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October 25, 1982

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

Subject: Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
Control of Heavy Loads
NRC Docket Nos. 50-454, 50-455,
50-456, and 50-457

References (a): April 7, 1982, letter from T. R. Tramm to H. R. Denton.

(b): August 2, 1982, letter from B. J. Youngblood to L. C. DelGeorge.

Dear Mr. Denton:

This is to provide additional information regarding the control of heavy loads at Byron/Braidwood to supplement that provided to the NRC in reference (a). These revisions, responses and comments are submitted in response to the draft TER enclosed with reference (b) which was discussed in a telephone conference on September 10, 1982.

The report provided in reference (a) was based on the drop of any load on any Class 1, 2, and 3 equipment on piping. The revisions contained in Attachment A to this letter change the basis to the drop of any heavy load on equipment required for safe shutdown, decay heat removal, or spent fuel pool cooling. The load handling systems now excluded from this report were deleted generally because they were incapable of carrying heavy loads or the heavy loads carried did not travel over equipment required for safe shutdown, decay heat removal or spent fuel pool cooling. These changes are discussed in greater detail in the response to 2.2.1c. These changes necessitated major revisions to Tables A through F, causing one to be deleted.

Attachment A contains changes to the text which were necessary to address the new scope of our evaluation and to address NRC comments documented in the TER. Changes are highlighted with a mark in the right margin.

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One signed original and fifteen copies of this letter and the attachment are provided for your use. Please address further questions to this office.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Administrator

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ATTACHMENT A

Additional Information

Regarding Control of Heavy Loads

Byron/Braidwood

CONTENTS

Pages ii through vii address specific points raised in the draft TER.

The following pages in the April 7, 1982 report have also been revised and are included:

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EG&G Request 2.2.1c (TER)

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. EG&G recommends that the licensee clarify whether the cranes mentioned in our evaluation should be included in Table 2.1 or not. We have presently included them in the table.

Response to 2.2.1c

After review of Table 2.1 and discussions with your office, we feel Table 2.1 should consist of the following crane/hoist systems:

Polar Cranes
Cable Tray Drawbridge Winches
Stud Tensioner Hoists
Fuel Building Crane
Spent Fuel Pit Bridge Crane
Trolley Beam 24
Trolley Beam 25
Trolley Beam 53
Trolley Beam 54
Trolley Beam 23
Trolley Beam 42 Braidwood only
Turbine Building Cranes
PTS-2
PTS-3
PTS-4
PTS-5
PTS-8 Braidwood only
PTS-9 Braidwood only
SG-1
SG-2
SG-3
SG-4

The load handling systems listed below are to be deleted from the review process. The reasons for the deletion are also provided.

SG-12 - Not capable of carrying heavy loads
SG-13 - Not capable of carrying heavy loads
RCP seal removal jibs for Loops 1,2,3 and 4 - Not capable of carrying heavy loads
Jibs 3,4,5,6 (Unit 2-Jibs 7,8,11,12) - Jibs no longer exist
Trolley Beams 10 and 11 - Review of loads carried by these beams resulted in derating beams to 1 ton.
Trolley Beams 28,29,55 - No piping or components required for safe shutdown, decay heat removal or spent fuel pool cooling.
SG-11 - Essential Service Water Makeup pumps not required for safe shutdown, decay heat removal or spent fuel pool cooling.

EG&G Request 2.3.1c (TER)

EG&G concludes from the Licensee's response that the Byron/Braidwood Stations partially comply with Guideline 1.

In order to adhere to the criteria of this guideline, EG&G recommends that the Licensee clearly mark safe load paths on the floor or by some other means in areas where heavy loads are handling.

Response to 2.3.1c

Load path markings on floors can become very quickly eradicated. Byron/Braidwood will incorporate into Maintenance/Equipment Removal Procedures references to the applicable M-517 and M-27 prints to identify safe load paths. To the extent necessary, these procedures will be available prior to fuel load. Procedures for heavy load movement inside Containment will incorporate Quality Control or Quality Assurance hold points as necessary and provide independent verification of proper load paths. Load movements will be directed by the responsible Maintenance Supervisor.

