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NEW ORLEANS, LOUISIANA 70160 • (504) 595-3100
MIDDLE SOUTH UTILITIES SYSTEM

October 3, 1986

W3P86-2549
A4.05
QA

Mr. George W. Knighton, Director
PWR Project Directorate No. 7
Division of PWR Licensing-B
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Waterford SES Unit 3
Docket No. 50-382
Additional Information
Technical Specification Change Request NPF-38-37

Reference: W3P86-1989 dated August 29, 1986

Dear Mr. Knighton:

By the referenced letter LP&L submitted a proposed Technical Specification change requests (NPF-38-37) to revise the location of two seismic monitors. One monitor was being physically relocated to a lower temperature environment. The second monitor was remaining in-place, however the Technical Specification location was in error.

In discussions with your staff, additional information was requested concerning the relocated monitor. Enclosed please find LP&L's response.

Should you require further information, please contact Mike Meisner at (504) 595-2832.

Yours very truly,

K.W. Cook

K.W. Cook
Nuclear Support & Licensing Manager

KWC/MJM/ssf

Enclosure

cc: B.W. Churchill, W.M. Stevenson, R.D. Martin, J.H. Wilson, NRC Resident Inspector's Office, C. Morris (NRC-NRR)

A001
1/1

W3P86-2549

bcc: J.G. Dewease, R.P. Barkhurst, F.J. Drummond, T.F. Gerrets, D.E. Dobson, S.A. Alleman, N.S. Carns, R.M. Nelson, G.E. Wuller, R.J. Murillo, R.F. Burski, M. Constable, J.E. Howard, G.E. Wilson, T.J. Gaudet, J.B. Houghtaling (Ebasco-W3), W.A. Cross, T.A. Jones (CE), Project Files, Administrative Support, Licensing Library

Additional Information
License Amendment Request NPF-38-37

Question:

The description of the proposed change indicates that "The seismic monitor is a passive device which serves no safety related function." What is the source of the requirement for the seismic monitor?

Response:

The source of the requirement for the seismic monitor in question is described in the Technical Specification Bases 3/4.3.3.3:

> The OPERABILITY of the seismic instrumentation ensures that sufficient capability is available to promptly determine the magnitude of a seismic event and evaluate the response of those features important to safety. This capability is required to permit comparison of the measured response to that used in the design basis for the facility to determine if plant shutdown is required pursuant to Appendix "A" of 10 CFR Part 100. The instrumentation is consistent with the recommendations of Regulatory Guide 1.12, "Instrumentation for Earthquakes," April 1974.

In accordance with Regulatory Guide 1.12, one passive seismic monitor which requires no internal and external power supplies should be installed on reactor equipment to record peak acceleration of an earthquake.

Question:

Has LP&L evaluated the interaction of the seismic monitors with safety related equipment in the event that the monitors fall off their mounts? Provide discussion and details of the evaluation.

Response:

The seismic monitor in question is being relocated from the top lifting lug of the pressurizer to the lower lifting lug of Safety Injection Tank (SIT) 1B at elevation +56 MSL. LP&L has reviewed the area below the new seismic monitor location and has determined that no safety related equipment (including SIT fixtures) lies below the new seismic monitor location.

Question:

Provide the physical description of the seismic monitors, i.e. dimensions, weight, materials, etc.

Response:

The seismic monitor to be relocated measures 5 1/8" x 3 1/2" x 3 11/32". It weighs 4 pounds and the casing is composed of cast aluminum. The unit does not require any power supply, therefore no cabling/conduit is involved.

Question:

Provide evidence that the seismic monitoring equipment design envelope bounds the environment in the new location for the monitors, i.e. temperatures, vibrations, etc.

Response:

The seismic monitor is being relocated due to damage induced by high temperatures at its previous location on the pressurizer. The monitor mounting includes a thermal barrier rated at 555°F. On the pressurizer the actual temperatures experienced by the monitor slightly exceeded the thermal barrier rating resulting in damage to the monitor.

For the new monitor location, the SIT maximum design temperature is 200°F - well below the thermal barrier rating. The actual SIT temperature will approximate the containment ambient temperature of approximately 110-120°F. Other environmental parameters are discussed in the enclosed monitor description.

Question:

Demonstrate LP&L's understanding that the seismic monitors when relocated will provide the capability to measure, evaluate, analyze and interpret the seismic response from the standpoint of the requirements specified in question 1) above.

