

Exelon Generation Company, LLC  
Byron Station  
4450 North German Church Road  
Byron, IL 61010-9794

www.exeloncorp.com

10 CFR 50.55a

March 29, 2001

LTR: BYRON 2001-0040  
File: 3.03.0800

United States Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Byron Station, Units 1 and 2  
Facility Operating License Nos. NPF-37 and NPF-66  
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Second Interval Inservice Testing Program Relief Request PR-2

Reference: Letter from Richard Barrett (NRC) to Thomas Kovach (Commonwealth Edison Company), "Safety Evaluation of the First Ten-Year Interval Inservice Testing Program for Pumps and Valves and Associated Requests for Relief for Byron Nuclear Power Station, Units 1 and 2," dated January 31, 1992

In accordance with 10 CFR 50.55a, "Codes and Standards," Paragraph (a)(3)(i), we are requesting approval of the attached request for relief from Inservice Testing (IST) program requirements for the two Essential Service Water (SX) Makeup Pumps. These two pumps serve both Byron Station Unit 1 and Unit 2 by providing an emergency source of makeup water to the Ultimate Heat Sink.

We have concluded that the American Society of Mechanical Engineers (ASME) Code requirements for pump vibration limits that prompt increased monitoring (i.e., Alert Range) are not applicable to the unique design configuration of these pumps and their prime movers as the pump's thrust bearing is located in the right angle gearbox located approximately 39 feet above the pump. The proposed alternate Alert Range vibration limit for the SX Makeup pumps gearbox measurements will provide an acceptable level of quality and safety. Relief is requested for the remainder of the second IST interval for Unit 1 and Unit 2.

In the referenced Safety Evaluation, the NRC conditionally granted a similar Relief Request for the first IST interval. The noted condition involved obtaining vendor concurrence with the proposed vibration limits. This previous Relief Request involved a proposed alternative to both the Alert Range and the Required Action Range. The vendor provided concurrence for the Alert Range but not the Required Action Range. Consequently, without vendor concurrence, the Relief Request was not utilized.

AD47

March 29, 2001


Byron Ltr: 2001-0040

**U.S. Nuclear Regulatory Commission**

This Relief Request addresses only the Alert Range vibration limit, for which both the equipment supplier and gearbox manufacturer have provided concurrence. These concurrences are documented in letters from the equipment supplier and gearbox manufacturer and are included in Attachment 2.

Should you have any questions concerning this letter, please contact P. Reister, Regulatory Assurance Manager, at (815) 234-5441, extension 2280.

Respectfully,

  
Richard P. Lopriore

Richard P. Lopriore  
Site Vice President  
Byron Nuclear Generating Station

**Attachments:** Attachment 1 – Byron Station Second IST Interval Relief Request for Essential Service Water Makeup Pumps – PR 2  
Attachment 2 – Vendor Concurrence Letters

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Byron Station

**Attachment 1**  
**Byron Station Second IST Interval Relief Request for Essential Service Water**  
**Makeup Pumps – PR 2**

## Relief Request PR 2

<u>Component Number</u>	<u>System</u>	<u>Code Class</u>
0SX02PA	Essential Service Water	3
0SX02PB	Essential Service Water	3

### Component Function(s)

The Essential Service Water (SX) Makeup Pumps provide an emergency source of makeup water from the river screen house to the SX cooling tower basin (i.e., Ultimate Heat Sink).

### Code Requirements

ASME/ANSI OMa-1988, Part 6, Paragraph 6, "Analysis and Evaluation," requires that if deviations fall within the Alert Range of Table 3a, "Ranges for Test Parameters," the frequency of testing specified in Paragraph 5.1 shall be doubled until the cause of the deviation is determined and the condition corrected. If the deviations fall within the Required Action Range of Table 3a, the pump shall be declared inoperable until the cause of the deviation has been determined and the condition corrected.

The Table 3a vibration limits for centrifugal and vertical line shaft pumps operating at or above 600 rpm, with a vibration reference value  $V_r$ , are as follows.

Vibration Reference Value	Acceptable Range	Alert Range	Required Action Range
$V_r$	$\leq 2.5V_r$	$> 2.5V_r$ to $6V_r$ , or $> 0.325$ in/sec	$> 6V_r$ or $> 0.70$ in/sec

### Relief Request History

Relief from the vibration limits of Table 3a was previously requested for these pumps and conditionally granted by the NRC on January 31, 1992, as documented in the referenced letter. The condition allowed one year for us to obtain vendor concurrence with the requested vibration limits for the Alert and Required Action Ranges.