EG&G Request 2.3.2c (TER)

The Byron/Braidwood Stations do not presently comply with Guideline 2. In order to comply with the guideline, the Licensee should complete the development of load handling procedures for the applicable cranes and loads. These procedures should be available for possible NRC review prior to fuel loading.

Response to 2.3.2c

See Response to 2.3.1c.

EG&G Request 2.3.3c (TER)

Based on the Licensee's statement, Byron/Braidwood will comply with Guideline 3. Procedures and program records should be readily available for possible review and inspection by the NRC staff.

Response to 2.3.3c

As previously stated, Byron/Braidwood will comply with ANSI B30.2 1976 Operator Training. Training records will be available for inspection and review prior to fuel load.

EG&G Request 2.3.4c (TER)

Byron/Braidwood Stations do not comply with Guideline 4. In order to satisfactorily comply with the criteria, the Licensee should perform the following:

1) review, evaluate and report on the design and fabrication of all special lifting devices with respect to the requirements of ANSI N14.6-1978 and Guideline 4.

2) submit verification that procedures exist for all special lifting devices which satisfy the requirements of Section 5 (Acceptance testing, Maintenance and Assurance of Continued Compliance) of ANSI N14.6-1978. Compliance with this guideline should be complete for each lifting device before they are used in a critical situation.

Response to 2.3.4c

1) The special lift rigs for the reactor vessel head and upper internals provided by Westinghouse have been designed for 200% of the dead load using AISC allowables and load tested to 125% of the rated load as stated in our April 7, 1982 Report.

The polar crane main hook lifting speed is 4 1/4 fpm and the auxiliary hook lifting speed is 25 1/2 fpm. Both the main and auxiliary hoists have inching capability. AISC-1978, Section 1.3.3, suggests use of 25% minimum impact allowance. This, therefore, gives the lift rigs a 75% design margin. In Commonwealth Edison's judgment, any additional review and point-by-point comparison will not change our design criteria, it would simply verify that the information and explanation already provided to the NRC is correct. Based on the above, it is Commonwealth Edison's judgment that no further evaluations are warranted. ANSI N14.6-1978 is a consensus standard developed for special lifting devices for containers weighing 10,000 pounds (4500 kg) or more for nuclear materials, i.e., spent fuel casks. It should not be applied to all special lifting devices used in a nuclear power plant.

Response to 2.3.4c (Cont'd)

2) The Byron and Braidwood Station procedures will comply with the intent of Section 5, "Acceptance Testing, Maintenance, and Assurance of Continued Compliance" with some exceptions. In Commonwealth Edison's judgment, the periodic load testing of the special lifting devices to 150% of the maximum load is not practical nor warranted, and may invalidate any vendor product guarantees. As stated in our April, 1982 Heavy Load Movement Report, the special lifting devices were load tested to 125%, which is in accordance with the proof-load test indicated on the vendor drawings. Additionally, the logistics of moving heavy test loads into the Reactor Containment Building to accommodate such periodic load testing are difficult.

   Prior to use of specially designed lifting assemblies, visual inspection will be performed and certain critical and accessible parts or members such as hooks and pins will be non-destructively examined at appropriate time intervals. In our judgment, the visual inspection and limited NDE are adequate to detect potential failures.

   However, should an incident occur in which a special lifting device is overloaded, damaged or distorted, an engineering assessment will be performed. This assessment will address ANSI N14.6 and include consideration of the load test up to the original procurement load test value or 150% whichever is less. The requirement to perform this assessment will be incorporated into plant procedures.