Response:

The relocation of the seismic monitor in question will not affect the capability to determine peak acceleration due to an earthquake. As with the pressurizer location, the response spectra of the SITs are representative of the reactor coolant system (RCS) due to the SIT connections with the RCS cold leg. The only significant difference between the two locations is the temperature environment.

Question:

Briefly describe how the seismic monitor operates.

Response:

Please refer to the attached monitor description.

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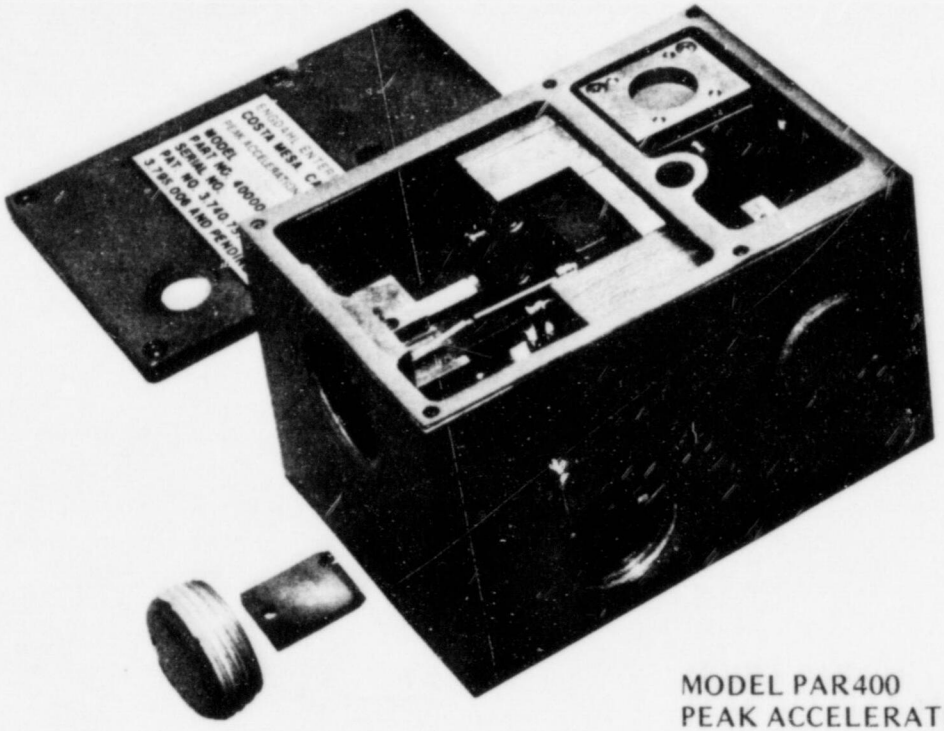
MODEL PAR400



3 inches
(7.6 cm)

MODEL PAR400
PEAK ACCELERATION RECORDER™

SENSES AND PERMANENTLY RECORDS PEAK ACCELERATIONS

- EARTHQUAKES
- STORMS
- EXPLOSIONS

RELIABLE and ECONOMICAL

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Introduction

Seismic events are random events, and may occur in remote and inaccessible locations or in built-up areas. Scientists and engineers frequently need to know the acceleration levels associated with these events, and for this reason, have developed instruments requiring no source of power, which can provide permanent records of peak acceleration.

Instruments of this type have been used for many years, but with the advent of the nuclear power plant, higher sensitivity and increased bandwidth are required to measure the accelerations induced in piping and other equipment. Since the older types of peak accelerometers had been pushed to their design limits, an entirely new instrument was required.

This requirement has been met with the Model PAR400, Peak Acceleration Recorder™. It is an inexpensive triaxial unit which requires no power supply, and is virtually maintenance free. Peak accelerations as low as .01 g can be recorded, and the minimum bandwidth extends from 0 to 20 Hertz. Permanent records are scribed by diamond stylii on replaceable metal plates. The peak acceleration is computed by multiplying the maximum excursion of the trace by the acceleration sensitivity of the recorder.

Description

The Model PAR400, Peak Acceleration Recorder™, senses and records peak accelerations triaxially. It is a self-contained passive device requiring no external power or control connections and has a minimum band width of 0 to 20 Hertz with a sensitivity as low as .01 g.

Each sensor of the PAR400 incorporates a new method of mechanical amplification which makes it more than five times as sensitive as previous devices. With the aid of optical magnification, its permanent record can be read to .001 of an inch or less. With a full scale deflection of .200 inches, the −1 version (2 g full scale) has a dynamic range of 200:1 (46 db).

