CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS
FORT ST. VRAIN NUCLEAR GENERATING STATION

Docket No. 50-267

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ABSTRACT

The Nuclear Regulatory Commission (NRC) has requested that all nuclear plants either operating or under construction submit a response of compliancy with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." EG&G Idaho, Inc. has contracted with the NRC to evaluate these responses. This report contains EG&G's evaluation and recommendations for Fort St. Vrain Nuclear Generating Station (FSVNGS).

EXECUTIVE SUMMARY

FSVNGS does not totally comply with the guidelines of NUREG-0612. In general, compliance is insufficient in the following areas:

- FSVNGS is not in compliance with Guidelines 1, 4, 5, and 7.
- FSVNGS will be in compliance with Guideline 2 when the action described in 2.3.2C is completed.

The main report contains recommendations which will aid in bringing the above items into compliance with the appropriate guidelines.

TECHNICAL EVALUATION REPORT
FOR
FORT ST. VRAIN NUCLEAR GENERATING STATION

1. INTRODUCTION

1.1 Purpose of Review

This technical evaluation report documents the EG&G Idaho, Inc. review of general load handling policy and procedures at Fort St. Vrain Nuclear Generating Station (FSVNGS). This evaluation was performed with the objective of assessing conformance to the general load handling guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" [1], Section 5.1.1.

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 to 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-phase

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, Article 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, Articles 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.

The approach used to develop the staff guidelines for minimizing the potential for a load drop was based on defense in depth and is summarized as follows:

- provide sufficient operator training, handling system design, load handling instructions, and equipment inspection to assure reliable operation of the handling system

- define safe load travel paths through procedures and operator training so that, to the extent practical, heavy loads are not carried over or near irradiated fuel or safe shutdown equipment

- provide mechanical stops or electrical interlocks to prevent movement of heavy loads over irradiated fuel or in proximity to equipment associated with redundant shutdown paths.

Staff guidelines resulting from the foregoing are tabulated in Section 5 of NUREG-0612.

1.3 Plant-Specific Background

On December 22, 1980, the NRC issued a letter [3] to the Public Service Company of Colorado (PSC), the Licensee for FSVNGS, requesting that the Licensee review provisions for handling and control of heavy loads at FSVNGS, 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 16, 1981, PSC provided the initial response [4] to this request.

2. EVALUATION AND RECOMMENDATIONS

2.1 Overview

The following sections summarize PSC's review of heavy load handling at FSVNGS accompanied by EG&G's evaluation, conclusions and recommendations to the Licensee for bringing the facilities more completely into compliance with the intent of NUREG-0612. The Licensee has not indicated the weight of a heavy load for this facility (as defined in NUREG-0612, Article 1.2). The submittal can be interpreted to say that the "Heavy Load" is 165.5 tons.

2.2 Heavy Load Overhead Handling Systems

This section reviews the Licensee's list of overhead handling systems which are subject to the criteria of NUREG-0612 and a review of the justification for excluding overhead handling systems from the above mentioned list.

2.2.1 Scope

"Report the results of your review of plant arrangements to identify all overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal (taking no credit for any interlocks, technical specifications, operating procedures, or detailed structural analysis) and justify the exclusion of any overhead handling system from your list by verifying that there is sufficient physical separation from any load-impact point and any safety-related component to permit a determination by inspection that no heavy load drop can result in damage to any system or component required for plant shutdown or decay heat removal."

A. Summary of Licensee Statements

"The results of the review of the plant arrangement has identified two handling systems from which a load drop may result in damage to a system required for plant shutdown. The two handling systems are the reactor building crane and the turbine building crane."

"The crane in the turbine building can be excluded from the list of potentially hazardous cranes with respect to load drops since it does not have the requirement nor the capability to carry a heavy load as defined in NUREG-0612. Loads such as parts from a turbine overhaul that have considerable weight, but not classified as a heavy load, would not be carried by the turbine building crane when the plant was operating."