Specifically, the requested relief was for the vibration levels at the gearbox of the SX Makeup Pump. The ASME/ANSI Code OMa-1988, Part 6 limits establish the beginning of the Alert Range at either 2.5 times the reference vibration value or 0.325 inches per second (in/sec), whichever is less. Part 6 also establishes the Required Action Range at 6.0 times the reference vibration value or 0.700 in/sec, whichever is less. Byron Station previously requested the Alert Range be established at 2.5 times the reference vibration value or 0.600 in/sec, whichever is less; and the Required Action Range be established at 6.0 times the reference vibration value or 0.900 in/sec, whichever is less.

In the associated Safety Evaluation, the NRC indicated that although the proposed Alert and Required Action Range thresholds appeared reasonable, obtaining the vendor's concurrence of these limits was appropriate. In consideration of this issue, Relief was conditionally granted, providing we obtained the vendor's concurrence within one year.

Only partial concurrence from the vendor was received. The vendor supported 0.550 in/sec for the Alert Range limit; however, they did not concur with the proposed 0.900 in/sec for the Required Action Range. Consequently, the SX Makeup Pumps vibration levels have remained in the Alert Range as established by Table 3a.

As outlined below, Byron Station is now requesting Relief for only the Alert Range limits of Table 3a. Byron Station proposes that the SX Makeup Pumps Alert Range limit be established at the limit previously agreed upon by the equipment supplier. The gearbox manufacturer has also concurred with this increased limit.

### **Basis for Relief**

Relief is requested pursuant to 10 CFR50.55a, "Codes and Standards," paragraph (a)(3)(i), as the proposed alternatives would provide an acceptable level of quality and safety.

The SX Makeup Pumps are a unique design. A horizontal diesel drives a right angle gearbox located approximately 39 feet above the pump. The driveshaft from the gearbox to the pump consists of five coupled sections and is located in the pump discharge piping column. Pump thrust is carried by bearings physically located within the gearbox. The centrifugal pump is submerged in river water (see figure 1).

This pump configuration is not addressed by ASME/ANSI Code OMA-1988, Part 6. Due to the monitoring limitations of this design, and because of its similarity to Code requirements for vertical line shaft pumps, vibration is monitored on the gearbox. The limitation of taking the vibration readings at this location is that the resultant vibration readings are not attributable to the pump. Vibration analysis has indicated the vibration readings obtained are the result of vibration induced by the diesel engine and gearbox itself, along with a resonant condition of the gearbox and its foundation.

Since the previous request for relief, maintenance and inspection activities have indicated that the angle gearboxes have been operating properly and without degradation. Maintenance and inspection activities on the pumps have indicated that there has not been any pump degradation due to the vibration observed on the gearboxes. Likewise, the pump units have not caused vibration degradation of the gearboxes. The pump impellers have been replaced with stainless steel units and the wear rings replaced with a more wear resistant alloy, due to the adverse quality of river water associated with SX Makeup Pumps. The new pump assemblies were tested at the vendor's facility and exhibited very low vibration levels.

Byron Station also recently consulted an industry vibration expert and vendor representative from the gearbox company, in an effort to ensure vibration levels are as low as achievable with this particular design, and to assure the existing vibration levels are not indicative of pump degradation. These efforts included the following activities.

- Field service representatives from the gearbox company supervised the refurbishment of the two gearboxes. Both refurbished units were then installed on the pumps. The units that were refurbished had seen a significant amount of service under the historically higher vibration conditions and when inspected did not show any vibration related degradation.
- Bi-directional support braces were installed on the gearboxes to address the vibration resonance problem.
- The gearboxes were precision aligned and the couplings were balance checked upon installation.

All these efforts combined have resulted in some reduction in the vibration levels; however not enough to remove the pumps from the ASME Code Alert Range. Since installation during plant construction, both pumps have experienced vibrations at the gearbox locations of up to 0.6 in/sec. We have concluded that vibration levels recorded at the gearbox locations are normal for the unique design configuration and do not indicate an unusual condition of the gearbox or the pump. The limits established in the below Proposed Alternate Testing section will ensure that required action is taken if vibration levels increase while ensuring the pump isn't prematurely declared inoperable.

