John D. O'Toole
Vice President

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April 29, 1983

Re: Indian Point Unit No. 2
Docket No. 50-247

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

ATTN: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Dear Mr. Varga:

In response to your request for additional information dated November 18, 1982 and in accordance with the commitment made in our December 23, 1982 letter, the attachment to this letter provides instrument accuracy and related data for the containment pressure monitors, containment water level monitors, and containment hydrogen monitors, (NUREG-0737 Items II.F.1.4, II.F.1.5, and II.F.1.6).

Should you or your staff have any questions, please contact us.

Very truly yours,

John D. O'Toole

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ATTACHMENT A

RESPONSE TO NRC REQUEST
FOR ADDITIONAL INFORMATION ON NUREG-0737 ITEMS:

II.F.1.4 CONTAINMENT PRESSURE MONITOR
II.F.1.5 CONTAINMENT WATER LEVEL
II.F.1.6 HYDROGEN MONITOR

1. EXCEPTIONS BEING TAKEN TO NUREG-0737 REQUIREMENTS

NRC Request

The submittals we have received to date do not indicate that you plan to take any exceptions to the NUREG-0737 requirements in our scope of review. Please indicate any exceptions you plan of which we are not aware. For each exception indicate (1) why you find it difficult to comply with this item, (2) how this exception will affect the monitor system accuracy, speed, dependability, availability, and utility, (3) if this exception in any way compromises the safety margin that the monitor is supposed to provide, and (4) any extenuating factors that make this exception less deleterious than it appears at face value.

Con Edison Response

An exception is requested for the Containment Pressure Monitor System. The pressure transmitters used for the Wide Range Containment Pressure Monitoring System (PMS) are environmentally qualified in accordance with NUREG-0588 (Category II guidelines), rather than NUREG-0737. Equipment meeting the specific criteria of Appendix B to NUREG-0737 was unavailable at the time this requirement was imposed. The transmitters are qualified to IEEE 323-1971 and IEEE 344-1971 in lieu of IEEE 323-1974 and IEEE 344-1975. This equipment is, therefore, acceptable on the basis that the "Best Available Equipment" was purchased to meet the implementation dates then in effect. Refer to Con Edison's letter dated May 4, 1982 in response to NRC's February 25, 1982 request for additional information on TMI action plan requirements. The exception identified above is not expected to have a significant impact on system accuracy, speed, dependability, availability, utility, or safety margin.

2. CONTAINMENT PRESSURE MONITORING SYSTEM

NRC Request

a) Provide a block diagram of the configuration of modules that make up your PMS. Provide an explanation of any details in the block diagram that might be necessary for an understanding of your PMS accuracy and time response.

b) For each module, provide a list of all parameters which describe the overall uncertainty in the transfer function of that module.

c) Combine parameters in 2b to get an overall system uncertainty. If you have both strip chart recorder and indicator output, give the overall system uncertainty for both systems. If you have systems spanning different ranges, give the overall system uncertainty for each system.

d) For each module, indicate the time response. For modules with a linear transfer function, state either the time constant, or the Ramp Asymptotic Delay Time, (RADT).

For modules with an output that varies linearly in time, state the full scale response time. (Most likely the only module you have in this category is the strip chart recorder).

e) We will compute the overall system time response for you.

Con Edison Response

a) A block diagram of the installed PMS is shown in Figure 1. The pressure transmitter is a Rosemount Model 1153GA7. The indicating recorder is a Leeds & Northrup Speedomax M Mark III. The accuracy data provided below are based on vendor supplied information for these models.

b) Pressure Transmitter Characteristics:

Span: 160 PSIG (calibrated minus 10 to 0 to plus 160 PSIG)

Calibrated Accuracy:	±0.25% of calibrated span. This includes combined effects of linearity, hysteresis and repeatability.
Temperature Effect:	±0.84% of span. Based on ±3.35% of span per 100°F and temperature excursion of ±25°F from 70°F normal.
Stability:	±1.0% of span per year. Based on two (2) times six month stability of ±0.25% of upper range limit (300 PSIG)
Other Effects:	None. Effects of power supply or other uncertainties are either imperceptible or calibrated out.
Time Response:	Constant of Transmitter is 0.2 seconds.