EG&G Request 2.3.5c (TER)

The Byron/Braidwood Stations do not comply with Guideline 5. In order to comply the licensee should submit verification for the following:

1) Slings are installed and used in accordance with ANSI B30.9-1971;

2) Sling selection is based on the sum of the static and maximum dynamic loads;

3) Slings are marked with the "static load" which produces the maximum static and maximum dynamic loads;

4) Slings restricted in use to only certain cranes are clearly marked to so indicate.

Response to 2.3.5

Byron/Braidwood procures and inspects slings to ANSI B30.9-1971 Inspections are conducted annually and examined visually prior to use. Slings are installed and used in accordance with ANSI B30.9-1971. Sling selection is based on the sum of the static and maximum dynamic loads. It should be noted that cables manufacturered per ANSI B30.9 have a 30% dynamic load factor built in. This information was provided to Commonwealth Edison by a cable manufacturer.

Slings are not restricted to special cranes.

EG&G Request 2.3.7c (TER)

Byron/Braidwood Stations comply with Guideline 7 to a substantial degree on the basis of the Licensee's statements. However, no information was available on the design standards for the majority of the cranes listed as being subject to the guidelines. EG&G recommends that the Licensee perform the following:

1) Submit verification that monorails, jib cranes, etc., were designed and fabricated to applicable industrial standards comparable to CMAA70 and ANSI B31.2.

2) Submit verification that the Turbine Building cranes were designed and fabricated in accordance with CMAA70 and ANSI B30.2 or justify their design and fabrication to some other standard.

Response to 2.3.7c

1) The comparable standards which are applicable to the monorails, jibs and single girder cranes are Monorail Manufacturers Association (MMA) Specifications (1973) and AISC-1978 standards.

   The trolley beams were designed and fabricated in accordance with AISC-1978 standards. The PTS and single girder systems (SG) were designed in accordance with MMA and AISC-1978 standards. The jib cranes were designed and fabricated according to AISC-1978 standards.

2) The Polar Cranes, Turbine Building Cranes and Fuel Handling Building Cranes were all designed and fabricated in accordance with CMAA70 1975 Revision and ANSI B30.2-1976.

2.1 GENERAL REQUIREMENTS FOR OVERHEAD HANDLING SYSTEM

Request 1:

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 specification, operating procedures, or detailed structural analysis).

Response 1:

The cranes, trolley beams, and winches planned and under consideration which are capable of dropping a "heavy load" which may damage any system required for plant safe shutdown or decay heat removal or impair its' operation are listed by building in Tables A through E.

Request 2:

Justify the exclusion of any overhead handling system from the above Category 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.

Response 2:

Tables A through E list the load handling systems where there is equipment or system components underneath which could be potentially damaged by a load drop from that load handling system. The tables also identify the equipment or system components that are required for safe shutdown as identified in the Safe Shutdown Analysis.

Based on horizontal separation, there are no load handling systems which can be excluded from further review.

All load handling systems in non-safety related structures are excluded from the hazard evaluation for one of the following reasons:

a) There is no equipment under the load handling system which is required for operation or shutdown of the plant (e.g., Trolley Beam 48).

b) Non-safety related equipment or components are located underneath which are required for plant operation but not safe shutdown (e.g., Trolley Beam 49).

Exceptions to the above are noted in Tables D and E.

Certain load handling systems are provided exclusively for the maintenance of the equipment underneath and carry no other loads. Since the equipment underneath must be out of service to perform maintenance, a load drop on or of such equipment would have no effect on safe shutdown as the redundant train will be operable. These load handling systems are: Trolley Beams 53 and 54, PTS-4 and 5, SG-1, SG-2, SG-3 and SG-4.

The cable tray drawbridge winch is located over the reactor vessel head cable tray drawbridge. The purpose of this winch is to raise and lower the cable tray drawbridge during refueling outages. It carries no other loads. The winch is permanently installed. All the cables to the reactor vessel head are routed under the winch, into the drawbridge and to the head. Dropping of the cable tray drawbridge will not impact the reactor vessel head and will therefore not affect safe shutdown or cooling of the reactor.

