

UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

TELEPHONE
(312) 858-2660

June 22, 1972

Commonwealth Edison Company
ATTN: Mr. Byron Lee, Jr.
Assistant to the President
P. O. Box 767
Chicago, Illinois 60690

Docket No. 50-237
50-249
50-254
50-265

Gentlemen:

As a result of the hanger failures experienced with the emergency core cooling system suction header at your Quad-Cities 2 reactor facility, the Directorate of Regulatory Operations has sent the enclosed information Bulletin No. 72-1 to other operators of boiling water reactors. It is requested that the inspections described in the enclosure be conducted at your Quad-Cities 1 and Dresden 2 and 3 facilities, and the results of your inspections be provided to this office.

If you have any questions concerning this matter, please let me know.

Very truly yours,

Boyce H. Grier
Regional Director

Enclosure:
Bulletin No. 72-1

cc: Dresden Station Superintendent
Quad-Cities Station Superintendent

bcc: RO Files
DR Central Files
PDR
Local PDR

*Misc
att.*

Date: June 22, 1972
Directorate of Regulatory
Operations Bulletin 72-1

FAILED HANGERS FOR EMERGENCY CORE COOLING SYSTEM SUCTION HEADER

We recently received information from the Commonwealth Edison Company concerning a problem found during startup testing of the Quad-Cities 2 boiling water reactor which may relate to the design and long term performance capability of the torus and the emergency core cooling suction header at your facility. The information is as follows:

a. Description of Circumstances

During startup testing the licensee found that four of the pipe hangers which support the 24-inch diameter torus suction header had failed. The 24-inch suction header serves as the main source of water for the emergency core cooling systems. Water is supplied to the header from the torus through four 20-inch diameter pipes spaced 90 degrees apart. The header is supported by three equally spaced sets of vertical and horizontal hangers which are attached to support plates welded to the torus and which are located between each of the four 20-inch pipes which join the suction header to the torus. A total of 12 hangers support the 24-inch suction header. The reactor was promptly shut down for investigation and repair following the discovery of the failed hangers.

Three of the four failed hangers were located within a 90 degree section of the header and resulted in a maximum sag in the header pipe of approximately six inches within that section. Four 3/4-inch diameter bolts (threaded their entire length), which secured pairs of shackles to the support plates welded to the torus and to the 24-inch diameter pipe, were found to have failed in double shear. The cause of the bolt failures has not as yet been determined; however, it is known that the suction header experienced vibration as a result of operational testing of the emergency core cooling system. In addition, the bolt holes, which were formed by flame cutting and punching, were found to be irregularly shaped and poorly aligned.

Chicago Bridge and Iron Company, the contractor for the torus and suction header design and installation, has provided a revised design requiring use of 1-inch diameter high strength bolts with smooth unthreaded bearing surface, and appropriately increased the size of the shackles. The change is being implemented for all the hangers.

Commonwealth Edison Company and General Electric Company plan to conduct additional investigation to determine the effect on the suction header and torus of routine plant operations and testing of the emergency core cooling systems.

We have also been informed that the Northern States Power Company's Monticello reactor found one bent suction header hanger bolt and is also currently replacing the hanger bolts with 1-inch diameter bolts.

b. Action Requested of the Licensee

It is requested that you conduct the following inspections for each of your facilities and provide this office with the results of your inspection:

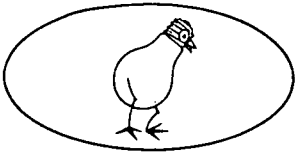
1. An inspection of the hangers, shackles and support plates for the torus suction header to assure that all components are in accordance with design, are in proper position, and do not indicate damage.
2. Inspect each bolt used to attach the shackle and support plate of each hanger (1) for deformation, (2) to establish that bolts are of the specified design, (3) to establish that specified locking devices are installed and (4) that the bolt shank supporting the header weight from the support and shackle is not threaded in the bearing area.

If the results of your inspection indicate the existence of conditions similar to those described above, or if any problems have previously been experienced with failed hangers or bent hanger bolts at your facility, please include in your response a description of the problem and the corrective action taken or planned, if any, and the date of scheduled completion of any planned corrective action. This information should be provided to this office, in writing, within ten days of your receipt of this letter.

