

ILLINOIS POWER COMPANY



1605-L

U-0538

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

September 17, 1982

Mr. James G. Keppler
Director, Region III
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

Clinton Power Station Unit I
10CFR50.55(e) Deficiency 82-04
Improperly Tightened Jam Nuts

On May 7, 1982, Illinois Power verbally notified Mr. H.M. Wescott of a potentially reportable deficiency involving improperly tightened jam nuts on certain structural steel bolted connections in the containment building. This initial notification was followed by one (1) interim report (Reference: letter, W.C. Gerstner to J.G. Keppler, U-0499, dated June 11, 1982) where it was anticipated that an additional ninety (90) days would be required to complete our investigation on this matter. Our investigation is now complete, and we have determined that the deficiency is reportable under the provisions of 10CFR50.55(e)(i). This letter presents a final report per 10CFR50.55(e)(3).

STATEMENT OF REPORTABLE DEFICIENCY

The intent of the Architect/Engineer, Sargent and Lundy (S&L), was not achieved in the field assembly of safety related structural steel slip joint connections (those connections allowing for thermal movement of the structural steel), in that jam nuts were installed finger tight instead of torqued snug tight against the high strength nuts on the bolted connection. Additionally, the investigation revealed that design information provided on certain other Architect/Engineer drawings (i.e., mechanical, electrical, and HVAC) pertaining to the application of jam nuts were found to be unclear and/or misleading, resulting in the possibility that jam nuts required on other plant items and components are improperly installed.

BACKGROUND

During an IP Quality Assurance surveillance of the containment building structural steel, it was noted that the jam nuts of certain structural steel slip joint connections were loose, i.e., jam nuts were not torqued snug tight against the high strength heavy hex nuts in the connection. Further investigation revealed that all jam nuts

of the structural steel slip joint connections within the containment building had been installed only finger tight. A review of the slip joint details shown on the structural design drawings disclosed ambiguities in the notes covering the installation of the jam nuts against the high strength nuts. Some of the notes were not clear as to their intent and there was a lack of consistency in the meaning of the notes. These ambiguities in the details led to misinterpretation by field personnel of the tightness required of the jam nuts.

As a result of concerns identified by the IP QA Surveillance Report, Illinois Power (IP) issued a Management Corrective Action Request (MCAR) to Baldwin Associates (IP Contractor) requesting immediate corrective action on the concerns identified. Baldwin Associates responded to the MCAR by issuing a STOP WORK ACTION on structural steel work within the containment building.

INVESTIGATION RESULTS

It is the designer's intent that high strength heavy hex nuts on the structural steel slip joint connections be installed finger tight allowing the connection to move, with a jam nut installed snug tight against it, preventing the heavy hex nut from loosening. However, due to misinterpretation of the ambiguous design drawings, both the high strength nut and the jam nuts were installed finger tight. This situation was found to exist primarily in structural steel connections inside the containment. In areas exterior to the containment, such as the containment gas control boundary, block wall seismic posts, and personnel walkway, structural slip joint connections are specified, however, design drawings did not call for jam nuts at these locations. This situation is not considered adequate, as the loosening of the single finger tight heavy hex nut could occur. Many of the affected connections were inspected and final accepted for use.

The identification of the inadequacies in the specification of the installation requirement for jam nuts for slip joint connection resulted in a review into similar areas for potential deficiencies. Design drawings for electrical, mechanical, and HVAC applications were reviewed to determine if deficiencies also existed in these areas. This review found that jam nut information on some of these drawings was also incorrect, unclear or ambiguous as follows:

1. Electrical drawings for certain cable tray hanger and conduit hanger details require jam nuts and required clarification.
2. Some mechanical component support detail drawings specified the use of jam nuts incorrectly, and required clarification.
3. Some drawings for HVAC duct hanger auxiliary steel structural connections specify the use of jam nuts and required clarification.

