

TECHNICAL EVALUATION REPORT

CONTROL OF HEAVY LOADS (C-10)

FLORIDA POWER & LIGHT COMPANY

TURKEY POINT UNITS 3 AND 4

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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. I. H. Sargent and Mr. C. Bomberger 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 the an independent review of general load handling policy and procedures at the Florida Power and Light Company's Turkey Point Units 3 and 4. 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 U.S. Nuclear Regulatory Commission (NRC) staff to systematically examine staff licensing criteria and the adequacy of measures in effect at operating nuclear power plants to assure 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 so 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 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 assure 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 Florida Power and Light Company (FPL), the Licensee for the Turkey Point Units 3 and 4, requesting that the Licensee review provisions for the handling and control of heavy loads at the Turkey Point plant, 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. On September 4, 1981, FPL provided its response [4] to this request. Additional information was provided in a submittal on November 12, 1981 [5]. In response to a telephone conference call involving FPL, the NRC, and the reviewer on February 12, 1982, the Licensee provided subsequent responses on August 10, 1982 [6], March 15, 1983 [7], and August 15, 1983 [8]. This final TER is based on information provided in these references.

2. EVALUATION AND RECOMMENDATIONS

This section presents a point-by-point evaluation of load handling provisions at the Turkey Point plant 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 to provide the defense-in-depth appropriate for the safe handling of heavy loads. They are identified under the following topics in Section 5.1.1 of NUREG-0612:

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

These seven guidelines should be satisfied by all overhead handling systems and programs 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.

2.1.1 Overhead Heavy Load Handling Systems

a. Summary of Licensee Statements and Conclusions

The Licensee conducted a review of all overhead handling systems at the Turkey Point plant to determine which overhead handling systems are subject to

Table 2.1 Turkey Point Units 3 and 4/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 Polar Crane Units 3 & 4	135/15	--	--	C	--	--	C	C	--	C
Reactor Missile 60 Shields		R	C	--	--	C	--	--	--	C
Pressurizer Missile Shields	25.6	R	C	--	--	C	--	--	--	C
Polar Crane Load Block	6	R	C	--	--	--	--	--	--	C
Reactor Vessel Head	57.5	R	C	--	R	--	--	--	--	C
Upper Internals	42	R	C	--	R	--	--	--	--	C
2. Fuel Cask Crane	105/15	--	--	C	--	--	C	C	R	--
Spent Fuel Shipping Cask	25	R	C	--	--	--	--	--	R	--
Fuel Cask Crane Load Block	4.8	R	C	--	--	--	--	--	R	--
3. Fuel Pool Bulkhead Monorail	3	--	--	C	--	--	C	C	R	--
Fuel Pool Bulkhead	1.5	--	C	--	--	C	--	--	R	--

C = Licensee action complies with NUREG-0612 Guideline.

-- = Not applicable.

R = Licensee has proposed modifications or revisions which, when implemented, will comply with NUREG-0612.

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
4. Turbine Gantry Cranes, Units 3 & 4	145/35	R	C	C	--	C	C	C	--	--
5. Intake Structure Gantry Crane	25	R	C	C	--	C	C	C	--	--
6. Charging Pump Monorails	5	--	C	C	--	C	C	C	--	--
7. Safety Injection Pump Monorail	5	--	C	C	--	C	C	C	--	--
8. Main Steam Platform Monorail	1	--	C	C	--	C	C	C	--	--

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this review. The Licensee identified the following overhead handling systems as those from which a load drop could result in damage to plant safe shutdown or decay heat removal systems, taking no credit for interlocks, technical specifications, operating procedures, detailed structural analysis, or system redundancy:

- o charging pump monorails
- o safety injection pump monorails
- o main steam platform monorails
- o turbine gantry cranes
- o reactor polar cranes
- o fuel pool bulkhead monorail
- o spent fuel cask crane
- o intake structure bridge crane.