The basis for the double test frequency is to provide for increased testing when vibration levels may indicate an abnormal pump condition. Since the gearbox normally exhibits relatively high vibration levels, due to its unique design, the use of the Table 3a Alert Range limits would not be practical in that it would require double test frequency when the vibration level is normal. Raising the Alert Range limit for these pumps would ensure the pumps are placed in double test frequency at a vibration level that would be abnormal for the SX Makeup Pumps' design configuration. Consequently, this proposed alternative provides an acceptable level of quality and safety.

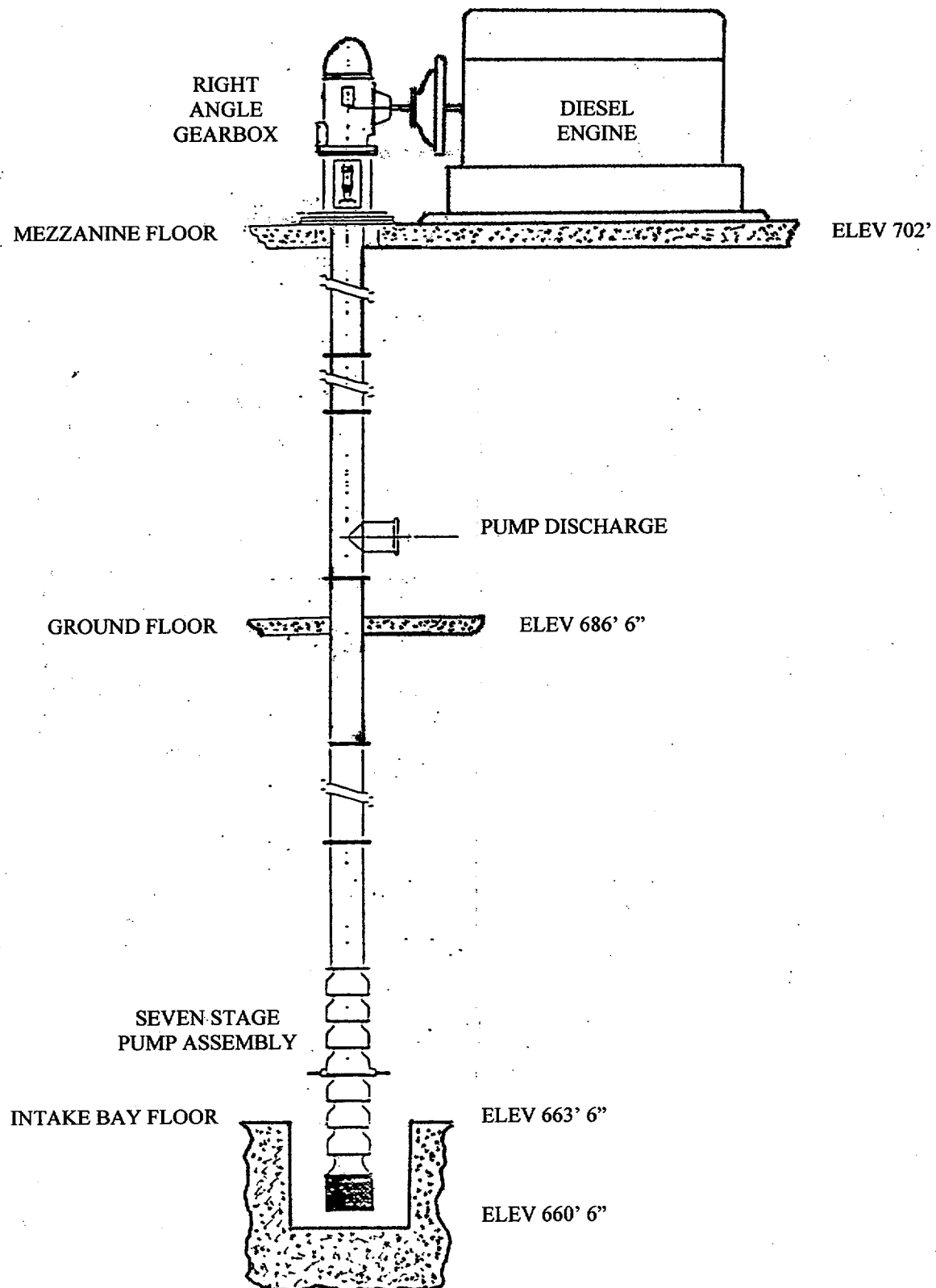
### **Proposed Alternate Testing**

To allow for practical vibration monitoring of the SX Makeup Pumps (i.e., 0SX02PA and 0SX02PB), alternate vibration acceptance criteria are required. Vibration monitoring will be performed during each quarterly test and the following vibration acceptance criteria will be applied:

