

**Martin, Robert**

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**From:** Wilson, George *mw*  
**Sent:** Wednesday, August 31, 2011 2:32 PM  
**To:** Merzke, Daniel; McHale, John; Boger, Bruce; Leeds, Eric; Grobe, Jack; Hiland, Patrick; Gitter, Joseph; Skeen, David  
**Cc:** Khanna, Meena; Manoly, Kamal; Munson, Clifford; Karas, Rebecca; Kammerer, Annie; Martin, Robert; Kulesa, Gloria; Zimmerman, Jacob  
**Subject:** seismic instruments at North Anna  
**Attachments:** seismic NCRODP.ppt

See attached

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*G / 1*

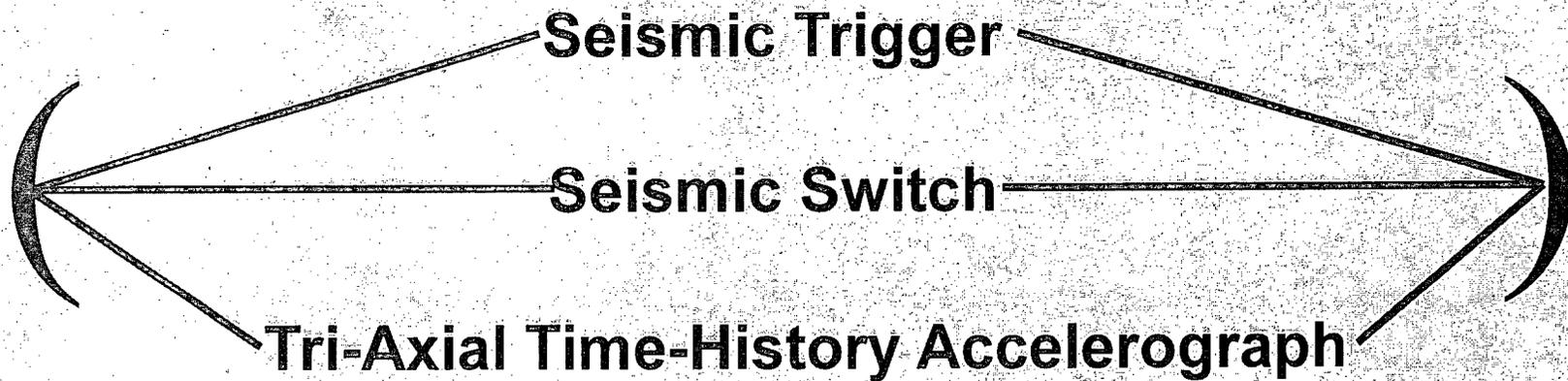
A photograph of a seismic monitoring system panel. The panel is rectangular and mounted on a wall. It features a grid of small, square sensors or components. The text "Seismic Monitoring System" is overlaid in a large, black, serif font across the center of the panel. The panel is secured with screws around its perimeter. There are some small labels and markings on the panel, including "PEARSON'S" and "INTERPRET" at the bottom. The overall image has a grainy, high-contrast appearance.

# Seismic Monitoring System

# Types

**Tri-Axial Peak Accelerograph**

**Tri-Axial Response Spectrum Recorder**



# Terms

The Seismic Monitoring System has both active and passive components

## Active components

Require an outside resource to perform their design function (electricity, compressed air, nitrogen, etc.)

The Tri-Axial Time-History Accelerograph is the only active device

## Passive components

Require no outside resource to perform design functions

These include the Tri-Axial Peak Accelerograph and the Tri-Axial Response Spectrum Recorder

# **Tri-Axial Peak Accelerograph**

EX 4

(2 pages)

# Tri-Axial Peak Accelerograph

A passive instrument that measures and records wide-band, low frequency, acceleration

It measures acceleration experienced by detectors in three directions:

- Vertical (up-down)
- Longitudinal (North-South)
- Transverse (East-West)

The are three Tri-Axial Peak Accelerograph's

# Tri-Axial Peak Accelerograph

The three detector locations are:

- Unit-1 containment basement, on "C" SI accumulator discharge pipe downstream of 1-SI-MOV-1865C
- Unit-1 containment RHR flat, on "B" RHR heat exchanger
- Auxiliary building third floor, on the unit-1 "A" CC heat exchanger

# **Tri-Axial Response Spectrum Recorder**

EX 4

(6 pages)

# Tri-Axial Response Spectrum Recorder

A passive instrument that is similar to the peak accelerograph

Has 12 reeds of different lengths and weights monitoring each direction (36 total)

Measure and record acceleration over a range of 12 specific frequencies in the three monitored directions

- Vertical (up-down)
- Longitudinal (North-South)
- Transverse (East-West)

There are four Tri-Axial Response Spectrum Recorders

# Tri-Axial Response Spectrum Recorder

The four detector locations are:

- Auxiliary building mat, between Unit-1 and Unit-2 CC pumps
- Auxiliary building 3rd floor, on support near unit-1 "A" CC heat exchanger
- Unit-1 containment basement, outside crane wall near PDTT
- Unit-1 containment, RHR pump and heat exchanger area

# Tri-Axial Response Spectrum Recorder

Unique is its ability to monitor peak acceleration in each of 12 different frequencies (2 - 24.5 Hz) in all three directions

Protected from moisture by use of a desiccant

The containment mat tri-axial response spectrum recorder, while considered a passive device, has an active component

