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April 19, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

Ms. E. G. Adensam's letter of May 31, 1983 transmitted a draft technical evaluation report related to Control of Heavy Loads, Phase I, NUREG-0612. My letter of June 28, 1983 provided responses to items noted in the DTER with the exception of Special Lifting Devices and Crane Design. A follow-up response for each of these items is attached.

Ms. E. G. Adensam's letter of November 21, 1983 transmitted a draft technical evaluation report related to Control of Heavy Loads, Phase II, NUREG-0612. A response to each of the identified open items is attached.

Very truly yours,

Hal B. Tucker/ROS

Hal B. Tucker

ROS/php

Attachment

cc: Mr. James P. O'Reilly
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Catawba Nuclear Station
Control of Heavy Loads, Phase I
NUREG-0612

TER Section 2.3.4 - Special Lifting Devices

The following special lifting devices have been identified:

1 - Reactor Vessel Head Lifting Rig
2 - Load Cell
3 - Reactor Internals Lifting Rig
4 - Reactor Coolant Pump Motor Lifting Rig
5 - Control Rod Drive Mechanism Missile Shield Lifting Rig

Although not originally specified to be designed in accordance with ANSI N14.6-1978, "Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 Kg or More for Nuclear Materials)," each of the special lifting devices was provided by Westinghouse or Duke Power, in accordance with appropriate quality assurance and quality control procedures, for a specific application. Each of the special lifting devices was load tested by Westinghouse or Duke Power based on then current industry practice. These load tests are summarized below:

Device	Design Capacity	Test	Performed by
Load Cell	500,000 lbs	625,000 lbs	Westinghouse
Internals Lifting Rig	325,000 lbs	407,000 lbs	Westinghouse
R.V. Head Lifting Rig	318,000 lbs	408,750 lbs	Westinghouse
RCP Motor Lifting Rig	110,000 lbs	87,600 lbs	Duke Power
CRDM Missile Shield Lifting Rig	129,000 lbs	193,500 lbs	

Section 2.3.7 - Crane Design

Hoists identified as arrangement R011 and R012 have been identified as under-hung cranes. Therefore, CMAA-70, "Specification for Electric Overhead Traveling Cranes," is not applicable.

Catawba Nuclear Station
Control of Heavy Loads, Phase II
NUREG-0612

TER Section 2.3.2

Based on the evaluation of Safe Shutdown and Decay Heat Removal equipment, it was determined that the following approach would satisfy the intent of NUREG-0612.

The polar crane is assumed to be capable of a drop at any point within the crane wall. Since the head is the largest item that can be dropped, all smaller loads would be covered by the reactor vessel head. This simplifies the analysis since we assume any/all equipment can be damaged by a load drop.

Since each load handling device has a station directive or procedure to control its use, and since flagmen and markers are used on all lifts, these cranes fully comply with NUREG-0612.

A third load drop of the reactor vessel head was considered. This case is a drop on the operating floor which causes concrete spalling and subsequent possible damage to equipment on lower levels of the Reactor Building. This case was not mentioned in earlier submittals covering the Reactor Building.

The three crane/load combinations are discussed below:

1) Dropping of the reactor vessel head onto the vessel flange, and

2) Oblique drop of the reactor vessel head onto the upper internals --

   These analyses were performed by Westinghouse and were documented in WCAP-9198, which concluded that the integrity of the fuel cladding, vessel and vessel nozzles is maintained. Additional analyses performed by Duke Power demonstrated that the primary loop piping, auxiliary piping and vessel supports are adequate to maintain core cooling capabilities.

3) Reactor vessel head drop onto the operating floor --

   Initial Conditions/Assumptions

   a. Weight of heavy load: 289,772 lb.; RV head, platform and accessories, lifting rig, load cell, crane hook, block and cable

   b. Impact area of load:

      1. Flat drop on the operating floor. Impact area of 8603 in^2

   c. Drop height: 5.583 ft. - height of storage stand plus 6 inches

   d. Drop locations: Operating floor

e. Credit for the action of impact limiters: No credit

f. Thickness of floor slab: 2 feet - 6 inches

g. Drag forces: No drag forces are assumed.

h. Load combinations: Impact load plus dead weight of the slab

i. Material properties: Main Reinforcing: No. 11 bars, grade 40, Concrete - f'_c = 5000 psi

Method of Analysis:

The operating floor was modeled using a STRUDL space frame finite element model subject to the RV head impact load. The impact load, slab ductility and penetrations were determined based on methods described in Chapter 6 of ASCE manual number 58, "Structural Analysis and Design of Nuclear Plant Facilities" and Williamson and Alvy, "Impact Effect of Fragments Striking Structural Elements." The resulting shears and moments were evaluated using conventional design methods.

Conclusion:

The postulated reactor vessel head drop does not penetrate the operating floor and some scabbing does occur on the underside; however, the structural stability and functional requirements are maintained.

TER Section 2.3.3

Information on the five identified hoists is attached.

Provisions for safe load paths, procedures, crane operator training, and cranes (inspection, testing and maintenance) were previously discussed in my letter of June 28, 1983 and are applicable to these five additional hoists.