The Turbine Building Cranes are eliminated on the basis of vertical separation. The SX piping located in or under the Turbine Building basemat is at its highest elevation 6'-8" (top of pipe) below the top of concrete and routed under or within six feet of structural columns. The only loads considered even remotely capable of causing damage to the SX pipes are the turbine rotors and the generator rotor. These components although very heavy, are also very long, the shortest being over 27 feet long. The maximum column-to-column spacing is 24'-4½" in the east-west direction (F through K) and 31'-9" (16 to 18) in the north-south direction. The main turbine floor (El. 451'-0") is used for turbine equipment laydown and therefore is designed to support the weight of the turbine rotors as a minimum in the area above the SX piping.

Because of the routing of the SX piping, the column spacing, and strength of the Turbine Building main floor and the two floors beneath, we feel the SX piping cannot be damaged by any potential load drop.

Request 3b:

A discussion of the measures taken to ensure that load handling operations remain within safe load paths, including procedures, if any, for deviation from these paths.

Response 3b:

Safe load paths have been defined for the movement of the heavy loads identified in Tables A through E, which, if dropped, could impact irradiated fuel or safe shutdown equipment, Deviations from defined load paths will require alternative procedures approved by the plant safety review committee. Load paths are not defined for loads equal to or less than 2,000 lbs., however, they typically follow the safest and shortest route with the load as close to the floor as practical.

Procedures will be developed to cover load handling operations for the heavy loads identified in Table 3.1-1 of NUREG-0612. These proceudres will identify the required equipment, the inspections and acceptance criteria prior to load movement, the steps and sequence in handling the load and define the safe load path and other special precautions.

Crane operators will be trained, qualified and will conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976, "Overhead and Gantry Cranes".

Special attention will be given to procedures, equipment and personnel for the handling of heavy loads over the reactor core.

Approved procedures will be in effect prior to fuel loading.

Request 2:

Justify the exclusion of any cranes in this area from the above category by verifying that they are incapable of carrying heavy loads or are permanently prevented from movement of the hook centerline closer than 15 feet to the pool boundary or by providing a suitable analysis demonstrating that for any failure mode, no heavy load can fall into the fuel storage pool.

Response 2:

The tool inspection winch is excluded from further analysis because it will not be capable of carrying heavy loads. A heavy load is defined as any load carried in a given area after a plant becomes operational, that weighs more than the combined weight of a single spent fuel assembly and its associated handling tool per Article 1.2 of NUREG-0612. This weight is 2000 lbs.

Request 4:

For cranes identified in 2.3.1 above not categorized according to 2.3.3, demonstrate that the evaluation criteria of NUREG-0612, Section 5.1 are satisfied. Compliance with Criterion IV will be demonstrated in your response to Section 2.4 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the containment and your determination of compliance.

Response 4:

With respect to Criterion I, it has shown that the manipulator crane is incapable of dropping heavy loads. The analysis for dropping of a spent fuel assembly is discussed in Response 2.2.4a.

The stud tensioner hoists mounted on the reactor vessel head are permanent features and are, therefore, incapable of dropping anything on the open core since the upper internals are in place when the head is moved.

The only heavy loads carried over the reactor vessel are the reactor head and upper internals. The lower internals and core barrel cannot be removed until the core has been removed. Dropping of the upper internals is considered unlikely for the following reasons:

1) The upper internals plus lifting rig weight is less than 40% of the nominal (230 ton) design rating of the crane.

2) Removal and installation of the internals is strictly controlled by procedure and supervision.

3) The lifting rig is designed for 200% of the lifted load and load tested to 125% of the lifted load.

4) The cranes were designed in accordance with CMAA-70 and are inspected in accordance with ANSI B30.2-1976 and Section 179 of 29 CFR 1910 prior to use to the beginning of each outage.

Procedures will be developed to ensure that the polar crane hooks will not be over the reactor vessel except when removing or installing the head and/or upper internals.