Indicating Recorder Characterisitics:

Span: 160 PSIG (Scale minus 10 to 0 to plus 160 PSIG)

Rated Accuracy:	±0.5% of span. This includes deadband, repeatability and ambient temperature excursions between 60°F to 105°F.
Dead Band:	±0.25% of span. Included in above.
Temperature Effect:	Included in above.
Stability:	±0.5% of span. This is an assumed value due to lack of vendor data.
Other Effects:	None. Effects of power supply or other influences are either imperceptible or calibrated out.
Time Response:	Less than 1.0 second for 100% scale step input, approximately 0.63 sec (63% step).

c) Standard Deviation (SD) of Total System

The SD of the total system uncertainty is computed using the data given above. The uncertainty in the data is treated as equivalent to one (1) SD, even though the data are maximum error limits. This results in conservative accuracy assumptions. The total system SD is then calculated by combining the individual SD's on a Root-Sum-Square (RSS) basis.

Uncertainty	% Span SD	SD Square
Transmitter		
Accuracy	±0.25	0.06
Temp Effect	±0.84	0.71
Stability	±1.00	1.00
Recorder/Indicator		
Accuracy	±0.50	0.25
Stability	±0.50	0.25
	Sum	2.27
	Square root	1.51

The total system SD is taken as ±1.50% of span, exclusive of added effects during a DBA.

d) Answered in Item 2b above.

e) Overall system time response to be computed by NRC.

3. CONTAINMENT WATER LEVEL MONITORING SYSTEM (WLMS)

NRC Request

a) Provide a block diagram of the configuration of modules that make up your WLMS. Provide an explanation of any details in the block diagram that might be necessary for an understanding of your WLMS accuracy.

b) For each module provide a list of all parameters which describe the overall uncertainty in the transfer function of that module.

c) Combine parameters in 3b to get an overall system uncertainty. If you have both strip chart recorder and indicator output, give the overal system uncertainty for both systems. If you have systems spanning different ranges, give the overall system uncertainty for each system.

Con Edison Response

a) The water level monitoring system (WLMS) is shown in Figure 2 and consists of monitors as described in Con Edison letters dated October 17, 1979 and May 12, 1981. However, the installation of the Reactor Cavity Pit water level monitor described in our May 12, 1981 letter is not intended to satisfy NUREG-0737 Item II.F.1 Attach. (5) criteria but is for monitoring inleakage during normal plant operation as a result of the October, 1980 flooding incident. This water level monitor represents an enhancement of overall accident containment water level monitoring capability. The level transmitter in the reactor cavity pit was changed during the 1982 outage. This transmitter was replaced with a Barton "Lot 7" unit with a span of 27 ft (Elevation 19'-9" to 46'-9"). This change allows the transmitter to be above the 46' 00" el. of the containment sump curb.

b) Differential Pressure Level Monitors for:

Containment Sump	(LT 3300)	Span 216"
Recirculation Sump	(LT 3301)	Span 216"

Sensor Assembly
- Accuracy: $\pm$0.5% of span
- Temperature Effect: $\pm$0.5% of span for 50^{o}F (change 40-150^{o}F)
- Power Supply Effect: not applicable
- Hysteresis Effect: included in accuracy statement
- Deadband Effect: included in accuracy statement
- Stability: $\pm$0.5% of span/yr.

Transmitter
- Accuracy (reference): $\pm$0.5% of span
- Temperature Effect: $\pm$0.5% of span for a 50$_{o}$F (80-130^{o}F.)

Power Supply Effect: ±0.5% per volt change (5 volt change assumed)
Deadband Effectr: included in reference accuracy
Stability: ±1% of span per year

Indicating Recorder

Accuracy: ±0.5% of span. This includes deadband, repeability and ambient temperature excursions between 60°F to 105°F.

Temperature Effect: Included in above.
Power Supply Effect: Imperceptible or calibrated out.
Hysteresis Effect: Imperceptible
Deadband Effect:Included in accuracy.
Stability: ±0.5% of Span. This is an assumed value due to lack of vendor data.

c) The Standard Deviation (SD) of the total system is obtained from the uncertainty parameters in section 3b above. The SD for "Accuracy" is taken as one third the upper limit. A review of test data and discussions with the manufacturers indicate that this is a valid assumption for these monitors.