4. Some drawings for miscellaneous mechanical applications specified the use of jam nuts and required clarification.

CORRECTIVE ACTION

The following measures have been or are being taken as corrective action to rectify this deficiency and to preclude further occurrences:

1. Sargent and Lundy has revised, by Engineering Change Notice (ECN 3031), the structural drawings general notes to add a note clarifying the high strength bolting requirements of slip joint connections, including jam nuts installation.
2. In those cases where insufficient thread length is available to add a jam nut (where one was not originally specified), various structural drawings were revised to allow the alternative of "crimped threads", where crimped is defined as deformed bolt threads to prevent loss of the nut.
3. For sliding-slotted connections for block wall seismic supports, appropriate design drawings have been revised to clarify bolting requirements.
4. Baldwin Associates has revised their procedures/ instructions to further clarify and assure proper installation and inspection of structural steel jam nuts.
5. Baldwin Associates will repair/rework and reinspect all affected structural steel slip joint connections located both within and outside the containment building, in accordance with the revised Sargent and Lundy drawings and Baldwin Associates procedures/instructions.
6. Electrical design drawings for cable tray hangers and conduit hangers were revised to clarify the installation requirements for jam nuts used on flexible structural connections.
7. Although it is believed that adequate installation and inspection practices have been implemented for the installation of jam nuts for electrical conduit hangers, cable tray hangers and associated auxiliary steel, Quality Control Instructions will be revised to more clearly address the inspection of jam nut tightness. Additionally, an "overinspection" effort, presently under the control of Illinois Power Quality Assurance and being implemented by United States Testing Company (UST), will inspect a sample of the electrical structural connections to confirm that they meet the designer's intent. The need for rework/repair and additional reinspection will be determined, based on the results of the overinspection.

8. An Engineering Change Notice (ECN 3082) has been issued to clarify the installation requirements for jam nuts utilized on slotted connections for component supports. Additionally, thirty (30) component support detail drawings were revised to correct information associated with jam nut installation.
9. Sargent and Lundy is further reviewing component support drawings in the Category I buildings and will provide a listing of slotted connections/jam nut requirements to Baldwin Associates. All component supports utilizing slotted connections, as stated on the S&L list, will be reworked as necessary and reinspected by Baldwin Associates to assure that jam nuts are properly installed.
10. An Engineering Change Notice (ECN 3178) has been issued to clarify the installation requirements for jam nuts utilized for HVAC duct hanger auxiliary steel structural connections.
11. At present, three (3) Baldwin Associates Stop Work Orders against the HVAC contractor (Zack Co.) are in effect, which prevent the continued installation of HVAC component supports.

To assure that existing HVAC work meets the designer's requirements, a 100% reinspection of the containment building HVAC auxiliary steel jam nut applications will be performed. Outside the containment building, a reinspection will be done on a sample basis. These reinspection plans are included in an overall Mechanical Stop Work Recovery Plan being prepared at Clinton and under close scrutiny by the NRC (Region III).

12. An Engineering Change Notice (ECN 3181) has been issued to clarify the installation requirements for jam nuts utilized for fan supports, HVAC duct hangers, and other miscellaneous attachments (primarily HVAC applications other than auxiliary steel discussed in 10 above). A 100% reinspection of items addressed in ECN 3181, which are in the containment building, will be performed. On items addressed in ECN 3181, which are outside the containment building, a reinspection will be performed on a sample basis.
13. The root cause of this deficiency has been determined to be a lack of understanding on the part of Architect/Engineer personnel in the correct way to specify jam nut installation requirements. In order to prevent recurrence, Sargent and Lundy will provide training for all applicable personnel into the requirements of, and correct way to specify, jam nut installation.

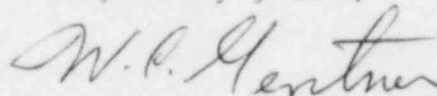
It is confident that the above stated corrective actions are adequate to prevent future occurrences.

SAFETY IMPLICATIONS/SIGNIFICANCE

It can be postulated that during operations, vibration could cause a loose jam nut to back off the bolt, falling onto and damaging some safety related component. Likewise a regular heavy hex nut could in the same manner vibrate off the bolt after the jam nut, adding to the possibility of damage to safety related equipment. It can further be postulated that if enough nuts worked loose, connections could fail and result in degradation of structural support of equipment. The postulated failure modes could adversely effect the safe operation of the facility.

We trust that this report is sufficient for your analysis and evaluation of the deficiency and corrective action.

Very truly yours,



W.C. Gerstner
Executive Vice President

cc: H.H. Livermore, NRC Resident Inspector
Director-Quality Assurance
Illinois Department of Nuclear Safety
Director, Office of I&E, Washington, D.C.