Both hydraulic and electromagnetic damping are incorporated. Hydraulic damping, which is very efficient for its size and weight, is the major factor; while electromagnetic damping, which is easily adjustable, is used for fine tuning. The electromagnetic damper also furnishes an electrical signal which is used to measure the natural frequency of the sensor and its effective damping.

Sensors are available in three natural frequencies: 32, 51 and 64 Hertz. The assemblies are mechanically identical and completely interchangeable, so any combination may be included in a triaxial recorder.

The record is scratched permanently on a metal plate which is both serialized and keyed to the recorder to assure that the records are not confused among the three axes. Since the record is scratched, it can be measured without further processing. The record plates are inserted through side holes in the casting without taking off the cover. This minimizes the possibility of damaging the recorder or inadvertently recording on the record plate during insertion or removal by touching the mechanism.

Uses

The PAR400 is useful whenever low frequency peak acceleration measurements are needed. These accelerations may be due to earthquake, storms, or explosions. The three records give the acceleration levels along three mutually perpendicular axes.

The Peak Acceleration Recorder™ can be used in connection with:

1. Nuclear power plants
2. Steel mills
3. Refineries
4. Bridges and dams
5. High-rise structures
6. Oil explorations
7. Mines
8. Ships
9. Earth studies
10. Towers

Features

The PAR400 is a very sensitive, wide band, low frequency acceleration recording instrument. The high sensitivity is obtained by using a heavy mass to detect the acceleration, and then mechanically amplifying its motion. A diamond tip scriber at the end of the amplifier arm traces a very fine visible permanent record of the arm's excursions. The scribe line widths are on the order of .0004 inches (.01 mm).

Three plates, stamped L, T, and V, respectively, are used to record the excursions in the three axes. Slotted keyways on the plates match up with pins in the housing so that only the correctly stamped plate can be inserted full depth into the corresponding sensor. Each set of three plates also carries a unique serial number. This permanent identification system eliminates the possibility of confusing the records.

The rugged cast aluminum housing has three pads to contact the mating surface when mounting. A single screw is used for attachment. Shims can be slid under the appropriate pad to level the unit. The screw is then tightened. A clearance hole is provided in the cover for the screw head so the cover need not be removed during mounting of the recorder.

To install the record plates, three plugs are removed from the side walls of the casting and the plates are slipped into the appropriate holders. The plugs are of such a size as to preclude damage to the mechanism during insertion or removal of the record plates. Since the cover does not have to be removed to replace record plates, the mechanism is not exposed to inadvertent damage. Two windows in the cover make it easier to replace record plates and also make possible verification that they are in position without having to remove the plugs.

When a record plate is inserted, a spring-loaded pin forces the plate to one side of the track to eliminate any side play which would introduce an error in the recorded acceleration. The insertion produces a zero line on the plate. On removal, a zero line is also scratched. These zero lines should coincide if there is no mechanical shifting between insertion and removal. If there is a shift, the user is made aware that a problem exists.

To obtain wide band response, the instrument is damped to 60% of critical. A preadjusted hydraulic damper is used for the major damping to keep the size and weight of the total package as small as possible. Adjustable electromagnetic damping is used to obtain the final damping. The electromagnetic damping system is also very useful in adjusting and calibrating frequency and damping as it provides an electrical output which can be displayed on an oscilloscope.

The recorder is reliable because of its simplicity. It does not contain any of the more complex and less reliable components, i.e., batteries, connectors, motors, and bearings. The recorder is self-contained, and requires no start-up time.

The recorder is economical in that no external connections or power are required. The record plates are reusable by replating. Maintenance is very low since the unit can be unattended for long periods of time.

Materials have been selected for long life even when exposed to nuclear radiation. The cast housing is impregnated to prevent leaks and along with the cover and three plugs is anodized and painted with epoxy paint. The windows are made of Lexan™ and gaskets of silicone rubber to increase resistance to radiation. All hardware is stainless steel. An indicating silica gel desiccant is also provided to decrease the humidity inside the recorder.

Data reduction is very simple requiring only one measurement and one multiplication for each of the three record plates to obtain its maximum acceleration.