Uncertainty Component	% Span SD	SD Squared
Transmitter		
Accuracy	±0.17	0.03
Temp. Effect	±0.5	0.25
Stability	±1.0	1.0
Pwr Supply Effect	±0.25	0.06
Sensor		
Accuracy	±0.17	0.03
Temp. Effect	±0.5	0.25
Stability	±0.5	0.25
Indicating Recorder		
Accuracy	±0.17	0.03
Stability	±0.5	0.25
	Sum	2.15
	Square Root	1.47

4. HYDROGEN MONITOR SYSTEM (HMS)--ACCURACY & PLACEMENT

NRC Request

a) Provide a block diagram of the configuration of modules that make up your HMS. Provide an explanation of any details in the block diagram that might be necessary for an understanding of your HMS accuracy. If you have different types of HMS's give this information for each type.

b) For each module provide a list of all parameters which describe the overall uncertainty in the transfer function of that module.

c) Combine the parameters in 4b to get an overall system uncertainty. If you have both strip chart recorder and indicator output, give the overall system uncertainty for both systems.

d) Indicate the placement and number of hydrogen monitor intake ports in containment. Indicate any special sampling techniques that are used either to examine one region of containment or to assure that a good cross section of containment is being monitored.

e) Are there any obstructions which would prevent hydrogen escaping from the core from reaching the hydrogen sample ports quickly?

<u>Con Edison Response</u>

a) Block diagrams of the installed HMS are shown in Figures 3a and 3b. Two Comsip-Delphi K-IV Hydrogen and Oxygen Monitors, each consisting of an analyzer panel and a remote panel, are installed with separate sample lines from containment. The remote panel with its indicating meter is located in the PAB-Motor Control Center (Case #2). In addition, Tracor-Westronics, Series T4N recorders are installed for the H_2 and O_2 indicator/recorder in the CCR (Case #1). The accuracy data provided below are based on vendor supplied information for these models.

b) <u>Comsip-Delphi K-IV Post-LOCA Containment Hydrogen and Oxygen Monitoring System Characterisitics:</u>

Analyzer range: 0-10% Hydrogen

System repeatability: ±1% of Span

Temperature Effects: Post-LOCA testing of system for 100 days @ 150°F shows negligible effect on system performance.

Power supply voltage: Analyzer electronic/cell assembly has an internal power supply (Instrument voltage variation is 85 to 135 volts).

	Case #1	Case #2
Deviation in flow measurement:	±1% of Span	±1% of Span
Calibration gas error:	±2% of Span	±2% of Span
Analyzer electronics/ cell accuracy:	±1% of Span	±1% of Span
4-20 ma transducer accuracy:	±0.5% of Span	

	Case #1	Case #2
Tracor-T4N recorder accuracy:	±0.5% of Span	
Indicating meter accuracy:		±2% of Span
System accuracy (Summation method): Case #1 (based on analyzer & CCR recorder system)	±5% of Span	
System accuracy (summation method): Case #2 (based on analyzer & remote panel indication system)		±6% of Span

The deadband and hysteresis effects are included in the above accuracy values.

Tracor-Westronics-Series T4N Recorder Characteristics:

Range:	0-10% Hydrogen
Repeatability:	±0.25% of span
Temperature effects:	No measurable effect (70°F to 100°F)
Power supply voltage:	No measurable effect (over voltage change ±10%)
Hysteresis effect:	±0.25% of span
Deadband effect:	±0.25% of span
Accuracy (worst case basis):	±0.5% of span

c) Standard Deviation (SD) of Total System:

The SD of the total system uncertainty is computed using the data given above. The uncertainty in the data is treated as equivalent to one (1) SD, even though the data are assumed maximum error limits. This results in conservative accuracy assumptions. The total system SD is then calculated by combining the individual SD's on a Root-Sum-Square (RSS) basis.

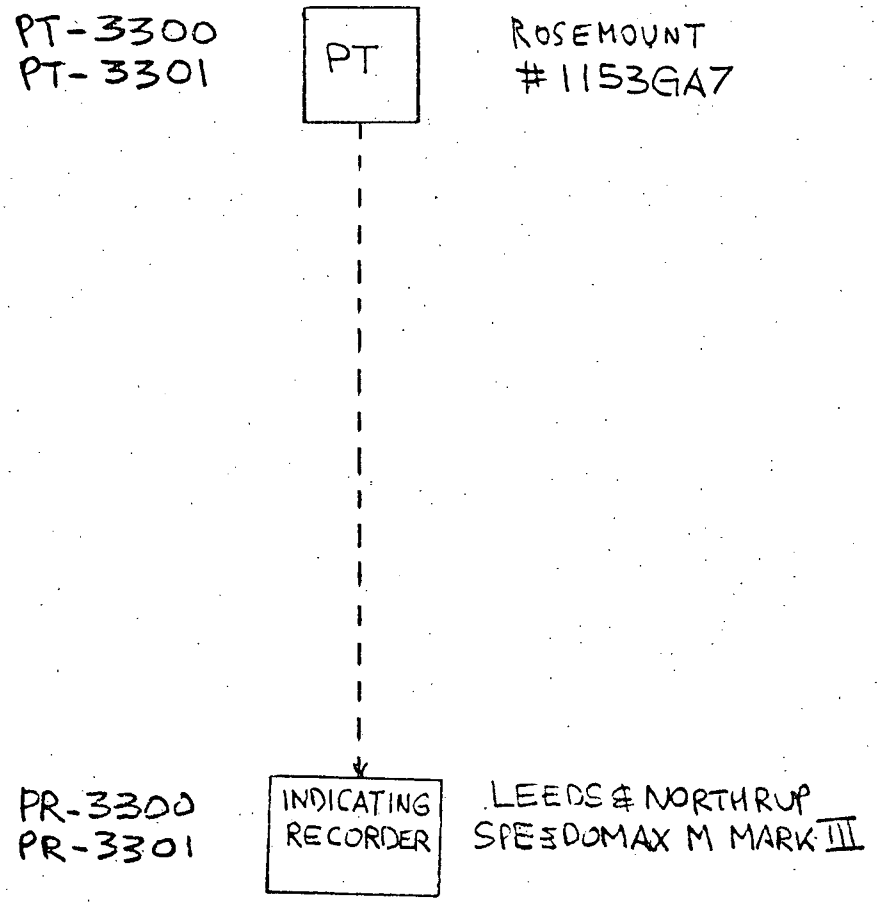
	Uncertainty	% Span SD	SD Squared
Case #1			
Analyzer:	deviation in flow measurement	±1.00	1.00
	calibration gas error	±2.00	4.00
	analyzer electronics/cell	±1.00	1.00
	4-20 ma transducer output	±0.50	0.25
Recorder:	accuracy (worst case basis)	±0.50	0.25
	repeatability	±0.25	0.06
		Sum	6.56
		Square Root	2.56
Case #2			
Analyzer:	deviation in flow measurement	±1.00	1.00
	calibration gas error	±2.00	4.00
	analyzer electronics/cell	±1.00	1.00
Analyzer/ Remote Panel:	indicating meter	±2.00	4.00
		Sum	10.00
		Square Root	3.16

The total system SD is taken as ±2.56% or ±3.16% of span for Case #1 (for analyzer and CCR strip chart recorder) or Case #2 (for analyzer and remote panel indicator) respectively. This is exclusive of added DBA effect.

d) There are five intake ports in containment. Each port samples the discharge from a recirculation fan cooler, upstream of its carbon filter. The minimum reliable air circulation rate of three of the five main ventilating blowers recirculates the entire containment air volume in about 13 minutes. Consequently, these samples should provide a good cross section of containment gas concentration because of the large volume of containment air handled and the constant mixing with any new hydrogen evolved in containment.

e) The air handling system is designed to promote the interchange of air throughout containment. This avoids the possibility of accumulation of hydrogen in stagnant pockets or strata. The location of hydrogen sample ports on the containment circulating fans' discharge insures that a representative gaseous sample is delivered to the HMS.

REVISIONS



WIDE RANGE CONTAINMENT PRESSURE MONITOR

INDIAN POINT UNIT NO. 2

DOCKET NO. 50-247

ITEM II.F.1.4-CONTAINMENT PMS

FIG. 1

REF. DWGS.

REF. STANDARDS

STATION - INDIAN POINT UNIT NO. 2	APPROVALS: MECH. PROGRAM ENG. VJ 4/20/83 D. Ellwood 4/20/83 DATE	Con Edison ENGINEERING
TITLE - WIDE RANGE CONTAINMENT PRESS. MONITOR, PER NUREG 0737	C&I ENG 4/20/83 DATE	Control & Instrumentation Sketch
DRAWN BY A. KOENIG CHECKED BY		DWG. NO. - CI-90049-23 REVISION

DISTRIBUTION:

REVISIONS

LT-3300 CONTAINMENT SUMP
LT-3301 RECIRCULATION SUMP

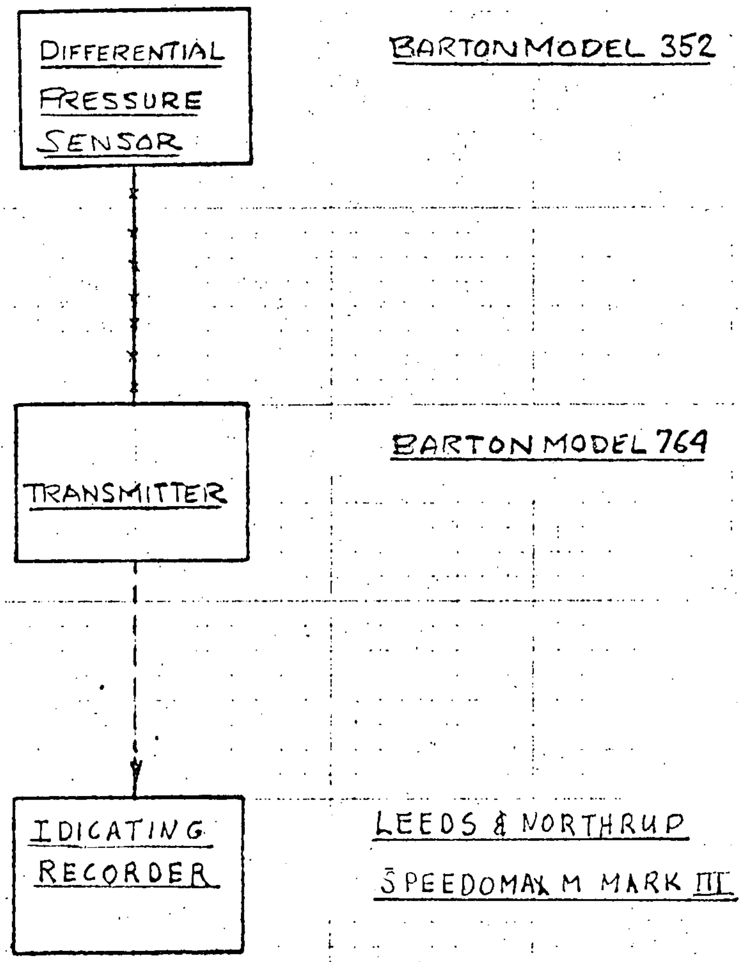
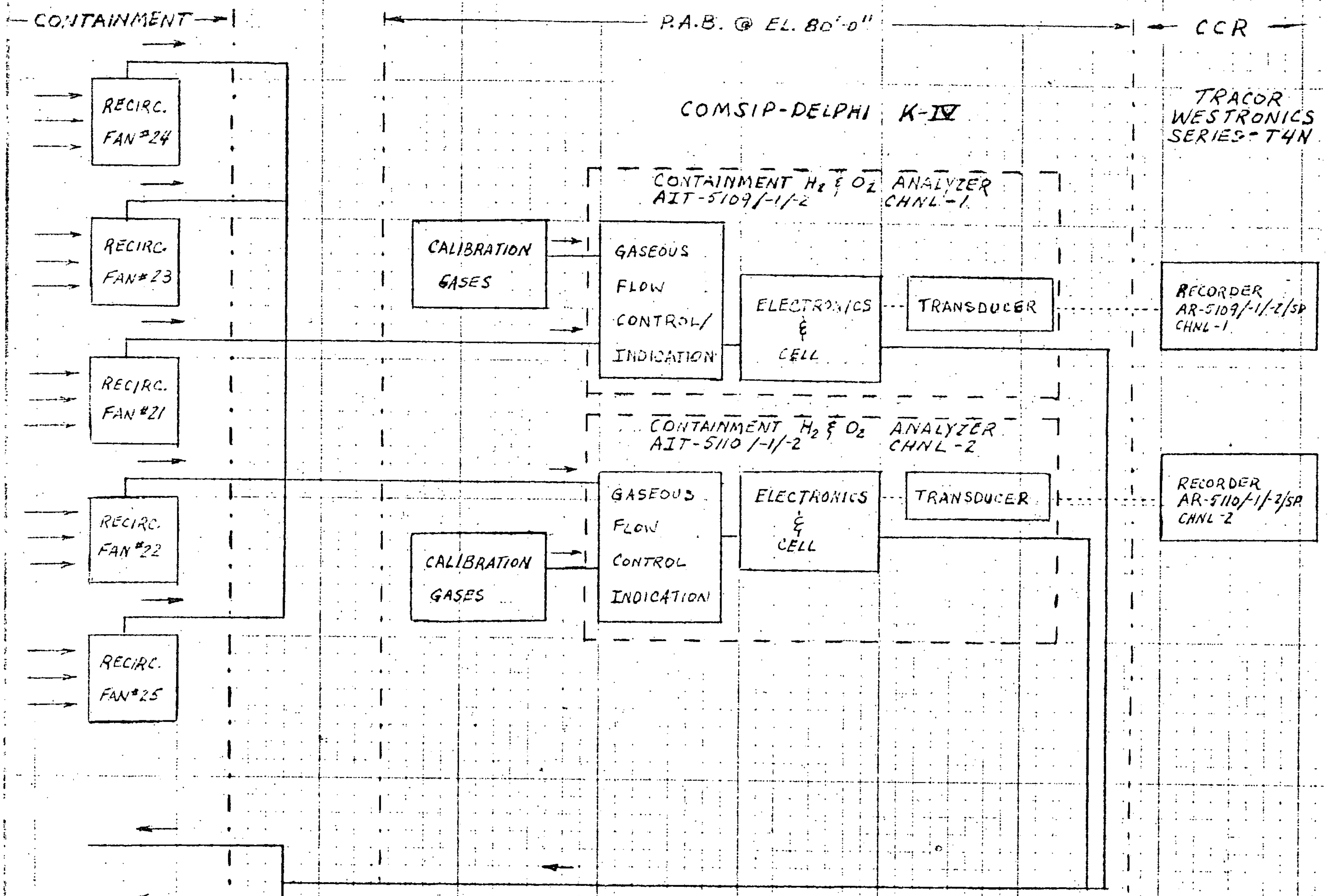