The Licensee excluded the following load handling devices from NUREG-0612 compliance because the devices are used during refueling operations and do not handle loads weighing more than one spent fuel assembly with a handling tool:

- o reactor cavity manipulator crane
- o fuel transfer machine
- o spent fuel bridge crane.

The Licensee also provided a tabulation of load handling systems for which they have determined by inspection that there is sufficient physical separation between any load impact point and any safety-related component.

b. Evaluation and Conclusion

The Licensee's conclusions concerning those load handling devices subject to the general guidelines of NUREG-0612 are consistent with the NRC objectives of improving load handling safety and reliability.

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 states that individual safe load paths will be developed for major loads which are routinely carried along the same route each time they are moved. These paths will be indicated on the load path sketches for use by the crane operators. For other loads that do not use the same route each time, it is the Licensee's opinion that the engineering review, which determined the exclusionary load paths, provides assurance that required safe shutdown and decay heat removal equipment will not be affected by an incident associated with the movement of heavy loads. An example of this exception would be for reactor coolant pump motors, which are moved to open areas in the containment for maintenance. Because they could be taken to several different locations depending on other scheduled work, it would be confusing and impractical to try to establish a certain single load path for these loads. The exclusion areas sketches will protect the necessary equipment during the movement of these loads.

Turkey Point procedures require the use of a signalman to direct the crane operator. The procedures will be reviewed to ensure that the signalman's responsibilities are clearly delineated.

Plant Maintenance Procedure 0736, "Heavy Load Handling," requires written alternatives for deviations from the safe load paths which are approved by the Maintenance Superintendent. The Plant Nuclear Safety Review Committee (PNSC) approved this procedure and has delegated this authority to the Maintenance Superintendent. The Maintenance Superintendent is a member of the PNSC and is responsible for all maintenance activities at the nuclear power plant. It is FPL's judgment that the individual filling this senior maintenance position

can determine when a safe load path variation requires full review by the PNSC, and as a member of that group he would bring the situation to the attention of that group.

b. Evaluation

The Licensee's commitment to develop individual load paths for major loads is consistent with the criteria of Guideline 1. Further, it is agreed that individual load paths need not be developed for lifts that are infrequently performed or for minor lifts. The Licensee's proposed action of observing exclusion areas developed on the basis of engineering review when carrying these limited loads is a reasonable alternative.

Use of a signalman whose duties are clearly defined in procedures will provide a suitable visual aid to the crane operator to ensure that load paths are properly followed.

The handling of load path deviations meets the intent of Guideline 1 because the authority to approve deviations is vested in a designated member of the plant safety review committee.

c. Conclusion and Recommendations

When implemented, safe load paths at Turkey Point Units 3 and 4 will have been developed 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 has stated that Plant Maintenance Procedure 0736, "Heavy Load Handling," governs overall load handling operations in the plant.

Special procedures have been prepared for those loads which are handled periodically over the reactor vessel. These procedures identify the required equipment; the inspection and acceptance criteria required before movement of the load; the steps and proper sequence to be followed in handling the load; and the load path and any special precautions. These special procedures include:

- o reactor missile shields
- o reactor vessel head
- o upper internals
- o spent fuel shipping casks
- o pressurizer missile shields.

b. Evaluation

Load handling procedures used at Turkey Point Units 3 and 4 meet the intent of Section 5.1.1(2) of NUREG-0612. Specific procedures have been developed for the major loads, and a generic procedure covers the remaining load handling events. Further, the Licensee's statements indicate that the procedures contain the information identified in Section 5.1.1(2) of NUREG-0612.

c. Conclusion

Procedures in use at Turkey Point Units 3 and 4 are in accordance with the criteria of 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 a training program in accordance with ANSI B30.2-1976 has been developed and that the company physical for new employees

meets or exceeds the physical requirements of the ANSI standard. The following exceptions to the ANSI standard have been taken:

1. Eye test of 20/40 in both eyes for new employees will be required.
2. The crane deadman switch, instead of the mainline disconnect, will be used to secure power because of the power requirements of the crane motor heaters.
3. Only those controls necessary for crane operation will be tested before beginning a new shift.
4. At shift change, the upper limit device will be tested under no load unless a load is hanging from the hook at shift change or unless no crane operation in the area of the upper limit is anticipated. Turkey Point procedures will be revised to provide the specific criteria to be used by supervisors to determine whether a pre-shift upper limit switch test is required.
5. Safety during maintenance work on cranes will be in accordance with the plant clearance procedures.

b. Evaluation

Turkey Point Units 3 and 4 substantially comply with Section 5.1.1(3) of NUREG-0612 since a program has been developed which is generally consistent with ANSI B30.2-1976, Chapter 2-3. The exceptions in eye testing, crane power disconnecting, controls testing, safety during maintenance, and upper limit switch testing are not considered to result in a substantial deviation from the intent of NUREG-0612. The eye testing and safety during maintenance requirements of ANSI B30.2 are intended to provide a baseline for all operators which is satisfied by FP&L program requirements. Further, disconnecting power at the deadman switch so that main power will still be available to the motor heaters while crane motion is secured is an acceptable alternative. Shift testing of only those crane controls necessary for crane operation is satisfactory with the understanding that testing is monitored to ensure proper implementation. Similarly, it is apparent that upper limit switch testing is inappropriate with an attached load or when lifts at the lower extreme of hook travel are planned. Licensee-proposed procedure revisions which identify when upper limit switch testing is necessary are consistent with this requirement.

c. Conclusion and Recommendations

Crane operator qualification and training at Turkey Point Units 3 and 4 is performed in a manner consistent with that prescribed by 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' [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 in lieu of the guideline in Section 3.2.1.1 of ANSI N14.6 which bases the stress design factor on only the weight (static load) of the load and of the intervening components of the special handling device."

a. Summary of Licensee Statements and Conclusions

The Licensee identified the following lifting devices to be subject to compliance with this guideline:

- o reactor vessel head lift rig
- o internals lift rig
- o load cell and load cell linkage
- o reactor coolant pump motor lift sling.

The design criteria for these devices are unknown by the Licensee because stress reports and design specifications were not documented when the devices were fabricated. However, the quality of these devices can be somewhat determined from the vendor (Westinghouse), who defined design, fabrication, and quality assurance requirements on detailed manufacturer's drawings and purchase order documents, in addition to issuing field assembly and operating instructions.

A detailed comparison has been performed by the Licensee between these devices and the criteria of ANSI N14.6-1978. A critical items list and a stress analysis has been prepared for each device. Details of material

specification and surface inspections have been reviewed and details of nondestructive examination (NDE) performed on critical welds are available from the vendor.

Stress analysis of the lifting devices indicates that, with one exception (the internals lift rig engaging screw), all tensile and shear stresses meet the design criteria of ANSI N14.6-1978, Section 3.2.1.1. The exception noted is not expected to be of consequence since the load of concern (the upper internals) is less than half the weight for which this device was designed (lower internals), and the resultant stresses are therefore well above the ANSI requirement.

Therefore, regarding design, fabrication, and quality control, it is the Licensee's conclusion that these devices are generally in agreement with the ANSI N14.6-1978 requirements.