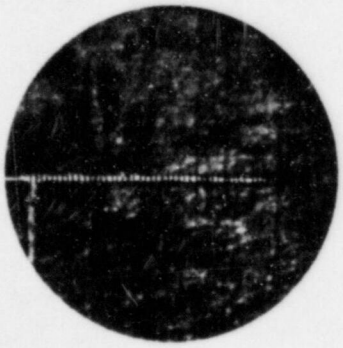
Data Reduction

Date reduction is accomplished by measuring the maximum displacement of the scratched record from the zero line. Normally just the maximum is recorded regardless of the direction. List this distance under "Displacement" on the calibration sheet.

Multiply the "Displacement" times the "Acceleration Sensitivity" and record in the "Acceleration" column.

Displacement measurements can be made using a magnifier or a microscope with a reticle having graduations in thousandths (.001) of an inch or in tenths (.1) of a mm Also, a microscope with a mechanical stage gives good results.

MAGNIFIED RECORD
USING A RETICLE



SAMPLE OF A
CALIBRATION AND TEST DATA SHEET

Sensor	Natural Frequency (Hertz)	Acceleration Sensitivity (g/inch) [g/mm]	Displacement (inches) [mm]	Acceleration (g)
L	32.3	10.2 [.402]	.031 [.787]	.32
T	30.9	9.3 [.366]	.015 [.381]	.14
V	33.3	10.4 [.409]	.007 [.178]	.07

PEAK ACCELERATION RECORDER™

MODEL PAR400

QUALIFIED TO: GUIDE FOR SEISMIC QUALIFICATION OF CLASS I ELECTRICAL EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS – IEEE GUIDE 344.

Designed to meet the characteristics of the Peak Accelerograph described in the American National Standard ANSI N18.5 – 1974, Earthquake Instrumentation Criteria for Nuclear Power Plants.

SENSORS

Number of Sensing Elements	3	
Arrangement of Elements	Triaxial	
Full Scale Acceleration	–1	2 g
	–2	5g
	–3	10 g
Dynamic Range	–1	200:1 (46 db)
	–2	385:1 (52 db)
	–3	500:1 (54 db)
Natural Frequency (± 5%)	–1	32 Hz
	–2	51 Hz
	–3	64 Hz
Damping	55 to 65% of Critical[1]	
Bandwidth	–1	0 to 20.2 Hz (63% of Natural Frequency)
	–2	0 to 32 Hz (63% of Natural Frequency)
	–3	0 to 32 Hz (50% of Natural Frequency)
Accuracy	–1	.01 to .50 g ± .01 g .50 to 1¼ g ± 2% 1¼ to 2 g ± 3%
	–2	.013 to .65 g ± .013 g .65 to 2 g ± 2% 2 to 5 g ± 3%
	–3	.02 to 1 g ± .02 g 1 to 3 g ± 2% 3 to 10 g ± 3%

Spurious Resonances: None within frequency range of interest

Cross Axis Sensitivity: Less than .03 g/g

PHYSICAL DIMENSIONS

Length	5-1/8 inches (13.02 cm)
Width	3-1/2 inches (8.89 cm)
Height	3-11/32 inches (8.49 cm)
Weight	4 pounds (1.8 kg)

MOUNTING

One (1) #10-24 Screw.

Level Recorder to ±1° (1/16 inch in 3½ inches) (.16 cm in 8.89 cm) by adding shims under the appropriate mounting pad. "V" will measure the vertical accelerations. Align long side of recorder within 3° (¼ inch in 5-1/8 inches) (.64 cm in 13.02 cm) of designated North/South line. "L" (longitudinal) will measure N/S accelerations. "T" (transverse) will measure E/W.

ENVIRONMENTAL

Temperature	–55°C to + 85°C
Altitude	To 50,000 feet (15,240 meters)
Humidity	To 100% RH
RFI	No adverse radiated or conducted RFI
Water	Water-Tight to 70 PSI (5 kg/cm^2)

Nuclear Radiation

The following materials are used in the construction of the PAR400.

1. Metals: Aluminum, Brass, Stainless Steel, Steel, Copper, Beryllium Copper, Cadmium, Solder
2. Non-Metallic Materials

Description	Material	Stress Level	Approx. Stability (RAD)[2]
Paint	Epoxy	Low	10^8
Adhesive	Epoxy	Low	10^8
	Anaerobic (Polyester)	Low	2×10^7
Damping Fluid	Silicone Fluid	Low	5×10^8
Gaskets	Silicone Rubber	Low	10^7
Windows	Lexan	Low	5×10^6

POWER REQUIREMENTS – None

[1]Damping adjusted at nominal temperature expected at time of operation

[2]Source: a. Dow Corning Corporation, b. Loctite Corporation

REPRESENTED BY: