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DUKE POWER COMPANY

NUCLEAR REGULATORY COMMISSION
ATLANTA, GEORGIA

POWER BUILDING

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September 16, 1980

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

Mr. J. P. O'Reilly, Director
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Re: McGuire Nuclear Station
Docket Nos. 50-369, -370

Subject: RII:JPO
IE Bulletin 79-02, Revision 2

Dear Mr. O'Reilly:

Please find attached a supplemental response to IE Bulletin 79-02, Revision 2. Note that this letter supplements previous Duke Power Company responses dated January 7, 1980, July 6, 1979 and August 20, 1979.

Very truly yours,

William O. Parker, Jr.
William O. Parker, Jr. *By [Signature]*

LJB:scs
Attachment

cc: Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

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MCGUIRE NUCLEAR STATION

Responses to USNRC IE Bulletin 79-02, Revision 2

Original: July 6, 1979
Revision 1: January 7, 1980
Revision 2: September 16, 1980

McGuire Nuclear Station is in the later stages of construction and very near completion and fuel load of Unit #1. Essentially all pipe supports have been erected in Unit #1 and a large number have been erected in Unit #2. The following is a summary, by item, of the extent and manner in which Duke Power Company intends to satisfy Actions 1 through 9 of the IE Bulletin 79-02, Revision 2.

Response 1:

Duke Power Company will account for base plate flexibility in the calculation of expansion anchor bolt loads for all Seismic Category I pipe support base plates using either a conservative hand calculation method which has been verified by non-linear finite element analysis or a specific non-linear finite element analysis for a particular base plate. The models and boundary conditions, including appropriate load displacement characteristics of the anchors, used for the finite element analyses, are based on Duke studies and on work performed by Teledyne Engineering Services which was sponsored by a group of thirteen (13) utilities formed to respond to generic items of IE Bulletin 79-02. All expansion anchor support plates designed prior to implementing these analysis methods are being reanalyzed accordingly and will be modified if required to comply with allowable anchor bolt loadings.

Response 2:

The minimum factors of safety, between the expansion anchor bolt design load and the bolt ultimate capacity determined from static load tests, used in Duke's design of pipe supports, are as follows:

Normal Conditions	-	4
Upset Conditions	-	4
Faulted Conditions	-	2 1/8

These factors of safety are for wedge type and sleeve type expansion anchors. Some shell type anchors were used in the early stages of McGuire construction. Use of shell type anchors for Nuclear Safety Related applications was discontinued in February 1975. Duke Power Company has identified all pipe supports using shell type anchors and the design of these supports has been reviewed to assure that a minimum factor of safety of five (5) is maintained.

McGuire Seismic Category I expansion anchor installations are restricted to normal weight structural concrete of varying strengths. Expansion anchor bolt ultimate load capacities are based on manufacturer's test results and recommendations for normal weight concrete and installed concrete strengths.

McGuire Seismic Category I expansion anchor designs properly account for shear-tension interaction, minimum edge distances and bolt spacing in accordance with manufacturer's test results and recommendations.

Response 3:

Duke Power Company designs pipe supports to resist all applicable loadings including seismic loads, hydro test loads, normal operating loads, thermal loads, etc. A support is designed for a static or quasi-static load resulting from the most critical combination of the applicable loadings. The safety factors used for the expansion anchors are as specified in Response 2. Duke Power Company co-sponsored tests performed by Teledyne Engineering Services to demonstrate that expansion anchors installed at McGuire Nuclear Station will perform adequately under both low cycle/high amplitude loading (seismic) and high cycle/low amplitude loading (operating). The final test report was generically submitted to USNRC for all Duke Power Company Nuclear Stations as described in Mr W O Parker's (Duke) letter to Mr J P O'Reilly (USNRC, RII) dated August 20, 1979 regarding McGuire Nuclear Station.

Response 4:

Duke Power Company has developed and is continuing to develop sufficient documentation to verify that expansion anchors used in Nuclear Safety Related pipe supports are the correct size and type and are properly installed in accordance with manufacturer's recommendations. The following is a summary of documentation developed:

In February 1977, Duke Power Company initiated some random testing of installed expansion anchors. This testing was performed in response to concerns developing in the industry about improper installation practices. Based on these tests, Duke decided that a formal inspection program for concrete expansion anchors would be implemented.

In March 1977, Construction Procedure CP-503 was issued for wedge, sleeve and self-drilling type concrete expansion anchor inspection. There were four criteria to be met: 1) spacing, 2) perpendicularity, 3) torque, and 4) embedment depth, except for self-drilling anchors which had no specified torque.

In June 1977, inspection was initiated to check anchors installed prior to issue of CP-503. All anchors for all pipe supports not having documentation in accordance with CP-503 were inspected in accordance with CP-503 and documented. A sampling of other types of attachments using expansion anchors was also made. A total of 4357 anchors were inspected, 2072 of which were pipe supports. This inspection was completed in September 1978.

