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ATTACHMENT (2)

HADDAM NECK PLANT

MILLSTONE NUCLEAR POWER STATION, UNIT NOS. 1 AND 2

PLANT-SPECIFIC PROGRAMS

845 294

JULY, 1979

PLANT-SPECIFIC PROGRAM

A. Millstone Unit No. 2

The refueling outage of Millstone Unit No. 2 provided the opportunity to inspect and test systems not accessible during operation. All anchor bolts in containment on the main steam, feedwater, shutdown cooling, and LPSI systems were inspected. Some anchor bolts on these systems outside of containment were also inspected. All of the concrete expansion anchor bolts used in Millstone Unit No. 2 are Hilti Kwik bolts or, in some cases, Wej-its.

During the 1979 refueling outage, a detailed field testing program was initiated by NUSCO field QC to inspect anchor bolts. The program consisted of checking as-built conditions, ultrasonically testing for embedment depth, and checking for tightness of anchor bolt nuts. The results of the program were audited by the Office of Inspection and Enforcement on May 10, 1979.

The program consisted of checking 496 bolts in containment and 401 bolts outside of containment. Every bolt on the base plate was tested for proper embedment and tightness of anchor bolt nut. The results of these inspections showed that approximately five percent of those UT tested did not meet the specific, minimum embedment. In each of these cases, a minimum factor of safety of four for the originally calculated bolt load was verified. The results of the large number of base plates and bolts that were inspected and tested comprise a data base that provides assurance of the operability of seismic Category I piping, while the remainder of the inspection and testing is completed.

A systematic program including review of original design calculations to determine base plate loads, determination of anchor bolt loads using the above-described analytical model, field inspection, and field testing of torque or tension is underway. Plans are to complete the analyses by the end of November, 1979, and to complete the testing in accessible areas by the end of December, 1979. Any additional tension or torque testing necessary in inaccessible areas will be done during the 1980 refueling outage, expected to begin in June. Design of any required modifications would be completed and modifications performed during the outage. Operability of safety-related systems would be confirmed.

Specific responses to I&E Bulletin Questions 1 through 4 for Millstone Unit No. 2:

(1) The generalized, finite element model briefly described above has been developed to respond to this question. We expect to submit a detailed description of the model in August, 1979. Analysis of the base plates and anchor bolts of the required systems is expected to be completed by the end of November, 1979.

(2) All of the expansion anchors on Millstone Unit No. 2 are of the wedge type. The analyses required for Question 1, the shear-tension interaction diagrams from the generic program as described above, and information from the manufacturers will be used to determine the minimum factor of safety. It is expected that this work will be completed by the end of November, 1979.

As mentioned above, based on the original design loads, the bolts reviewed have a minimum factor of safety of four.

(3) As described above, the cyclic load testing of the generic program is expected to provide information regarding the effect of both low cycle and high cycle loads on the static load capacity of the anchor bolts. We expect to submit a report on this program in August, 1979.

(4) As described above, a total of 897 bolts has already been inspected and tested at Millstone Unit No. 2. It is expected that field testing in accessible areas will be completed by the end of December, 1979 and that any additional tension or torque testing in inaccessible areas will be completed during the 1980 refueling outage.

Results of the cyclic load testing of the generic program will be used to assure the anchor bolts and base plates perform their intended function.

B. Millstone Unit No. 1

Since Millstone Unit No. 1 was down for a refueling outage in May/June, 1979, it was not practical to follow a systematic approach of performing analyses, inspecting, and testing. A testing program was initiated prior to performing any analytical work on existing base plates and anchor bolts. As described in Reference (2), due to several problems associated with verification of proper installation of shell-type anchors, it became obvious that replacement with wedge-type anchor bolts would be more expedient than complete field testing of the shell type. NNECO, therefore, initiated replacement of self-drilling, shell-type anchor bolts subjected to tension loads on the safe shutdown systems with wedge-type anchor bolts during the 1979 refueling outage. Approximately 400 base plates with approximately 2,000 anchor bolts were replaced. The replacement approach was selected because of the time limitations of the refueling outage; NNECO had not reached a negative finding with respect to the adequacy of the original supports. As of this date, all shell-type anchor bolts on safe shutdown systems, subject to tension loads, including the isolation condenser, shutdown cooling, condensate storage and transfer system, service water, reactor building closed cooling water system, control rod drive system, low pressure coolant injection (LPCI), feedwater and main steam have been replaced with wedge-type anchor bolts. Based on data developed in a torque test of Hilti Kwik Bolts performed at Millstone Unit No. 3, it is our conclusion that the actual installation torque of the Hilti Kwik Bolts used assured an initial preload greater than 25 percent of the ultimate static capacity of the bolts. Furthermore, tests done for the FFTF show the expansion anchor bolts could successfully withstand two million cycles at a maximum intensity of 0.2 of the static capacity and the observed failure load was about the same as the ultimate static capacity.

The new wedge-type anchor bolts were designed for a minimum safety factor of four as required by I&E Bulletin #79-02, Question 2. Bolt load analysis was performed to account for the effects of shear tension inter-

action, minimum edge distance, and proper bolt spacing. The base plate flexibility was also accounted for in the calculation of the anchor bolt loads. In a majority of cases, thicker base plates were used to assure rigid plated design. Bechtel Power Corporation designed the modified base plates and anchor bolts. Additionally, Northeast Utilities Service Company (NUSCO) checked the designs using the TES finite element model and verified the minimum factor of safety of four on the design bolt loads.