B. EG&G Evaluation

The only drawing submitted was small (8-1/2 in. x 11 in.) and of such poor quality that it was almost useless.

No discussion is presented of the possibility of a release of radioactivity in excess of 25 percent of the limits of 10 CFR 100 as a result of drop on the PCRV when the plant is not operating, e.g., damage to irradiated fuel in the reactor and during transfer, or damage to gas cleanup equipment.

C. EG&G Conclusions and Recommendations

Based on the information provided, EG&G concludes that the Licensee has included all applicable hoists and cranes in their list of handling systems which must comply with the requirements of the general guidelines of NUREG-0612.

2.3 General Guidelines

This section addresses the extent to which the applicable handling systems comply with the general guidelines of NUREG-0612, Article 5.1.1. EG&G's conclusions and recommendations are provided in summaries for each guideline.

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:

A. Guideline 1--Safe Load Paths

B. Guideline 2--Load Handling Procedures

C. Guideline 3--Crane Operator Training

D. Guideline 4--Special Lifting Devices

E. Guideline 5--Lifting Devices (not specially designed)

F. Guideline 6--Cranes (Inspection, Testing, and Maintenance)

G. Guideline 7--Crane Design.

These seven guidelines should be satisfied for 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. The succeeding paragraphs address the guidelines individually.

2.3.1 Safe Load Paths [Guideline 1, NUREG-0612, Article 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

"During plant operation no loads are carried over the Prestressed Concrete Reactor Vessel (PCRV). This is the only area restricted from travel by the reactor building crane during plant operation. The restricted crane area, as well as the spent fuel storage and safety-related equipment are shown on the attached sketch. It should be noted that for Fort St. Vrain, other than the area over the PCRV there is no need to define safe load paths for the travel of the reactor building crane. The reason for this as explained in the FSAR, Section 9.2.1, is primarily because the design of the load handling system makes it virtually impossible to have a heavy load drop."

B. EG&G Evaluation

PSC has not addressed the possibility of ". . . heavy loads, if dropped, to impact irradiated fuel in the reactor vessel and . . ." (2.3.1 above). Also, the possibility of damage to the coolant cleanup system has not been addressed.

The prohibition from carrying any heavy loads over the PCRV during operations is adequate for that situation. Safe load paths for using the fuel handling machine are not addressed.

Section 9.2.1 of the FSAR (for FSVNGS) describes mechanical devices that produce a low probability of a heavy load drop. Marking of safe load paths is not addressed. Securing approval for deviation from safe load paths seems to be addressed in 2.3.2A (Technical Specifications).

C. EG&G Conclusions and Recommendations

(1) The information provided in the submittal does not show that FSVNGS is in compliance with Guideline 1.

(2) PSC should provide a written analysis of safe load paths relative to the use of the fuel handling machine near the PCRV. Also address the marking of safe load paths and methods of securing approval for departure therefrom.

2.3.2 Load Handling Procedures [Guideline 2, NUREG-0612, Article 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 3.1-1 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

"Personnel operating the reactor building crane are required by written approved procedures not to allow any movement of the crane over the PCRV at any time, except during refueling. The crane operators are required to follow PSC's

Crane Operating Procedure Manual in which these procedures of crane operation are spelled out. These procedures are reviewed each refueling with the Fuel Handling People. Administrative controls, as defined in the Technical Specifications, Section 7.4.2, would be followed to deviate from these procedures.

"As defined in the NUREG-0612, PSC has only one heavy load that is handled by the reactor building crane. The total weight of the heavy load is 165.5 tons. This is the weight of the fuel handling machine plus the weight of a fuel element. The designated lifting device is the reactor building crane. The operation of the crane when engaging the fuel handling machine is governed by PSC's Fuel Handling Procedure and by PSC's Crane Operating Procedure. These procedures contain the information required in NUREG-0612, Section 5.1.1(2)."

B. EG&G Evaluation

Sample procedures were not submitted so EG&G is not in a position to address the adequacy of the procedures. The Licensee states that the procedures cover the requirements of NUREG-0612, Section 5.1.1(2).