FIGURE 2

INDIAN POINT UNIT No. 2
DOCKET No 50-247
ITEM II. F. 1. (5)
WATER LEVEL MONITORING SYSTEMS (WLMS)

STATION- INDIAN POINT UNIT No. 2 CONTAINMENT WATER LEVEL SYSTEMS PER NUREG 0737, ITEM II. F. 1 DRAWN BY J. [illegible]	APPROVALS SUB-SECT. ENGR. [signature] ENG. [signature] DATE [illegible]	Con Edison ENGINEERING SKETCH No. SKJL412[illegible]



INDIAN POINT UNIT No. 2

DOCKET No. 50-247

ITEM II.F.1.6 CONTAINMENT HYDROGEN MONITOR

FIGURE 3A

Con Edison ENGINEERING SKETCH No. RSB30321

APPROVALS

SUB-SECT. ENGR.

ENG.

DATE

STATION- INDIAN POINT - UNIT No. 2

CONTAINMENT HYDROGEN MONITOR SYSTEM

REF. NUREG 0737, ITEM II.F.1.6

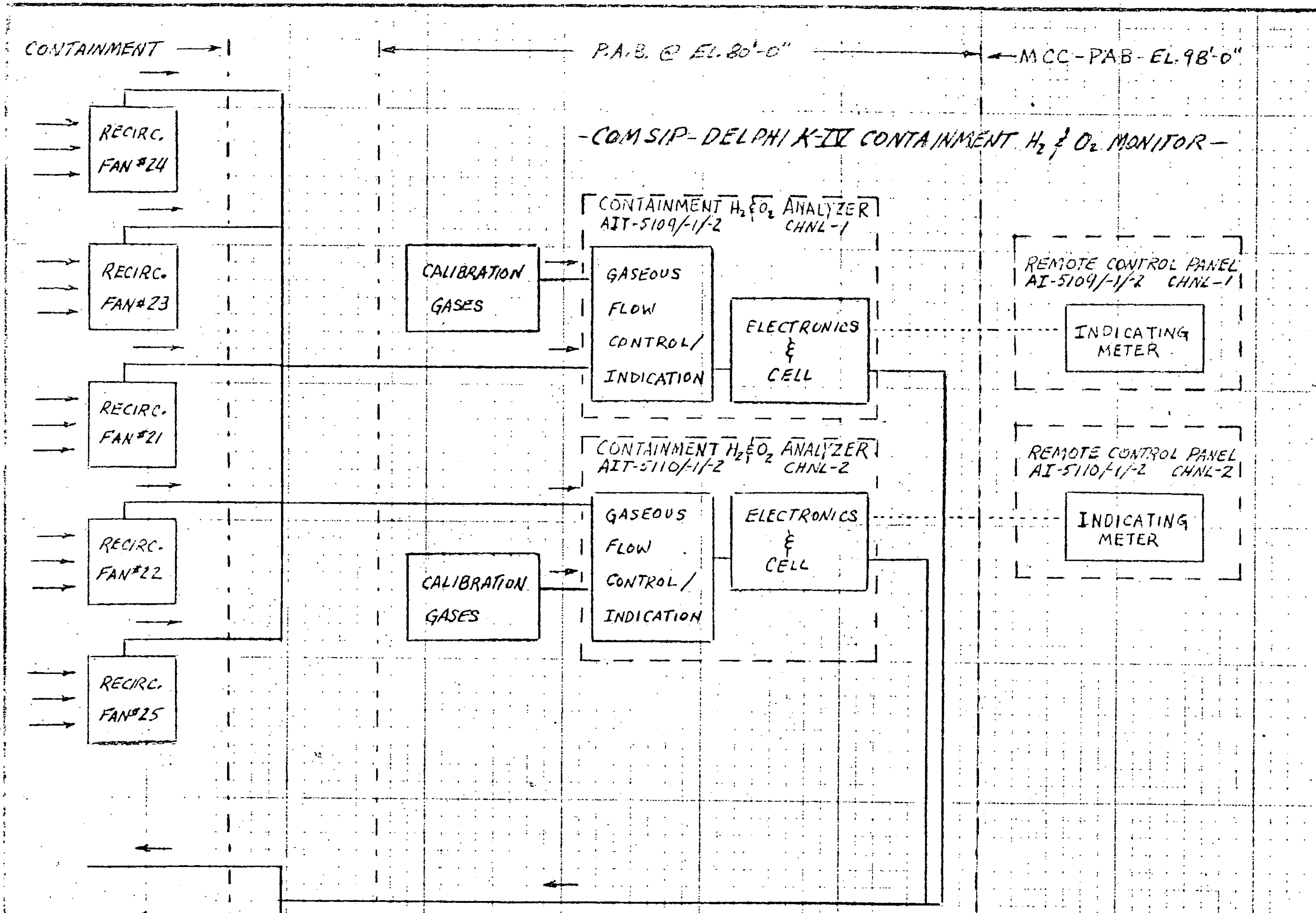
DRAWN BY R. SCHMIDT

SCALE

REVISIONS

FIGURE 3A

CASE # 1



INDIAN POINT UNIT No. 2

DOCKET No. 50-247

ITEM II.F.1.6 CONTAINMENT HYDROGEN MONITOR

FIGURE 3B

Con Edison ENGINEERING SKETCH No. RS830722

SUB-SECT. ENGR.

ENG.

DATE 4-20-83

APPROVALS

STATION- INDIAN POINT UNIT No. 2

CONTAINMENT HYDROGEN MONITOR SYSTEM

PER NUREG 0737 ITEM II.F.1.6

DRAWN BY K. SCHMIDT

SCALE

REVISIONS

FIGURE-3B

CASE # 2