Test Parameter	Acceptable Range	Alert Range	Required Action Range
$V_r$	$\leq 2.5V_r$ , or $\leq 0.550$ in/sec	$> 2.5V_r$ to $6V_r$ , or $> 0.550$ in/sec	$> 6V_r$ or $> 0.70$ in/sec

Hydraulic parameters will continue to be monitored and evaluated in accordance with ASME/ANSI OMa-1988, Part 6.

FIGURE 1 – BYRON STATION ESSENTIAL SERVICE WATER  
MAKEUP PUMP LAYOUT



**Attachment 2**  
**Vendor Concurrence Letters**





## PHILADELPHIA GEAR CORPORATION

181 South Gulph Rd.  
King of Prussia, PA 19406  
(610) 265-3000 Fax (610) 337-5637

March 1, 2001

Exelon Nuclear  
Byron Station  
4450 N. German Church Rd.  
Byron IL 61010

Attention: Mike Robinson

Subject: Relief request for Essential Service Water Make-Up Pumps vibration

The AGMA (American Gear Manufacturer Assoc.) standard 6000-A88 for measurement of linear vibration applies to this unit. This standard identifies subject unit as a class "B" type gear unit, (gears with a pitch line velocity of  $\geq 5000$  fpm). Under section 7.1 of this standard the recommended maximum allowable levels of filtered housing vibration in terms of velocity is 0.3 inches per second peak.

The level of allowable vibration in the AGMA specification is established as a gear manufacturer standard for gear unit testing in the manufacturers shop and does not generally apply to associated equipment in the drive train. Acceptable test and operating limits for additional equipment should be independently specified. In field installation gearbox vibration levels are sometimes higher due to environmental and system influences. The standard can be applied for this particular type of moderate speed system as a good barometer of overall machine health.

The Byron Station Essential Service Water Make-Up Pumps have routinely experienced vibration levels above 0.3 inches per second. Historically the higher vibration levels have never been associated with poor pump performance to our knowledge. During the recent disassemble and inspection of the gear units overseen by a Philadelphia Gear serviceman, there was no evidence that the higher levels were detrimental to the gearbox gears bearings or other associated rotating components. Based on the duty that these units would see if their use were required, the following action levels would be considered acceptable.

Alarm (Alert) = 0.55 IPS overall in any plane  
Shutdown (Action) = 0.7 IPS overall in any plane

Should the measured vibration readings taken periodically indicate an upward trend of overall or discreet frequencies or if the spectrum displays frequencies previously undetected, then further diagnoses shall be required at that time.

PHILADELPHIA GEAR CORP.

George D Lankford  
Field Service Engineer

ATTACHMENT C

**STEWART & STEVENSON SERVICES, INC.**

P.O. BOX 1637 - HOUSTON TEXAS 77261-0637 • (713) 923-2151  
ADMINISTRATION BLDG FAX (713) 923-8866 • PURCHASING DEPT FAX (713) 923-1111  
TELEX 964387 - TWX 910-830-8800

1-21-93  
TRANSMISSION DATE

**RECIPROCATING ENGINE DIVISION**

We are transmitting 1 pages (including cover letter). If transmission is incomplete, please call (713) 923-0317.

Please deliver to:

Page 1 of 1NAME Warren WagnerFROM Jim BellFIRM Commonwealth EdisonPHONE NO (713) 923-0337FAX NO (815) 234-5441 X2270FAX NO (713) 923-4917

REFERENCE: 8V71N Pump Unit  
W.O. N74410

Dear Mr. Wagner,

As per our telephone conversation Stewart & Stevenson's minimum standard for vibration peak to peak is 6 mils displacement at 1800 RPM horizontal and vertical. This corresponds to .56 inches per second velocity peak.

The existing .55 inches per second velocity peak corresponds to 5.8 mils displacement peak to peak which is within tolerance.

If you have any further questions, please get back with me.

Very truly yours,

  
James Bell

cc: Robert Mitcham

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