Section 7.4.2 of the Technical Specifications (of FSVNGS) addresses only the maintenance of records of changes made to the procedures or equipment, and records of special reactor tests and experiments. It does not relate how approvals for changes are obtained, or what level of management is required to approve the changes.

C. EG&G Conclusions and Recommendations

Based on the information supplied, EG&G concludes that FSVNGS is in compliance with Guideline 2. However, PSC should address the level of management necessary to approve changes, and have all procedures available for possible NRC audit.

2.3.3 Crane Operator Training [Guideline 3, NUREG-0612, Article 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' [5]."

A. Summary of Licensee Statements

"There are no exceptions taken to ANSI B30.2-1976 with respect to operator training, qualification, and conduct."

B. EG&G Evaluation

EG&G assumes that this statement constitutes a commitment to comply with Chapter 2-3 of ANSI B30.2-1976. There is no indication as to whether this program is in effect now or will be put in effect in the future.

C. EG&G Conclusion and Recommendations

(1) If this program is in effect now, FSVNGS is in compliance with Guideline 3.

(2) If the program is not in effect now, it should be put in effect immediately and the enforcing documentation should be kept available for possible NRC audit.

2.3.4 Special Lifting Devices [Guideline 4, NUREG-0612, Article 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' [6]. 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) or the load and of the intervening components of the special handling device."

A. Summary of Licensee Statements

"All lifting devices comply with the requirements of ANSI B30.9-1971. These requirements are contained in PSC's Crane Operating Inspection and Maintenance Procedure."

B. EG&G Evaluation

The information in 2.3.4A is the sole response relative to Guidelines 4 and 5. Guideline 4 was not addressed. The method of attaching the Fuel Handling Machine to the reactor building crane is not addressed. EG&G suggests that this might qualify as a Special Lifting Device.

C. EG&G Conclusions and Recommendations

(1) Since insufficient evidence was supplied, EG&G considers that FSVNGS is not in compliance with Guideline 4.

(2) PSC should submit a statement addressing compliance with ANSI N14.6-1978 as modified by Guideline 4.

2.3.5 Lifting Devices (Not Specially Designed) [Guideline 5, NUREG-0612, Article 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' [7]. 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

"All lifting devices comply with the requirements of ANSI B30.9-1971. These requirements are contained in PSC's Crane Operating Inspection and Maintenance Procedure."

B. EG&G Evaluation

EG&G assumes that all lifting devices which are not specially designed are in compliance with ANSI B30.9-1971. PSC has not addressed the added requirements of compliance with Guideline 5.

C. EG&G Conclusions and Recommendations

(1) FSVNGS is not in compliance with Guideline 5.

(2) PSC should [redacted] supply a written commitment to comply with Guideline 5.

2.3.6 Cranes (Inspection, Testing, and Maintenance) [Guideline 6, NUREG-0612, Article 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

"ANSI B30.2-1976 has been invoked with respect to crane inspection, testing, and maintenance. These requirements are contained in PSC's Crane Operating Inspection and Maintenance Procedure. All reactor crane operators at Fort St. Vrain are required to follow these procedures. No exceptions are taken to this standard."

B. EG&G Evaluation

PSC has made an unreserved commitment to comply with Chapter 2-2 of ANSI B30.2-1976, without the relief afforded by Guideline 6. The tense of the first sentence in 2.3.6A indicates that the program is now in effect.

C. EG&G Conclusions and Recommendations

EG&G concludes that FSVNGS is in compliance with Guideline 6.

2.3.7 Crane Design [Guideline 7, NUREG-0612, Article 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' [8]. 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

"The crane was originally specified and designed in 1967, to EOCI Spec. #61. In 1972 the crane was reanalyzed and upgraded to conform to CMAA 70 specifications."

B. EG&G Evaluation

The December 14, 1981 submittal (Phase II), Attachment 1, states that the crane was certified to be in compliance with CMAA-70 (1970) by the Whiting Corporation, the manufacturer. NOTE: Compliance with CMAA-70 is not compliance with the intent of NUREG 0554.

