are several load-bearing members of special lifting devices for which inspection in accordance with Section 5.3.1(2) is impractical due to problems involved in disassembly and paint removal. The Licensee proposes to institute an annual visual inspection coupled with a more comprehensive 5-year dimensional and nondestructive examination (NDE) program for these members. The proposed inservice inspection program is based upon the Licensee opinion that these devices are:

1. used infrequently and are therefore subjected to fewer stress cycles
2. stored in a controlled environment
3. constructed of materials with ample design safety margins
4. handled in accordance with stringent operating procedures.

Further, the Licensee believes that the proposed inspection program is equivalent to the intent of ANSI N14.6 and provides sufficient inspection and examination to identify wear or degradation that could potentially reduce design safety margins.

b. Evaluation

It is acknowledged that a strict interpretation of compliance of existing special lifting devices with the criteria of ANSI N14.6-1978 cannot be made. Therefore, the Licensee's response is consistent with the intent of this guideline in addressing only those sections (3.2 and 5) directly related to the load handling reliability of the lifting devices. It is noted from the Licensee's response that the devices comply with the design safety margins of 3 on yield strength and 5 on ultimate strength for the four lifting devices reviewed. Evaluations of the special lifting devices identified satisfy the requirements of this guideline for these sections based on the Licensee's statement that the lifting devices comply with the standards, with the exceptions noted. It is also agreed that desgin margins of the missile shield lifting harness substantially satisfy ANSI criteria and additional modification (beyond pin replacement) is not required.

For those exceptions noted by the Licensee, proposed actions for Exception 1 (periodic inspections by maintenance or nonoperating personnel) are consistent with this guideline and with NUREG-0612 guidance for inspection of cranes (Guideline 6). In addition, the Licensee's intent to perform an annual visual inspection of special lifting devices to ensure continuing compliance, coupled with comprehensive dimensional and NDE every 5 years, should provide lifting devices with continued reliability consistent with the requirements of this guideline.

c. Conclusion and Recommendations

Design of special lifting devices at Davis-Besse Unit 1 and programs implemented to ensure their continued reliability satisfy 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' [12]. 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 stated that, with the exception of the spent fuel shipping cask, other loads identified by the Licensee are lifted with slings which are selected, inspected, and maintained in accordance with ANSI B30.9-1971. An analysis has been performed which demonstrates that dynamic loading on slings is within the variance of 1% to 8% of the static loads handled this dynamic load effect is insignificant and may be disregarded.

b. Evaluation

Procedures for use of slings at Davis-Besse Unit 1 satisfy the recommendations of this guideline on the basis that they comply with ANSI B30.9-1971. Dynamic loads are a reasonably small percentage of the overall static loads and may be disregarded in rating the slings.

c. Conclusion and Recommendations

Selection and use of slings at Davis-Besse Unit 1 is consistent with Guideline 5.

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

Davis-Besse preventive maintenance and surveillance test programs provide for crane inspection, testing, and maintenance. The preventive maintenance program outlines a schedule of preventive maintenance per Administrative Directives AD 1844.00, Maintenance, and AD 1844.01, Preventive Maintenance. Periodic Test Procedure PT-5199.02, Station Crane Periodic Test, provides for station crane surveillance. Administrative Directive 1844.04 specifies crane lubrication guidelines. Crane lubrication data are kept in the plant lubrication manual.

These procedures and practices were reviewed against the provisions of ANSI B30.2-1976, Chapter 2-2. Where areas of noncompliance with the standard were identified, revisions to procedures were developed. No exceptions to ANSI B30.2-1976 are taken.

b. Evaluation and Conclusion

Davis-Besse Unit 1 satisfies the requirements of this guideline on the basis that existing procedures have been reviewed and revised to comply with ANSI B30.2-1976, with no exceptions.

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' [13]. 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

Specifications for cranes subject to NUREG-0612 compliance have been compared to CMAA-70 and to the additional safety requirements of ANSI B30.2-1976.

Each of these cranes--the containment polar crane, the reactor service crane, the spent fuel shipping cask crane, and the intake structure gantry crane--was designed in accordance with Bechtel design specifications. These specifications required that each crane be designed in accordance with the minimum requirements for Class A cranes, except as the requirements are extended by the Bechtel specification, in which case the more stringent restriction governed. The Licensee noted that the Bechtel specification predates the 1975 revision to CMAA-70. As a result of the above comparison, the Licensee stated that all four cranes have been found to comply with CMAA-70 and ANSI B30.2-1976, with two exceptions:

1. The Bechtel specifications place no additional requirements on welding other than the requirement of CMAA-70, which in turn references AWS D14.1 for welding. ANSI B30.2-1976 requires welding to be in accordance with AWS D1.1 as modified by AWS D14.1. With the exception of requirements for storage of low hydrogen welding rods included in AWS D1.1, there are no significant differences between AWS D1.1 and AWS D14.1 that would affect load handling reliability. Licensee review revealed that the manufacturer's shop practices provided for control of low hydrogen rods even though AWS D1.1 was not specifically used. Therefore, the welding requirements in effect were equivalent to the requirements of ANSI B30.2.

2. In regard to the tolerance on crane runway dimensions, CMAA-70 specifies that center-to-center distances on runway rails be within $\pm$1/8 inch. For the polar crane, the equivalent center-to-center distance is the diameter of the circular track. The plant designer (Bechtel) and the polar crane manufacturer (Harnischfeger) have used a tolerance of $\pm$1/2 inch. It is the Licensee's judgment that this deviation from the standard is not significant to load handling reliability in view of the fact that both Bechtel and Harnischfeger worked to the same dimensions.

b. Evaluation

Cranes at Davis-Besse Unit 1 satisfy the requirements of this guideline on the basis that they were designed and built to specifications which meet or exceed the criteria of CMAA-70 and ANSI B30.2-1976. The Licensee responses regarding exceptions indicate that (1) welding procedures used are equivalent to ANSI B30.2-1976 and meet the intent of this guideline and (2) deviation from the crane center-to-center runway tolerances is not significant to load handling reliability.

c. Conclusion

Design of cranes at Davis-Besse Unit 1 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. Evaluation

A review of technical specifications at Davis-Besse Unit 1 indicates that Technical Specification 3.9.7 prohibits movement of loads greater than 2430 lb over spent fuel assemblies in the spent fuel pool area.

b. Conclusion

Davis-Besse Unit 1 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

Toledo Edison has performed the special reviews for the Interim Protection Measure 6 of NUREG-0612.

b. Evaluation and Conclusion

The Davis-Besse plant complies with Interim Protection Measure 6 based on the Licensee's verification. In light of the responses to Guidelines 2 and 3, it is apparent that procedures for handling loads over the core and for operator training have been reviewed and upgraded as appropriate. In addition, design of cranes and programs for selection and use of slings have been reviewed and found to comply with NUREG-0612.

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 Davis-Besse Nuclear Power Station Unit 1. 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 Davis-Besse Nuclear Power Station Unit 1 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 certain measures (NUREG-0612, Section 5.3) that 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. The evaluation of information provided by the Licensee indicates that the Davis-Besse plant complies with the staff's measures for interim protection.

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