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REPLY TO:
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B.4.1.1
WVY 79-95

August 29, 1979

United States Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region I
631 Park Avenue
King of Prussia, PA 19406

Attention: Mr. Boyce H. Grier, Director

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) USNRC Letter to VYNPC dated March 8, 1979
(c) VYNPC Letter to USNRC dated July 6, 1979
(d) USNRC Letter to VYNPC dated July 26, 1979
(e) VYNPC Letter to USNRC dated July 31, 1979
(f) USNRC Letter to VYNPC dated August 3, 1979

Dear Sir:

Subject: Second Supplementary Response to I&E Bulletin 79-02, Revision 1

As a result of several telephone conversations around August 2, 1979, a meeting between Vermont Yankee personnel and NRC staff members was held in Bethesda, Maryland on August 8, 1979. This meeting covered an agenda included in Reference (f).

During the week of August 14, NRC staff members requested that certain work accomplished by Vermont Yankee before the meeting be redone using a more conservative method. The following response documents the statements made at the original meeting and the results of the additional work requested:

As stated previously, Vermont Yankee concluded that Seismic Category I piping systems are capable of withstanding seismic design loads despite the low percentage of anchor bolt failures found during testing required by NRC. This is because of highly conservative seismic design loadings required during the original plant design. These conservatisms were incurred by the following design cycle.

1. Original design was accomplished to loads derived from building response spectra from a ground motion of .07 g not amplified for equipment responses. Damping values used were 5% for the concrete buildings and 1% for the steel drywell. The building response accelerations were increased by a factor of 4 to account for equipment responses.

2. Late in the construction cycle amplified response spectra were developed for Vermont Yankee and were found to give resonant peak accelerations much higher than those produced in the original estimate.

3. Pipe stresses and support loads were then divided by the original acceleration factors and multiplied by the new ARS peak response accelerations times and a modal contribution factor of 1.3. The resulting loads on piping and seismic supports caused large scale redesign of supporting structures. All piping supports were designed to include a factor of safety of five for DBE.

This redesign cycle assumed that all piping systems were in resonance with the building structures and applied acceleration forces which would be present only if they were in resonance. Our resonance evaluation was conducted to show that most of our systems are not in resonance and therefore, the new "Robinson Fix" accelerations are in reality factors of safety on these seismic supports.

This resonance evaluation was modified by an NRC staff request for the use of a more conservative method to determine piping runs which are in resonance. This method is taken from D. J. Gorman's "Free Vibration Analysis of Beams and Shafts," J. Wiley and Sons, 1975. The results of this modified resonance evaluation show the following runs to have natural frequencies below ten cycles per second. Building peak response frequencies are at 5.5 cycles per second.

RCIC	two runs
HPCI	one run
RHR	one run
SW	one run
SGT	one run
CST	one run

Of the systems in resonance the following approximate percentages apply to the affected portion of the total systems:

RCIC	35 percent
HPCI	8 percent
RHR	8 percent
SGT	70 percent
CST	13 percent
SW	5 percent

To date, anchor bolts in the portions of the RCIC, HPCI, SW and RHR systems, initially identified to be in resonance have been inspected and/or replaced as necessary to achieve the required design load capability. The remaining runs, which were identified within the past week to be in resonance, will be addressed as follows:

1. RCIC (6" Suction from CST) - The accessible anchor bolts associated with the seismic restraints in question will be inspected and/or repaired to achieve the required design load capability on or before September 4, 1979. In parallel, a more detailed engineering analysis, versus the initial hand calculation, is being conducted to ascertain the degree of conservatism contained in the hand calculation method. If it can be shown by the detailed analysis that resonance is not a problem in the existing geometry, the schedule for completing the inspection and/or repair will be deferred until the end of the upcoming refueling outage.

2. CST (4" Suction to CRD Pumps) - Visual examination of the subject line indicates that bolts subject to tensile stresses are the embedded type. The six expansion type anchor bolts installed in this system are subject to only shear stress.

3. RCIC (4" Test Line) - The portion of this line identified to be near resonance is isolable. It's configuration is such that propogation of failure to any other safety related system or loss of isolation capability is highly improbable.

4. SBGTS - The anchor bolts associated with the three seismic restraints in question will be inspected and/or repaired to achieve the required design load capability on or before September 4, 1979.

Cross coupling due to the two direction earthquake for which Vermont Yankee piping systems were designed was considered to have inconsequential effects upon the resonance estimates.

The amplified response spectra were developed by inputing time history accelerations into a multi-degree of freedom dynamic model of the building. Time history accelerations were used to construct a maximum response spectrum of the piping systems located at the various building mass points. The floor response spectra for piping systems used a damping ratio of .005. The time history input used the -N69°W component of the Taft earthquake normalized to .07 g for DBE. SSE values used are two times DBE.

Pre-tension values for existing expansion anchor bolts at Vermont Yankee are established by applied torques. To verify that tensile values are achieved by the torque method, tests of several bolts of each size were conducted on existing bolts in the plant. These tests use belleville washers with known displacement versus load values and calibrated torque wrenches. Torque versus load curves were established which show our normally required torque values to be conservative. The following data are indicative of the results for Phillips Redheads:

Bolt Size	Required Tension (lbs.)	Required Torque (ft-lbs)	Tension at Min. Tq. Value (lbs)	Standard Dev. (lbs)
1/2	2253	28-31	2271	135
3/4	4293	76-84	4646	80
7/8	4463	98-108	4648	125

Safety priorities used on anchor bolt testing and replacement follow safety class boundaries where possible. In some cases it is more convenient to repair or replace anchor bolts in a specific area, in which case some lower safety class systems will be replaced first. In cases where resonant system runs were identified these runs are being given priority over other runs and systems. Within these systems the higher safety class are receiving first attention.

The following are our estimates concerning number of base plates and types and number of bolts in the system runs identified to be in resonance which you requested. These are listed by system:

System	No. Baseplates	Type Baseplates	No. Bolts/BP
RCIC	6	wall	4
RBSW	7	wall	4
HPCI	13	wall, floor ceiling	2,2s 2,6s* 5,4s 2,5s 1,10 1,8
RHR	5	wall, 1 floor	2,6s 1,4 1,8 & 1,10
SBGTS	4	wall	4,4s

*2,2s means two, two bolt baseplates etc.

This information for the two remaining systems has not yet been tabulated. We estimate the numbers will be in about the same ratio as those presented above.

We are confident that this letter provides the information you require. If, however, you need additional information, please contact us at your convenience.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

D. E. Moody
Manager of Operations

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