The effect of dropping of a spent or new fuel assembly on the spent fuel racks noted in Criterion II has been analyzed and the results of this analysis is discussed in Response 2.2.4a.

2.4 SPECIFIC REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS OPERATING IN PLANT AREAS CONTAINING EQUIPMENT REQUIRED FOR REACTOR SHUTDOWN, CURE DECAY HEAT REMOVAL OR SPENT FUEL POOL COOLING

Request 1:

Identify any cranes listed in 2.1.1 above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6 or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load handling system (i.e., crane-load combination) information specified in Attachment 1.

Response 1:

The Safe Shutdown Analysis transmitted on November 17, 1981, defines the systems and equipment required for safe shutdown and decay heat removal. Tables A, B, C, D and E list all the load handling systems in the Containment, Fuel Handling Building, Auxiliary Building, Turbine Building and Braidwood Lake Screen House, respectively, which have system components underneath.

The analyses in 2.2 and 2.3 above, show the polar crane, the Spent Fuel Pit Bridge crane and the manipulator crane as having sufficient design features to make the likelihood of a load drop extremely small. The load drop analyses have shown that the consequences of a load drop from any of these cranes will not exceed the limits set by the evaluation criteria I through IV in Section 5.1 of NUREG-0612.

The load handling system for the Spent Fuel Pit Bridge Crane consists of the fuel handling tool, the fuel assembly and crane.

The load handling system for the manipulator crane consists of the crane and fuel assembly and fuel handling tool.

The load handling system for the polar crane is the crane load blocks, hook, lifting rig and reactor vessel head or internals.

Request 2:

For any cranes identified in 2.1-1 not designated as single failure proof in 2.4-1, a comprehensive hazard evaluation should be provided which includes the following information:

Request 2a:

The presentation in a matrix format of all heavy loads and potential impact areas where damage might occur to safety related equipment. Heavy loads identification should include designation and weight for cross-reference to information provided 2.1.3c. Impact areas should be identified by construction zones and elevations or by some other method such that the impact area can be located on the plant general arrangement drawings.

Response 2a:

Tables A through E provide the required matrix data for all load handling systems identified in 2.1.1.

Request 2b:

For each interaction identified, indicate which of the load and impact area combinations can be eliminated because of separation and redundancy of safety related equipment, mechanical stops and/or electrical interlocks or other site specific considerations. Elimination on the basis of the aforementioned considerations should be supplemented by the following specific information:

Request 2b (1):

For load-target combinations eliminated because of separation and redundance of safety related equipment, discuss the basis for determining that load drops will not affect continued operation (i.e., the ability of a system to perform its safety related function).

Response 2b (1):

None of the load handling systems listed in Tables A through E may be deleted on the basis of horizontal or vertical separation without a detailed structural analysis.

All the load handling systems designated as "B" in the Hazard Elimination Category (HEC) column may be deleted on the basis of redundancy. The redundant equipment cannot be damaged by a load drop from any of these systems due to separation between the system components.

No safety related equipment other than the reactor vessel is located within the refueling cavity. Only the vessel head, upper internals and fuel assemblies are moved over the core. Load drops in the refueling cavity which might damage a primary coolant leg would not disable the core cooling systems as they are located outside the missile wall.

The reactor coolant pump motors and any other load carried by the polar crane must be carried in a clockwise manner (looking down, Byron-1) around the containment. Load carrying past the pressurizer is not possible as this area is blocked off by the containment electrical penetrations, galleries, and VQ penetrations. The worst case load drop for the polar crane would include the auxiliary hook, and either one accumulator or one of two RHR loops plus one of four SI loops plus one CS loop. The RHR loop can be isolated by valves inside the secondary shield wall. Other piping would also be damaged but it would not be required for safe shutdown or long term cooling of the reactor vessel.

5) Only one SX pipe could be affected by a load drop affecting one SX pump slightly at the Lake Screen House.

6) The turbine LP spindle must impact with three intervening floors before hitting the basemat of the Turbine Building and can only damage one SX pipe due to separation of the pipes.

Request 2B (2):

Where mechanical stops or electrical interlocks are to be provided, present details showing the areas where crane travel will be prohibited. Additionally, provide a discussion concerning the procedures that are to be used for authorizing the bypassing of interlocks or removable stops, for verifying that interlocks are functional prior to crane use and for verifying that interlocks are restored to operability after operations which require bypassing have been completed.

Response 2b (2):

The manipulator crane has been discussed and eliminated per Responses 2.1.3f, 2.3.1, and 2.3.2.

The Fuel Handling Building crane design was discussed in Response 2.1.3f. Procedures governing the carrying of heavy loads and the control of the removable end stops will be developed and in effect prior to fuel load as discussed in Response 2.1.3c.

CONTROL OF HEAVY LOADS

NOTES

System Designation

1. Trolley Beams are S shape beams designed by Sargent & Lundy to AISC-1978 standards.
2. PTS (Patented Track Systems) are monorail systems for electric or manual hoists and designed by others to Monorail Manufacturers Association (MMAA) standards.
3. All jib cranes are designed by others to AISC-1978 standards.
4. Single Girder Cranes (SG) are all designed by others according to MMAA standards.
5. All Double Girder Cranes are designed by Harnischfeger unless noted as Stock Equipment Company.
6. Winches are wall or column mounted and provided by others.
7. All cranes, trolley beams, PTS and winches in Category I structures are seismically supported.

System Elevation

1. System Elevations are given to the nearest inch or approximated if the elevation is not known precisely.

System Capacity

1. The nominal design rating of the load handling system (which may vary depending on the hoisting equipment used) is provided.

Hazard Elimination Category (H.E.C.)

Hazard Elimination Category -

- A- Crane travel for this Area prohibited by electrical interlocks or mechanical stops.
- B- System Redundancy and separation precludes loss of capability of system to perform its safety related function following a load drop in this Area.
- C- Likelihood of handling system failure for this load is extremely small.
- D- Analysis demonstrates that crane failure and load drop will not damage safety related equipment.
- E- Special Station procedures for heavy loads or operation.

System Design Loads

1. The principle loads and their weights used in the system design is noted. Other loads may be carried that are not listed.

Safety Systems Underneath

1. Only systems or system components required for safe shutdown or decay heat removal are listed.
2. Any load listed under "System Design Loads" may be dropped on any component listed in this column with this exception noted. The reactor vessel head and internals move in either a north or south direction inside the refueling cavity and do not pass over any other piping or equipment except the reactor vessel.

Interlocks

1. Standard Interlocks for Trolley Beams: Mechanical End Stops are provided.
2. Standard Interlocks for PTS: Mechanical End Stops are provided.
3. Standard Interlocks for Jib Cranes: Mechanical End Stops on the boom are provided.
4. Standard Interlocks for Single Girder Cranes: Mechanical End Stops on bridge girder and runways are provided.
5. Standard Interlocks for all Double Girder Cranes: Bumpers on Runway/Bridge and Mechanical End Stops on the Runway and Bridge.
6. All electric hoists have upper and lower limit switches which may be geared or block type or both.
7. Manual hoists have no interlocks.
8. Special Interlocks for the Fuel Building Crane are: Electrical Interlocks and Mechanical Stops on the Bridge to prevent travel over the spent fuel pool with a load over 2,000 lbs. plus upper and lower limit switches on both hoists.
9. The manipulator crane is provided with interlocks to prevent a fuel assembly from colliding with the refueling cavity walls or equipment attached to the cavity walls; upper and lower limit switches on the gripper hoist.
10. Stock Equipment Drum Storage Crane is remotely operated.
11. The Turbine Building Crane has trolley chocks and limit switches on the bridge rails plus upper and lower limit switches on the hoists plus a second upper limit switch if the lifting beam is used.
12. The Polar Crane has limit switches for overtravel of the bridge trolley, 2 upper limit switches per hoist and 1 lower limit switch per hoist, and trolley chocks.
13. The stud tensioner hoists have geared upper and lower limit switches and overload limit switch.
14. The Turbine Building Cranes, Fuel Handling Building Cranes and Polar Cranes are top running double girder bridge cranes designed by Harnischfeger.