MEMO ROUTE SLIP Form AEC-93 (Rev. May 14, 1947) AECM 0240		See me about this. Note and return.	For concurrence. For signature.	For action. For information.
TO (Name and unit) J. B. Henderson, RO J. G. Keppler, RO R. H. Engelken, RO P. A. Morris, RO H. D. Thornburg, RO		INITIALS	REMARKS Commonwealth Edison Company - Docket No. 50-237	
		DATE	50-249	
			50-254	
			50-265	
TO (Name and unit) A. Giambusso, L RO Files <u>DR Central Files</u> PDR Local PDR		INITIALS	REMARKS	
		DATE		
TO (Name and unit) NSIC DTIE		INITIALS	REMARKS	
		DATE		
FROM (Name and unit) G. Fiorelli RO:III <i>GF</i>		REMARKS	Attached is a copy of licensee's adequate reply to Bulletin No. 72-1.	
PHONE NO. 858-2660	DATE 7-20-72			

USE OTHER SIDE FOR ADDITIONAL REMARKS

GPO : 1968 O-294-619



Commonwealth Edison Company

ONE FIRST NATIONAL PLAZA ★ CHICAGO, ILLINOIS

Address Reply to:

POST OFFICE BOX 767 ★ CHICAGO, ILLINOIS 60690

July 5, 1972

Mr. Boyce H. Grier
Regional Director
Directorate of Regulatory Operations,
Region III
U. S. Atomic Energy Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Grier:

This letter is being sent in response to your letter of June 22, 1972 requesting the results of our inspections of the Dresden and Quad-Cities torus suction headers.

QUAD-CITIES

Inspections

On May 29, 1972, the night of the Unit 2 incident where four hangers were found to have failed, an inspection of the Unit 1 suction header hangers was made. This inspection revealed one hanger had its support bolt broken. Additionally, several others were found to be bent. No deflection or other damage to the Unit 1 header was observed. The broken bolt was replaced at the time of its discovery.

Corrective Action

The same corrective action that was taken on Unit 2 was also taken on Unit 1. All of the original $2\frac{1}{2}$ inch wide by $\frac{1}{2}$ inch thick hanger straps were replaced with 3 inch wide by $\frac{1}{2}$ inch thick straps; also all original $\frac{3}{4}$ inch fully threaded bolts for the hangers were replaced with 1 inch diameter bolts with a non-threaded bearing surface. The original bolts were ASTM-A-307 specification and the new bolts are A-325. All newly installed bolts were "staked" to prevent the nuts from working loose. The bolt hanger holes were in-line drilled. This corrective action has been approved by the Chicago Bridge & Iron Company, and was checked as completed on June 12, 1972.

The loading on each hanger was measured after the revised hangers were adjusted to improve load distribution. The hanger load distribution after adjustments is as follows:

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<u>Hanger No.</u>	<u>Load - Lbs.</u>	
	<u>Unit 1</u>	<u>Unit 2</u>
1	2,600	7,800
2	7,600	10,300
3	7,100	9,400
4	7,600	7,400
5	5,800	8,300
6	6,700	7,200
7	8,000	6,700
8	5,100	7,600
9	7,600	7,800
10	7,600	7,800
11	6,300	8,500
12	7,400	8,900

On Unit 1, hanger No. 10 was assigned plant north with numbers decreasing in a clockwise direction. On Unit 2, hanger No. 2 was assigned plant north with numbers increasing in a clockwise direction. The load distribution was discussed with Chicago Bridge & Iron and felt to be acceptable by them.

Continued Investigations.

General Electric Company conducted a series of tests on the Unit 2 containment system during this current month. Approximately 20 displacement sensors were installed at various locations on the torus and suction header. The tests included simultaneous operation of all electromatic relief valves, and operation of the various ECCS pumps using the suppression chamber. The results of these tests are presently being analyzed, and if any further design modifications are required, we will keep you informed.

DRESDEN

Preliminary Inspection

On June 29 & 30, 1972, the torus suction header supports were visually inspected, without disassembly, to assure that all components are in accordance with design, are in the proper position, and do not indicate damage. Results of these inspections are as follows:

Unit 2

The hanger assemblies generally were found in good condition with the following exceptions.

- 1) Bay #5 vertical straps were found to have less bearing material than design below the bolt shank.

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- 2) Bay #3 vertical straps had double holes drilled in a vertical plane with the bolt attached in the upper hole.
- 3) Two sets of vertical straps were found to have been slightly bent, apparently to facilitate installation.

In addition, the seismic restraints at all positions were examined and found to be extended beyond their normal range.

Unit 3

The hanger assemblies were found to be in good condition with the exception that no locking nuts were used on the bolts.

In addition, seismic restraints were found to be in the proper position in accordance with design.

Detailed Inspection

All hanger assemblies were disassembled for closer inspection on Unit 3 during a weekend outage. All bolts, bolt holes, and support pieces were examined for proper design, position, and damage.

- 1) All bolts were $3/4"$ x $2-3/4"$, as specified by design. Bolt clear shank length varied from $3/4"$ to $1"$. Consequently, some of the load was carried on the threaded portion of the bolt. One bolt of the total of 56 appeared to be slightly deformed.
- 2) Bolt holes - All bolt holes were inspected on straps and support plates. Some holes were drilled and some were flame cut. Dimensional checks indicated approximately $13/16"$ diameter, as specified in the design. The following exceptions were noted:
 - a) Bay #1 and Bay #7 had double holes drilled in a horizontal plane on the ring header support plate. The holes were spaced between $3/4"$ to $1\frac{1}{2}"$ apart.
 - b) Bay #2 had a double hole drilled in a vertical plane on the ring header support plate with the bolt passing through the lower hole. The upper hole was plugged. The plug was loose in the upper hole.
 - c) Seven holes which were flame cut were slightly oversized and oval in shape.

While disassembling each ring header support, the hydraulic jack loadings were used to determine the vertical hanger support loads. This data was reported and found to be within allowable load

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for the new bolts (A-325). Two vertical hangers were found essentially unloaded.

After the above mentioned inspections were made and while the unit remained shut down, the following changes were made in accordance with the Chicago Bridge & Iron Company and Mechanical and Structural Engineering Department recommendations.

- 1) All vertical and horizontal support bolts were replaced with new, certified, high strength A-325 3/4" x 3" lg. bolts with a 1 1/2" clear (unthreaded) shank.
- 2) All nuts were replaced with new, certified, double nuts of the same material.
- 3) The two unloaded hangers were replaced with new 1/2" x 3" A36 certified bar stock along with the new 3/4" x 3" lg. A-325 bolts, and dimensioned in order to increase the loading on these hangers. The hanger load distribution after adjustment is as follows:

<u>Bay No.</u>	<u>Load - lbs.</u>
1	2,700
2	12,320
3	5,800
4	11,600
5	11,600
6	*
7	12,320
8	7,600
9	8,960
10	11,400
11	10,100
12	11,600
13	11,200
14	*
15	6,300
16	5,800

*Design does not require a hanger in these bays and none are installed.

A similar disassembly and inspection will be performed on Unit 2 as soon as practical. A seismic analysis is being performed by Chicago Bridge and Iron Company to determine whether the hanger disassembly and inspection can be safely made with Unit 2 at power. Bolt replacement and hanger adjustments will be made on Unit 2 as required.

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We are evaluating the ring header support plates which have double holes, and those straps which have oversized, flame cut holes, to determine whether corrections are required.

Seismic restraints on Unit 2 will be readjusted to conform to design specifications.

All corrective actions are expected to be completed by July 15, 1972 if the safety evaluation shows that the detailed inspection can be done with the unit in service. If an outage is required, the detailed inspection will be done on the first 72 hour outage.

Very truly yours,



H. K. Hoyt
Superintendent
Production-Nuclear

HKH:BRS:mak

cc: Messrs. F. A. Palmer
W. P. Worden