In addition, all existing wedge-type anchors on these systems were checked for proper embedment length.

The replacement of the base plates and anchor bolts on the above-described safe shutdown systems assures the operability of those systems. A program is underway to perform analyses, to inspect and to test, and to modify as found to be necessary, the base plates and anchor bolts on the remaining seismic Category I systems to be addressed in accordance with I&E Bulletin #79-02. The analyses are expected to be completed by the end of October, 1979 and the inspection and testing of accessible systems completed by the end of December, 1979. Inspection and testing of the inaccessible systems will be completed during the 1980 refueling outage, expected to begin in Augustof 1980. Where practical, necessary modifications will be made prior to the 1980 refueling outage with the remainder completed during the outage.

Specific responses to I&E Bulletin #79-02, Questions 1 through 4, for Millstone Unit No. 1:

(1) The generalized finite element model briefly described above has been developed to respond to this question. We expect to submit a detailed description of the model in August, 1979. Analyses of the base plates and anchor bolts of the required systems are expected to be completed by the end of October, 1979.

(2) All of the replacement anchor bolts were wedge-type bolts and were designed to have a minimum factor of safety of four. A conservative, linear shear-tension interaction relationship was assumed. The finite element program described above will be used to calculate the minimum factor of safety of either four or five, as appropriate for this type of bolt, for base plates of the remaining systems. It is expected that the analysis of the base plates and anchor bolts of the required systems will be completed by the end of October, 1979. Depending on the type of bolt, a factor of safety of four or five will be assured.

(3) The cyclic load testing being done as part of the generic program is expected to provide information regarding the effect of both low cycle and high cycle loads in the static load capacity of the anchor bolts. We expect to submit a report on this program in August, 1979.

(4) Approximately 2,000 wedge-type bolts were installed during the 1979 refueling outage with an installation torque that assures adequate preload, as described above. Records have been kept showing specified size and types were correctly installed. The various steps of the

program of analysis, inspection, testing, and modification, as appropriate, are expected to be completed as described above with all of the work completed by the end of the 1980 refueling outage.

C. Haddam Neck Plant

In addition to the early generic program work that is necessary to respond to I&E Bulletin #79-02, a large-scale program of inspection, testing, and analysis of base plates and anchor bolts has been undertaken. Since the completion of the large-scale replacement program on Millstone Unit No. 1, there are considerably more resources to apply to the effort for the Haddam Neck Plant.

Initially, eight systems, including feedwater, main steam, reactor coolant, CVCS, RHR, service water, ECCS, and spent fuel pool, have been identified as Category I seismic systems and drawings of these systems and their supports have been assembled. A review of any additional systems is underway.

Inspection of accessible systems is being performed and is expected to be completed by the end of July, 1979. Field testing of anchor bolts, using direct tension where practical and torque testing where necessary is being performed. Rather than waiting to calculate design loads for each anchor bolt, the test load is conservatively established as one fourth of P(ultimate) for the particular size of bolt (i.e., 1.25 x Pu/5 for shell-type anchors). It is planned to complete the analysis of most of the accessible systems by the end of August, 1979. Field testing of both the accessible and inaccessible base plates and anchor bolts is planned for completion by the end of October, 1979. If found necessary, modifications of the supports on the accessible systems will be made concurrently with the inspection and testing with consideration given to the operability of the system. Completion of any appropriate modification is expected to be completed by mid-November, 1979.

As of July 5, 1979, a visual inspection of 107 base plates has been performed and no unacceptable conditions found. Again, as of July 5, 1979, the anchor bolts of 23 base plates have been direct-tension tested and no base plates were found for which the anchor bolts could not be proven able to withstand the test load.

The results obtained thus far provide confidence that the base plates and anchor bolts will continue to function as expected while inspection, analysis, and testing program is completed within the scheduled described above.

The actual analysis of piping systems for seismic accelerations will be performed since present seismic analysis requirements have changed significantly since the time of original design and licensing of the Haddam Neck Plant. This reanalysis could likewise require reanalysis of some base plates if loads change.

Specific responses to I&E Bulletin #79-02, Questions 1 through 4, for the Haddam Neck Plant:

(1) The generalized finite element model briefly described above has been developed to respond to this question. We expect to submit a detailed description of this model in August, 1979. Analyses are expected to be completed by the end of October, 1979.

(2) Both shell-type and wedge-type expansion anchors have been used at the Haddam Neck Plant. The analyses required for Question 1, the shear-tension interaction relationships of the generic program described above, and information from manufacturers will be used to determine the minimum factor of safety, the criteria being four or five as appropriate. Plans are to complete this work by the end of October, 1979.

(3) The cyclic load testing being done as part of the generic program is expected to provide information regarding the effect of both low cycle and high cycle loads on the static load capacity of the anchor bolts. We expect to submit a report on this program in August, 1979.

(4) An inspection and testing program to establish the specified size and type of expansion anchor bolts has been initiated. Direct tension testing to provide the ability of the bolts to withstand potential loads is used to the extent practical and where not practical, torque testing is used.

As described above, the results obtained thus far provide confidence that the anchor bolts will continue to function as expected while the inspection and testing proceeds. Plans are to complete the inspection and testing of accessible systems by August, 1979, and of inaccessible systems, during the first extended outage. Modifications to all Category I systems are expected to be completed by mid-November, 1979.