In August 1977, QA Procedure M-52 was issued which supersedes CP-503 as the applicable inspection procedure for concrete expansion anchors. M-52 stated that only anchors greater than 5/8" Ø required torque inspection and this was later revised to all anchors with a specified torque greater than 100 ft-lbs.

This reduction in torque inspection was based on the results of the testing performed in which only 2 of the 4357 anchors failed to meet torque requirements.

In April 1975, Construction Procedure CP-308 was issued to provide control over the installation of concrete expansion anchors. This procedure has been updated periodically to reflect the experience gained by Duke through its inspection and testing programs.

Self-drilling shell type expansion anchors were installed in accordance with the manufacturer's recommended installation procedures. Adequate embedment depth and full expansion of the shell is assured since the anchor shell itself is used to drill its own hole and the shell is driven below the surface of the wall in the final installation step. Shell type anchors were inspected for size, type, perpendicularity, spacing and bolt snugness. Response 2 indicated that Duke has identified all Seismic Category I pipe supports using shell type anchors. Duke implemented a shell type anchor inspection program in accordance with IE Bulletin 79-02, latest revision, to supplement existing documentation. The parameters inspected were bolt thread engagement, shell shoulder to plug measurement, perpendicularity and bolt hole size, in addition to pull testing a 3% sample of visually acceptable shell type expansion anchors in each system to confirm that the visual inspection program is sufficiently rigorous to identify any deficiency having a significant effect on load carrying capability of the anchor. This inspection and testing program is outlined in McGuire Nuclear Station Specification MCS-1196.02-00-0003.

A total of 52 supports with 242 self-drilling anchors were inspected at McGuire Unit 1. Four (4) supports were in the Diesel Generator Building, five (5) were in the Reactor Building and the remainder were in the Auxiliary Building. The 3% pull test sample was completed with 8 anchors being tested. None of the sample anchors failed the pull test. Thirteen (13) of the 242 self-drilling anchors were found to have significant deficiencies which had the potential for degrading their ultimate load carrying capability.

Plate bolt hole size is specifically not inspected as part of the Duke expansion anchor inspection program. In response to Revision 1 of IE Bulletin 79-02, Duke inspected 331 bolt holes in 104 plates which utilized either sleeve or wedge anchors to confirm that plate bolt hole sizing was not a problem. Seven (7) plate bolt holes were found to be slightly undersized and 38 were found to be slightly oversized from design drawings. All of the plate bolt hole sizes were acceptable. Duke has concluded that this test sample provides reasonable and adequate assurance of proper plate bolt hole size for wedge and sleeve type expansion anchors.

The supplemental Self-Drill Inspection Program implemented under MCS-1196.02-00-0003 identified 55 of 191 plate holes inspected as oversized. This oversizing was determined to be due to the self-drill anchor installation procedures. All oversized holes have been reviewed and modifications made where required.

In order to address the question of the relationship of cyclic/ load carrying capacity to installation procedure (anchor preload), the tests referred to in Response 3, performed by Teledyne Engineering Services and sponsored by the group of thirteen (13) utilities, have been performed on anchors installed in accordance with manufacturer's recommended installation procedures and have no more preload than is provided by the use of these procedures. Based on Duke's understanding of the behavior of expansion anchors and on cyclic testing which has been performed, Duke Power Company is confident that the anchors will perform adequately.

Response 5: Nuclear Safety Related/seismic pipe supports are prohibited from being attached to block (masonry) walls using concrete expansion anchors. In response to Revision 2 of IE Bulletin 79-02, Duke Power Company has conducted an on-site confirmatory review at McGuire Unit 1 of Nuclear Safety Related/seismic pipe supports to assure that no such installations exist. Results of this review have confirmed that there are no such installations of this type at McGuire Nuclear Station Unit 1.

Response 6: The expansion anchor installation and inspection procedures utilized at McGuire Nuclear Station and described in Response 4 apply to all expansion anchors installed in Nuclear Safety Related pipe supports. Each expansion anchor is inspected regardless of the physical configuration of the steel members being connected to the concrete. These supports are included in the actions being performed by Duke Power Company to satisfy the requirements of IE Bulletin 79-02.

Response 7: McGuire Nuclear Station is currently under construction, therefore Bulletin Item 7 is not applicable.

Response 8: McGuire Nuclear Station is currently under construction, therefore Bulletin Item 8 is not applicable.

Response 9: Those pipe supports which have not been installed are included in actions performed to meet the requirements of IE Bulletin 79-02 as outlined in Responses 1 through 6.

Revision 2 of Item 2 of the Bulletin requests verification by Duke Power Company that a uniform factor of safety was applied for all load combinations in the design of expansion anchors for McGuire Nuclear Station. The expansion anchor design factors

of safety utilized are outlined in Response 2 and are graded based on the normal, upset and faulted load combination. The gradation approach is consistent with design practices for other types of structures subject to the same load combinations.

There are no previously unreported instances in which Duke Power Company did not meet the revised (R2) sections of Item 4 prior to its issuance.

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