The Licensee also notes that these lifting devices are not in strict compliance with ANSI requirements for acceptance testing, maintenance, and verification of continuing compliance. The following are summaries of the Licensee's response and proposed recommendations for those items noted to be in noncompliance:

1. Operating procedures should be reviewed to verify that the procedures contain appropriate consideration of ANSI N14.6-1978, Sections 5.1.3 through 5.1.8. These sections contain requirements for scheduled periodic testing, marking, repair, testing, and use.
2. The head lift rig was initially load tested and inspected at assembly to approximately 100 percent of the rated load. The internals lift rig and reactor coolant pump motor lift sling were not required to be load tested.
3. For periodic testing, the Licensee states that since a 150 percent load test is very impractical to perform, the recommended approach is to perform a minimum of NDE. This NDE will primarily consist of a visual inspection of each device and its welds prior to use, and a visual inspection while holding the load slightly above the supports for 10 minutes. NDE will not be performed annually because:
 - o access to the welds for surface examination is difficult (i.e., rigs are in containment, contamination on rigs)

- o all tensile and shear stresses in the welds are well within the allowable stress
- o items that are welded remain assembled and cannot be misused
- o performance of NDE would require removal of contaminated paint, repainting, and cleanup of contaminated areas.

It is recommended that periodic NDE of critical welds and parts be performed once every ten years as part of the inservice inspection outage.

b. Evaluation

Although it cannot be determined that the specific requirements of ANSI N14.6-1978 for component design and fabrication have been satisfied for these devices, it is evident from available Licensee documentation that these devices were designed and fabricated in a manner that provides load handling reliability consistent with that of the ANSI standard.

Although not currently in compliance with criteria for assuring continuing compliance, recommended actions by the Licensee are consistent with the intent of ANSI N14.6-1978 based upon load tests to 100% of the load of concern, relatively simple designs of the devices, and fabrication records of all critical welds. In addition, a lift of the lower internals constitutes a 150% load test of the internals lift rig for the heavy load of concern (upper internals). Deferral of surface NDE of critical welds to periods which coincide with the inservice inspection interval is also consistent based upon the limited and controlled usage of these devices.

c. Conclusion and Recommendations

The design, testing, and continued use of special lifting devices at Turkey Point Units 3 and 4 will provide a degree of load handling reliability consistent with Guideline 4 when the proposed Licensee actions have been implemented.

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' which 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 the program for sling use and maintenance at Turkey Point Units 3 and 4 meets the requirements of ANSI B30.9. Sling selection is not based on dynamic loading, and it is presumed that sufficient margin is present from the 5:1 safety factor. In any event, the hoisting speeds at the Turkey Point plant are relatively slow and any contribution from a dynamic effect would be insignificant. Further, the rated capacity is marked on the slings. These slings are inspected yearly by an outside contractor, and worn slings are replaced.

b. Evaluation

The program for sling selection and maintenance at Turkey Point Units 3 and 4 meets the intent of Section 5.1.1(5) of NUREG-0612 based on the Licensee's confirmation of compliance with ANSI B30.9-1971.

c. Conclusion

Installation and use of slings at Turkey Point Units 3 and 4 is performed in a manner 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

where 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, test, and maintenance should be performed prior to their use)."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that the Turkey Point crane inspection, testing, and maintenance program complies with the requirements of ANSI B30.2-1976 with the exception that tests and inspections are performed prior to use where it is not practical to meet the frequencies of ANSI B30.2 for periodic inspection and test or where the frequency of crane use is less than the specified inspection and test frequency.

b. Evaluation and Conclusion

Crane inspection, testing, and maintenance at Turkey Point Units 3 and 4 is performed in accordance with Guideline 6 of NUREG-0612 based on the Licensee's confirmation of compliance with ANSI B30.2-1976 with the exceptions allowed in Section 5.1.1(6) of NUREG-0612.

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 Traveling 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 following cranes are considered by the Licensee to fall within the scope of Guideline 7:

- o reactor building polar crane
- o fuel cask crane
- o intake structure crane
- o turbine gantry crane.

These cranes were originally designed to the Electric Overhead Crane Institute Specification 61 (EOCI-61) and the applicable ANSI safety standards in effect at the time of manufacture. The Licensee has also performed an evaluation of existing crane design with the more restrictive criteria of CMAA-70. Based upon information received from the crane manufacturer, the Licensee states that Units 3 and 4 cranes comply with CMAA-70 criteria for the following items:

- | | |
|----------------------------------|---------------------------|
| o impact allowance | o drum design |
| o torsional forces | o bridge brake design |
| o allowable compressive stresses | o hoist brake design |
| o fatigue considerations | o static control systems |
| o hoist rope requirements | o longitudinal stiffeners |
| o bumpers and stops | o gear design |
| o restart protection | |

b. Evaluation

Cranes at the Turkey Point plant satisfy, to a considerable extent, the criteria of Guideline 7, since the cranes were procured to accepted industrial standards at the time of manufacture. In addition, FPL has addressed the more restrictive design requirements imposed by CMAA-70 which could affect the crane's ability to handle a heavy load safely. All cranes now comply with or will be modified to comply with CMAA-70 in accordance with the Licensee's independent determination.

c. Conclusion

Design of cranes at Turkey Point Units 3 and 4 is consistent with the criteria of NUREG-0612, 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 is 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 Pool 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."

a. Summary of Licensee Statements and Conclusions

The Licensee will submit a technical specification to prohibit movement of heavy loads over irradiated fuel in the spent fuel pool.

b. Evaluation and Conclusion

Turkey Point Units 3 and 4 will comply with Interim Protection Measure 1 when the new technical specification has been implemented.

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. Summary of Licensee Statements and Conclusions

Summaries of Licensee statements and conclusions are contained in discussions of the respective general guidelines in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7.

b. Evaluations, Conclusions, and Recommendations

The evaluations, conclusions, and recommendations are contained in discussions of the respective general guidelines in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7.

2.2.3 Special Reviews for Heavy Loads 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 operations, and content of procedures."

a. Summary of Licensee Statements and Conclusions

The Licensee has stated that a review of procedures, equipment, and personnel used in load handling operations over the core has been conducted,

and that these operations have been addressed in their Administrative Procedure 0736, "Heavy Load Handling."

b. Evaluation and Conclusion

Turkey Point Units 3 and 4 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 Turkey Point Units 3 and 4. 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 Turkey Point Units 3 and 4 can be expected to be conducted in a reliable manner generally consistent with the staff's objectives as expressed in these guidelines.

3.2 INTERIM PROTECTION

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. Evaluation of information provided by the Licensee indicates that the Licensee complies with the staff's measures for interim protection.

4. REFERENCES

1. NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants"
NRC, July 1980
2. V. Stello, Jr. (NRC)
Letter to all Licensees
Subject: Request for Additional Information on Control of Heavy Loads
Near Spent Fuel
NRC, May 17, 1978
3. NRC
Letter to FPL
Subject: Request for Review of Heavy Load Handling at St. Lucie Unit 1
December 22, 1980
4. R. E. Uhrig (FPL)
Letter to D. G. Eisenhower (NRC)
Subject: Interim Actions for Control of Heavy Loads
September 4, 1981
5. R. E. Uhrig (FPL)
Letter to D. G. Eisenhower (NRC)
Subject: Control of Heavy Loads
November 12, 1981
6. R. E. Uhrig (FPL)
Letter to S. A. Varga (NRC)
Subject: Control of Heavy Loads, Draft Technical Evaluation Report
August 10, 1982
7. R. E. Uhrig (FPL)
Letter to S. Varga (NRC)
Subject: Control of Heavy Loads
March 15, 1983
8. R. E. Uhrig (FPL)
Letter to S. Varga (NRC)
Subject: Control of Heavy Loads
August 15, 1983
9. ANSI B30.2-1976
"Overhead and Gantry Cranes"
10. ANSI N14.6-1978
"Standard for Special Lifting Devices for Shipping Containers Weighing
10,000 Pounds (4500 kg) or More for Nuclear Materials"

11. ANSI B30.9-1971
"Slings"
12. CMAA-70
"Specifications for Electric Overhead Traveling Cranes"