Compliance with Chapter 2-1 of ANSI B30.2-1976 is not addressed.

EG&G accepts the statement of compliance with CMAA-70; however, the following information is presented for PSC's information.

The Franklin Research Center (FRC) has compared the recommendations of CMAA-70 with those of EOCI-61 and has identified several areas where revisions incorporated into CMAA-70 may affect crane safety and should therefore be evaluated to determine if the intent of NUREG-0612 is met. EG&G has reviewed FRC's work and concurs with it.

(1) Impact allowance. For cranes with hoist speeds in excess of 30 feet per minute, it is possible that the impact allowance applied under EOCI-61 will be less than that required by CMAA-70. This variation is not expected to be of consequence for overhead cranes subject to this review since these cranes, in general, operate with hoist speeds below 30 feet per minute.

(2) Torsional forces. CMAA-70, Article 3.3.2.1.3 requires that twisting moments due to overhanging loads and lateral forces acting eccentric to the horizontal neutral axis of a girder be calculated on the basis of the distance between the center of gravity of the load, or force center line, and the girder shear center measured normal to the force vector. EOCI-61 states that such moments are to be calculated with reference to the girder center of gravity. For girder sections symmetrical about each principal central axis (e.g., box section or I-beam girders commonly used in cranes subject to this review), the shear center coincides with the centroid of the girder section and there is no difference between the two requirements. Such is not the case for nonsymmetrical girder sections (e.g., channels).

(3) Bending Stress. CMAA-70, Article 3.3.2.2 requires that bending stress calculations include a wind load of 5 pounds per square foot in design stress calculations based on the sum of dead and live loads. EOCI-61 requires that the design of outdoor cranes include a wind load of 10 pounds per square foot of projected area but is not specific concerning the combination of wind loads with other dead and live loads. The combination of a wind load with other design loading calculations constitutes codification of the same good engineering practice that would have been used in the cranes built to EOCI-61 specifications.

(4) Longitudinal stiffeners. CMAA-70, Article 3.3.3.1 specifies (1) the maximum allowable web depth/thickness (h/t) ratio for box girders using logitudinal stiffeners and (2) requirements concerning the location and minimum moment of inertia for such stiffeners. EOCI-61 allows the use of longitudinal stiffeners but

provides no similar guidance. Requirements of CMAA-70 represent a codification of girder design practice, and they are expected to be equivalent to design standards employed in cranes built to EOCI-61 specifications.

(5) Allowable compressive stress. CMAA-70 Article 3.3.3.1.3 identifies allowable compressive stresses to be approximately 50% of yield strength of the recommended structural material (A-36) for girders, where the ratio of the distance between web plates to the thickness of the top cover plate (b/c ratio) is less than or equal to 38. Allowable compressive stresses decrease linearly for b/c ratios in excess of 38. EOCI-61 provides a similar method for calculating allowable compressive stress except that the allowable stress decreases from approximately 50% of yield only after the b/c ratio exceeds 41. Consequently, structural members with b/c ratios in the general range of 38 to 52 designed under EOCI-61 will allow a slightly higher compressive stress than those designed under CMAA-70. This variation is not expected to be of consequence for cranes subject to this review since b/c ratios of structural members are expected to be less than 38.

(6) Fatigue considerations. CMAA-70, Article 3.3.3.1.3 provides substantial guidance with respect to fatigue failure by indicating allowable stress ranges for various structural members in joints under repeated loads. EOCI-61 does not address fatigue failure. The requirements of CMAA-70 are not expected to be of consequence for cranes subject to this review since the cranes are not generally subjected to frequent loads at or near design conditions (CMAA-70 provides allowable stress ranges for loading cycles in excess of 20,000) and are not generally subjected to stress reversal

(CMAA-70 allowable stress range is reduced to below the basic allowable stress for only a limited number of joint configurations).

(7) Hoist rope requirements. CMAA-70, Article 4.2.1 requires that the capacity load plus the bottom block divided by the number of parts of rope not exceed 20% of the published rope breaking strength. EOCI-61 requires that the rated capacity load divided by the number of parts of rope not exceed 20% of the published rope breaking strength. The effect on crane safety margins of this variation depends on the ratio of the weights of the load block and the rated load.

(8) Drum design. CMAA-70, Article 4.4.1 requires that the drum be designed to withstand combined crushing and bending loads. EOCI-61 requires only that the drum be designed to withstand maximum load bending and crushing loads with no stipulation that these loads be combined. This variation is not expected to be of consequence since the requirements of CMAA-70 represent the codification of good engineering practice which should have been incorporated in cranes built to EOCI-61 specifications although a specific requirement was not contained in EOCI-61.

(9) Drum design. CMAA-70, Article 4.4.2 provides recommended drum groove depth and pitch. EOCI-61 provides no similar guidance. The recommendations in CMAA-70 constitute a codification of good engineering practice with regard to reeving stability and reduction of rope wear and are not expected to differ substantially from practices employed in the design of cranes subject to this review and built to EOCI-61 specifications.

(10) Gear design. CMAA-70, article 4.5 requires that gearing horsepower rating be based on certain American Gear Manufacturers Association Standards and provides a method for determining allowable horsepower. EOCI-61 provides no similar guidance. The recommendations in CMAA-70 constitute a codification of good engineering practice for gear design and are not expected to differ substantially from the practices employed in the design of cranes subject to this review and built to EOCI-61 specifications.

(11) Bridge brake design. CMAA-70, Article 4.7.2.2 requires that bridge brakes, for cranes with cab control and the cab on the trolley, be rated at at least 75% of bridge motor torque. EOCI-61 requires a brake rating of 50% of bridge motor torque for similar configurations. A cab-on-trolley control arrangement is not expected for cranes subject to this review.

(12) Hoist brake design. CMAA-70, Article 4.7.4.2 requires that hoist holding brakes, when used with a method of control braking other tban mechanical, have torque ratings no less than 125% of the hoist motor torque. EOCI-61 requires a hoist holding brake torque rating of no less than 100% of the hoist motor torque without regard to the type of control brake employed. This variation is not expected to be of consequence for cranes subject to his review since mechanical load brakes were typically specified for cranes procured when EOCI-61 was the standard. The addition of a holding brake safety margin in conjunction with electric control braking is a codification of good engineering practice. Some manufacturers provide holding brakes rated at up to 150% of hoist motor torque when used with electrical control braking systems.

(13) Bumpers and stops. CMAA-70, Article 4.12 provides substantial guidance for the design and installation of bridge and trolley bumpers and stops for cranes which operate near the ends of bridge and trolley travel. Further, the guidance of CMAA-70 constitutes the codification of good engineering practice that would have been used in the design of cranes built to EOCI-61 specifications.

(14) Static control systems. CMAA-70, Article 5.4.6 provides substantial guidance for the use of static control systems. EOCI-61 provides guidance for magnetic control systems only. This variation is not expected to be of consequence because magnetic control systems were generally employed in cranes designed when EOCI-61 was in effect and the static control requirements identified in CMAA-70 constitute a codification of the same good engineering practice that would have been used in the design of static control systems in cranes built to EOCI-61 specifications.

(15) Restart protection. CMAA-70, Article 5.6.2 requires that cranes not equipped with spring return controllers or momentary contact push buttons be provided with a device that will disconnect all motors upon power failure and will not permit any motor to be restarted until the controller handle is brought to the OFF position. No similar guidance is provided in EOCI-61. This variation is not expected to be of consequence for cranes subject to this review since they are generally designed with spring-return controllers or momentary-contact push buttons.

C. EG&G Conclusions and Recommendations

(1) The reactor building crane at FSVNGS is in compliance with CMAA-70.

(2) PSC should provide an analysis of compliance with Chapter 2-1 of ANSI B30.2-1976.

(3) FSVNGS is not in compliance with Guideline 7.

2.4 Interim Protection Measures

The NRC staff has established (NUREG-0612, Article 5.3) that six 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, Article 5.1 is complete. Four of these six interim measures consist of general 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:

- Heavy load technical specifications
- 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.

2.4.1 Interim Protection Measure 1--Technical Specifications

"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

Not addressed by the Licensee.

B. EG&G Evaluation

Since Interim Protection Measure 1 is written to address fuel storage pools, it is not directly applicable to FSVNGS.

C. EG&G Conclusions and Recommendations

EG&G concludes that Interim Protection Measure 1 is not applicable to FSVNGS.

2.4.2 Interim Protection Measures 2, 3, 4, and 5--Administrative Controls

"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

Summaries of Licensee statements are contained in discussions of the respective general guidelines in Sections 2.3.1, 2.3.2, 2.3.3, and 2.3.6, respectively.

B. EG&G Evaluations, Conclusions, and Recommendations

EG&G evaluations, conclusions, and recommendations are contained in discussions of the respective general guidelines in Sections 2.3.1; 2.3.2, 2.3.3, and 2.3.6.

2.4.3 Interim Protection Measure 6--Special Review for Heavy Loads Over the Core

"Special attention should be given to procedures, equipment, and personnel for the handling of heavy loads over the core, such as vessel internals for 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

Not addressed by the Licensee.

B. EG&G Evaluation

No evaluation possible.

C. EG&G Conclusion

PSC should address Interim Measure 6 and discuss measures to be taken until FSVNGS is brought into compliance with the seven guidelines of NUREG-0612.

3. CONCLUDING SUMMARY

3.1 Applicable Load Handling Systems

Based on the information supplied, EG&G concludes that the list of cranes and hoists provided by the Licensee as being subject to the provisions of NUREG-0612 is adequate (see Section 2.2.1).

3.2 Guideline Recommendations

Compliance with the seven NRC guidelines for heavy load handling (Section 2.3) are partially satisfied at FSVNGS. This conclusion is represented in tabular form as Table 3.1. Specific recommendations to aid in compliance with the intent of these guidelines are provided as follows:

Guideline	Recommendation
1. (Section 2.3.1)	a. Provide a written analysis of safe load paths relative to the use of the fuel handling machine near the PCRV. b. Address the marking of safe load paths and methods of securing approval for departure therefrom.
2. (Section 2.3.2)	a. Address the level of management necessary to approve changes. b. Have procedures available for possible NRC audit.
3. (Section 2.3.3)	a. Enforcing documentation should be kept available for possible NRC audit.
4. (Section 2.3.4)	a. Submit a statement addressing compliance with ANSI N14.6-1978, as modified by Guideline 4.

Guideline	Recommendation
5. (Section 2.3.5)	
	a. Supply a written commitment to comply with Guideline 5.
6. (Section 2.3.6)	
	a. FSVNGS is in compliance with Guideline 6.
7. (Section 2.3.7)	
	a. Provide an analysis of compliance with Chapter 2-1 of ANSI B30.2-1976.

3.3 Interim Protection

EG&G's evaluation of information provided by the Licensee indicates that the following actions are necessary to ensure that the six NRC staff measures for interim protection at FSVNGS are met:

Interim Measure	Recommendation
Interim Measures were not addressed	PSC should respond to enclosure (2) of the Generic Letter to describe the precautions being taken while bringing FSVNGS into compliance with NUREG-0612.

TABLE 3.1. NUREG-0612 COMPLIANCE MATRIX FORT ST. VRAIN NUCLEAR GENERATING STATION

Equipment Designation	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
Reactor Building Crane		200	NC	R	C	NC	NC	C	NC
	Fuel Handling Machine	165.5							

C = Licensee action complies with NUREG-0612 Guideline.
NC = Licensee action does not comply with NUREG-0612 Guideline.
R = Licensee has proposed revisions/modifications designed to comply with NUREG-0612 Guideline.
I = Insufficient information provided by the Licensee.