Impact Area

The area underneath the trolley beam is the impact area and may include more than one elevation. If more than one elevation is given, only the highest and lowest impact elevations are provided. Please refer to the M-517 series drawings for trolley beam and crane location. The M-27 series indicate equipment removal routes.

BYRON/BRAIDWOOD
CONTROL OF HEAVY LOADS
Table A

System Designation	System Elevation	System Capacity	H.E.C.	System Design Loads and Weights	System Components Underneath	Impact Area
Polar Crane	500'-0"	230/40 ton	B,C,E,	Reactor Vessel Head-411,750 lb Reactor Upper Internals-145,000 lb Reactor Lower Internals-269,600 lb Reactor Coolant Pump Motors-77,500 lb Reactor Core Barrel Assembly - 217,300 lb Main Hook Lower Load Block - 6783 lb Auxiliary Hook Lower Load Block - 1770 lb	Steam Generator Reactor Vessel Piping for RH, FC, RY, CC, CV, , AF, SX, Electrical Conduits and Cable Pans for the above systems	Outside the secondary shield wall on El. 426'-0" for all loads noted except RPV head, Internals, Core Barrel Assembly. The RCP Motor and Pump Components may also be dropped down the vertical lift points noted.
Manipulator Crane	426'-0"	3000 lbs.	A,B,C,E	Fuel Assembly - 1700 lb	Reactor Vessel	Refueling Cavity - Elevation varies
Cable Tray Drawbridge Winch	447'-9"	10 ton	C,E	Cable Tray Drawbridge - 9000 lb	Reactor Vessel	Cable Tray Drawbridge El. 426'-0". Winch or drawbridge must come off its' mounting first.
Stud Tensioner Hoists (3)	416'-10"	2 ton	E	Reactor Vessel Head Stud Tensioner - N/A Reactor Vessel Head Studs - 806 lb	Reactor Vessel Head Flange	El. 400'-0"

BYRON/BRAIDWOOD

CONTROL OF HEAVY LOADS

Table 8

Load Handling Systems in the Fuel Handling Building

System Designation	System Elevation	System Capacity	[illegible]	System Design Loads and Weights	System Components Underneath	Impact Area
Fuel Building Crane	434'-8"	125 ton	A,E	Spent Fuel Cask-[illegible] 000 lb (TN-12) Fuel Assembly - 1467 lb (Main Hoist Lower Load Block - 5600 lb) Auxiliary Hoist Lower Load Block - (1500 lb est.) Failed Fuel Cannister - 940 lb Control Rod Cluster - 158 lb	New Fuel Storage Racks Spent Fuel Storage Racks Spent Fuel Pit Cooling System Failed Fuel Storage Rack	All areas of the Fuel Handling Building within reach of the crane.
Spent Fuel Pit Bridge Crane	426'-0"	2 ton	E	New Fuel Assembly - 1467 lb Spent Fuel Assembly - 1467 lb Fuel Handling Tools - 375 lb max. Failed Fuel Cannister - 940 lb Control Rod Cluster - 158 lb	Spent Fuel Racks Failed Fuel Racks New Fuel Elevator Spent Fuel Pit Cooling System	Spent Fuel Pit and Fuel Transfer Canal El. 385'-0"

BYRON/BRAIDWOOD
CONTROL OF HEAVY LOADS
Table C

Load Handling Systems in the Auxiliary Building

System Designation	System Elevation	System Capacity	H,E,C,	System Design Loads and Weights	System Components Underneath	Impact Area
Trolley Beam 24	420'-10"	12 ton	E	RHR Heat Exchangers Tube Bundle - 14,500 lb Concrete Plugs - 15,000 lb	RHR Heat Exchangers	El. 401'-0"
Trolley Beam 25	420'-10"	12 ton	E	RHR Heat Exchangers Tube Bundle - 14,500 lb Concrete Plugs - 15,000 lb	RHR Heat Exchangers	El. 401'-0"
Trolley Beam 53	375'-6"	8 ton	B	Charging Pump - 7500 lb Charging Pump Motor - 4345 lb	Charging Pump and Motor	El. 364'-0"
Trolley Beam 54	375'-6"	8 ton	B	Charging Pump - 7500 lb Charging Pump and Motor - 4345 lb	Charging Pump and Motor	El. 364'-0"
SG-1	420'-0"	2 ton	B	Diesel Generator Cylinder Head Covers - 830 lb	Diesel Generator	El. 401'-0" for loads dropped to either side of the diesel generator
SG-2	420'-0"	2 ton	B	Diesel Generator Cylinder Head Covers - 830 lb	Diesel Generator	
SG-3	420'-0"	2 ton	B	Diesel Generator Cylinder Head Covers - 830 lb	Diesel Generator	
SG-4	420'-0"	2 ton	B	Diesel Generator Cylinder Head Covers - 830 lb	Diesel Generator	

BYRON/BRAIDWOOD
CONTROL OF HEAVY LOADS
Table C

Load Handling Systems in the Auxiliary Building

System Designation	System Elevation	System Capacity	H.E.C.	System Design Loads and Weights	System Components Underneath	Impact Area
PTS - 2 PTS - 3 (Unit 2)	375'-4"	6 ton	E,B	Concrete Plugs - 11,700 lb Containment Spray Pump/Motor - 7307 lb RHR Pump/Motor - 6200 lb Charging Pump - 7500 lb Safety Injection Pump - 5260 lb Charging Pump Motor - 4345 lb Safety Injection Pump Motor - 4345 lb	RHR Pump/Motor	El. 364'-0" See M-517-4
PTS - 4 PTS - 5 (Unit 2)	375'-6"	6 ton	E,B	Safety Injection Pump - 5260 lb Safety Injection Pump Motor - 3100 lb	Safety Injection Pump Safety Injection Pump/Motor	El. 364'-0" See M-517-4
Trolley Beam 23	422'-4"	10 ton	B	Charging Pump - 7500 lb Containment Spray Pump/Motor - 7307 lb RHR Pump/Motor - 6200 lb Safety Injection Pump - 5260 lb Safety Injection Motor - 4345 lb ESW Pump - 9500 lb ESW Motor - 12,000 lb	Line 1SXC6AA24 Line 1SX02AB36	El. 364'-0" See M-517-2 and M-517-5

BYRON/BRAIDWOOD
CONTROL OF HEAVY LOADS
Table D

Load Handling Systems in the Turbine Building

System Designation	System Elevation	System Capacity	H.E.C.	System Design Loads and Weights	System Components Underneath	Impact Area
Turbine Building Cranes Unit 1	506'-6"	125/25 ton	B	Turbine Components: LP Spindles - 294,000 lb HP Spindles - 131,000 lb HP Cylinder Cover - 166,000 lb LP Cylinder Cover - 172,300 lb Other Lighter Loads	SX supply and discharge piping	El. 451'-0" or El. 369'-0" Any area within crane reach.
(Unit 2)		148/25 ton	B			

Table E

Load Handling Systems in the Braidwood Lake Screen House

System Designation	System Elevation	System Capacity	H.E.C.	System Design Loads and Weights	System Components Underneath	Impact Area
PTS - 8 PTS - 9	638'-11"	30 ton	B	Circulating Water Pump Motor 75,000 lb	SX supply pipe	See M-517-9
Trolley Beam 42	638'-3"	12 ton	B	WS Pump - 41,300 lb WS Motor - 22,500 lb	SX supply pipe	See M-517-9