36 dual-action micro-switches which input to the peak shock annunciator panel

- The first contact on each micro-switch is set to pick up at approximately 67% of DBE (AMBER)
- The second contact is set at 100% of DBE (RED)

These alarms do not directly feed the MCR annunciators

# Seismic Trigger

## Tri-Axial Seismic Trigger

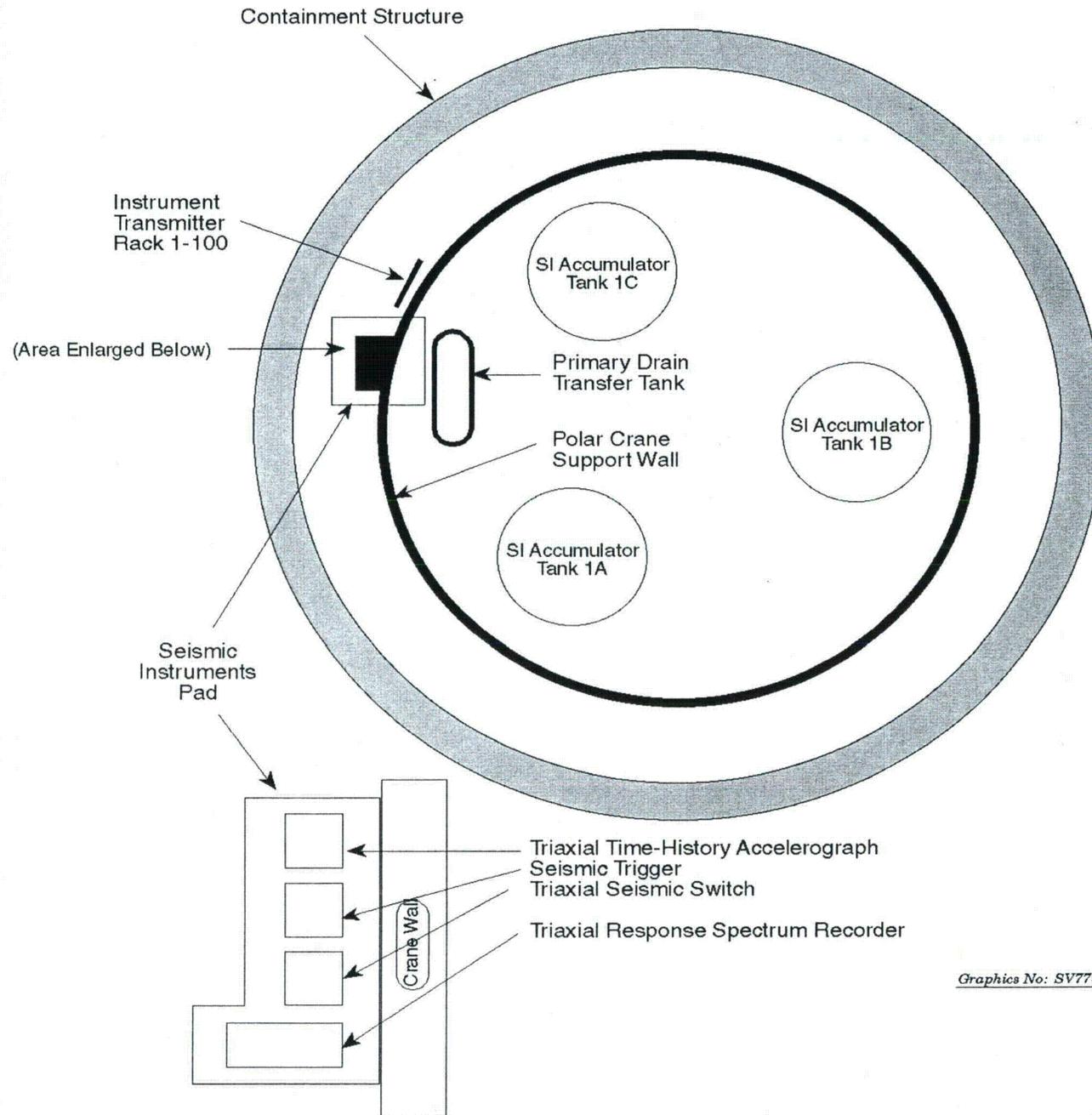
The trigger is an “on-off” switch set at 0.01 g's in any direction

The trigger has pendulums in the horizontal and vertical directions (imagine a grandfather clock)

Motion exceeding 0.01 g's in any direction, will cause the switch to pick-up

The signal is sent to the seismic panel in the MCR

The seismic trigger is located on the seismic instrument pad in the unit-1 containment basement



Graphics No: SV778

SEISMIC INSTRUMENTS LOCATION  
(CONTAINMENT 216' 11" ELEVATION)

# **Seismic Switch**

# Tri-Axial Seismic Switch

**The seismic switch detects motion using accelerometers**

The seismic switch operation is similar to the analog time-history accelerographs

The voltage output is sent to internal relays which provide an "on-off" output when the setpoint is exceeded

Its output is used to directly actuate a MCR annunciator

## Tri-Axial Seismic Switch

The seismic switch has two setpoints (OBE)

- Vertical - 0.04 g's
- Horizontal - 0.06 g's

The seismic switch performs the following:

- Alerts the operator - EARTHQUAKE INSTRUMENT PANEL TROUBLE
- Illuminates local yellow light for approximately 10 seconds, then resets automatically

The seismic switch is located next to the seismic trigger in the Unit-1 containment basement

EX 4

(5 pages)