LOAD/IMPACT AREA MATRIX
AUXILIARY BUILDING

Crane: Motor Driven Aux. Feedwater Pump Hoist - A009

Capacity: 5 Ton

General Arrangement Drawing No: CN-1200-5.4

Approximate Uppermost Impact Area: AA,50 - El. 553+0

LOADS	SAFETY-RELATED* EQUIPMENT	ELEVATION OF EQUIPMENT	HAZARD ELIMINATION CATEGORY
Motor Drive Aux. Feedwater:	Mechanical/Nuclear & Electrical		
1) Pump - 3700 lbs.	Train A & B	< 553+0	(1) & (5)c
2) Motor - 2550 lbs.			
3) Driver - 4560 lbs.			

* Equipment required for plant safe-shutdown and/or decay heat remova

LOAD/IMPACT AREA MATRIX
AUXILIARY BUILDING

Crane: Aux. Feedwater Pump Hoist - A010

Capacity: 5 Ton

General Arrangement Drawing No: CN-1200-5.4

Approximate Uppermost Impact Area: AA,63 - El. 553+0

LOADS	SAFETY-RELATED* EQUIPMENT	ELEVATION OF EQUIPMENT	HAZARD ELIMINATION CATEGORY
Motor Driven Aux. Feedwater:	Mechanical/Nuclear & Electrical		
1) Pump - 3700 lbs.	Train A & B	< 553+0	(1) & (5)c
2) Motor - 2550 lbs.			
3) Driver - 4560 lbs.			

* Equipment required for plant safe-shutdown and/or decay heat removal

LOAD/IMPACT AREA MATRIX
AUXILIARY BUILDING

Crane: Turbine Driven Aux. Feedwater Pump Monorail - A027

Capacity: 10 Ton

General Arrangement Drawing No: CN 1200-10.5

Approximate Uppermost Impact Area: AA,60 - El. 605+0

LOADS	SAFETY-RELATED* EQUIPMENT	ELEVATION OF EQUIPMENT	HAZARD ELIMINATION CATEGORY
Hatch Cover - <20,000 lbs. Turbine Driven Aux. Feedwater:	Mechanical/Nuclear & Electrical		
1) Pump - 5725 lbs.	Train A & B	605+0 to 594+0	(4)a
2) Base - 1750 lbs.		594+0 to 577+0 at hatch	(4)a
3) Driver - 4000 lbs		577+0 to 560+0 at hatch	(4)a
		560+0 to 543+0 at hatch	(1) & (5)c
		<605+0 not at hatch	(4)b

* Equipment required for plant safe-shutdown and/or decay heat removal

LOAD/IMPACT AREA MATRIX
AUXILIARY BUILDING

Crane: Turbine Driven Aux. Feedwater Pump Monorail - A028

Capacity: 10 Ton

General Arrangement Drawing No: CN-1200-10.5

Approximate Uppermost Impact Area: AA,51 - El. 605+0

LOADS	SAFETY-RELATED* EQUIPMENT	ELEVATION OF EQUIPMENT	HAZARD ELIMINATION CATEGORY
Hatch Cover - <20,000 lbs.	Mechanical/Nuclear & Electrical		
Turbine Driven Aux. Feedwater:			
1) Pump -5725 lbs.	Train A & B	605+0 to 594+0	(4)a
2) Base - 1750 lbs.		594+0 to 577+0 at hatch	(4)a
3) Driver - 4000 lbs.		577+0 to 560+0 at hatch	(4)a
		560+0 to 543+0 at hatch	(2)
		<605+0 not at hatch	(4)b

* Equipment required for plant safe-shutdown and/or decay heat removal

LOAD/IMPACT AREA MATRIX
AUXILIARY BUILDING

Crane: Component Cooling Pump Monorail - A046

Capacity: 3 Ton

General Arrangement Drawing No: CN-1200-9.1

Approximate Uppermost Impact Area: EE, 56 - El. 583+0

	LOADS	SAFETY-RELATED* EQUIPMENT	ELEVATION OF EQUIPMENT	HAZARD ELIMINATION CATEGORY
	Component Cooling:	Mechanical/Nuclear & Electrical		
1)	Pump - 1555 lbs.	A & B Train	583+0 to 577+0	(2)
2)	Motor - 4200 lbs.		577+0 to 560+0	(2)
3)	Bed Plate - 1150 lbs.		560+0 to 543+0	(2)
			543+0 to 522+0	(2)

* Equipment required for plant safe-shutdown and/or decay heat removal

Hazard Elimination Categories

1. This system has sufficient separation and redundancy with cross connections and/or isolations to allow it to perform its safety function in the event of a load drop in this area.

2. The location and function of this system is separable and redundant to that of the Standby Shutdown Facility, allowing the units to be shutdown in the event of a load drop in this area.

3. Site-specific considerations preclude the need to consider load/target combinations.

   a. These cranes will only be operable during cold shutdown or refueling.

4. Analysis demonstrates that crane failure and subsequent load drop will not damage equipment required for plant safe-shutdown and/or decay heat removal.

   a. Equipment identified not required.

   b. Floor slab thickness of sufficient thickness and strength to prevent load from penetrating slab and striking equipment.

   c. Equipment identified not located in load drop area.

5. Likelihood of handling system failure for this load is extremely small.