ATTACHMENT 1

NUREG-0737 TOPIC II.B.2
PLANT SHIELDING

R. E. GINNA NUCLEAR POWER PLANT

Rochester Gas & Electric Corporation

15 pp.

September 1981

Item II.B.2 of NUREG-0737 (previously identified as item 2.1.6.b of NUREG-0578) required that a radiation and shielding-design review be performed.of the spaces around systems that may, as the result of an accident, contain highly radioactive materials. That review was completed to determine whether post-accident radiation fields unduly limit personnel access to areas necessary for mitigation of, or recovery from an accident; or unduly degrade the proper operation of safety equipment. This review was accomplished using the recommendations and guidelines of NUREG-0578 and subsequent clarifications as provided by the NRC. Results of the review were presented in a submittal dated December 28, 1979 from L. D. White, Jr. to Mr. Dennis M. Crutchfield.

The review identified the most critical areas requiring personnel access following the onset of extreme accident conditions following a postulated major release of radioactivity into the Containment Building. Consideration was given to areas where predetermined post-accident functions would be performed (Nuclear Sample Room, Chemistry Laboratory, Count Room, Control Room and air sample penetrations) and to areas where personnel could be called upon to execute certain accident-mitigating or short-term recovery tasks. Potential radiation exposures were determined for each task and included additional exposure due to accessing the areas where tasks would be performed.

We concluded that the actions which may be taken under the conservative post-accident conditions assumed in the analysis, can be accomplished without causing undue radiation exposures to personnel.

We also identified certain areas which require modifications to existing procedures, shielding, and/or relocation of equipment. These were discussed in detail in Section 4.0 of the appendix to the 1979 submittal.

The modifications included portable shadow shielding for post-accident sample collection, handling and analysis. Additional shielded sample containers were also required. All of the portable shielding and sample containers have now been provided.

Our 1979 report also identified modifications required to use our existing sampling equipment under the assumed post-accident conditions. These modifications included additional shielding around the nuclear sample room sample coolers, additional shielding around primary system sample lines along the personnel access route by the nuclear sample room and rerouting the RHR system sample and gas vent header lines along the access route in the auxiliary building.

Recently completed detailed design studies indicate that the proposed shielding would be extremely difficult to install and would require considerable structural rework to support additional loads on existing facilities. As a result we have changed our plans to use existing sample equipment following an accident. A new Post-Accident Sampling System (PASS) is now planned. The new PASS will require a longer period for design, procurement and installation than the original shielding concept, however, the PASS will result in lower post-accident and normal operation doses to personnel. A description of the PASS is given in Appendix A. Portions of the system used only during normal

operation may be revised prior to installation, however, a description of these portions of the system is included for completeness.

As a result of purchasing the PASS fewer shielding modifications in the plant need to be made. The modifications which we believe should still be made include the following:

1. A lead door and wall shielding will be added near the primary system sample line containment penetrations.
2. Portions of the gas vent header will be rerouted and shielded in the auxiliary building.
3. The sample count room wall facing the containment will be shielded to prevent containment shine from disrupting sample counting or, provisions will be made to relocate counting equipment.

Completion of the above modifications and installation of the PASS will provide a permanent capability for post-accident sampling and allow operator access to those parts of the plant required for accident mitigation or short-term recovery actions following significant fuel damage.

Experience at TMI has shown that existing radwaste equipment will probably not be used for long term recovery and cleanup following accidents with similar fuel damage. Existing radwaste equipment may be used following less significant accidents. In such cases the dose rates at the existing equipment will be reduced from the conservatively high doses calculated in our study. Because it is difficult to define when the radwaste equipment may be used, we have committed in previous submittals

(see our letters dated December 28, 1979 and December 15, 1980) to relocate some controls on radwaste panels in the basement of the auxiliary building. This relocation may be prudent for some long term recovery actions to minimize radiation exposure to operating personnel and will aid in our normal operation ALARA program.

An engineering review of the radwaste panel controls relocation has resulted in a commitment to a complete new radwaste control panel involving several subsystems. The firmware controller based system (a processor whose system function cannot be changed by software programming) is now under development by RGE and its consultant, Gilbert Assocoates, Inc. The control system will provide the necessary tools to perform automatic and operator initiated control, alarm monitoring, and display for the radwaste system. The new control panel will operationally replace existing control panels now used to monitor and control existing radwaste hardware. The new panel will probably be located in the intermediate building in the vicinity of the sample room. The existing radwaste control panels will be retained as backup capability.

The new radwaste control panel will incorporate control and monitoring features for the following equipment:

boric acid evaporator
ultra-filtration system
gas stripper system
waste concentrate evaporator
boron recycle system

Our current engineering effort is directed toward review of existing elementary and wiring diagrams and functional drawings for the existing radwaste control panels. A specification for new equipment has been prepared and is being finalized for issuance to vendors. Installation of the planned radwaste panel represents a significant improvement over our earlier proposal to relocate a select few controls.

Our schedule for completing the modifications for this topic is as follows. Installation of shielding (and/or provision for relocation of counting equipment) and rerouting of the vent header piping will be completed by January 1, 1982. Delivery of the PASS equipment is scheduled for early in the spring 1982 refueling outage. Installation of the PASS will probably be completed during the outage and therefore will be operational by July 1, 1982 in accordance with NUREG-0737. Delivery of equipment for the radwaste panel modification is expected in September 1982, with installation and testing to be completed by November 1982. Significant effort is required to complete these modifications as scheduled. Earlier completion of the work is impossible. Should equipment delivery slip or unforeseen problems develop the installation schedule may be extended. Should this occur, we will notify you.

APPENDIX A TO ATTACHMENT 1

Post-Accident Sampling System

The Post Accident Sampling System (PASS) for Ginna is being designed and fabricated by NUS Corporation. The description provided on this appendix accurately reflects the current design. There may be changes to specific system features or to system specifications, however, prior to installation as engineering design work is completed.

The system is composed of three subsystems to provide sampling, instrument readout, and system operational control. These subsystems are:

- o Liquid and Gas Sample Panel (LGSP)
- o Instrument Panel (IP)
- o Electrical Control Panel (ECP)

Liquid and Gas Sample Panel (LGSP)

The Liquid and Gas Sample Panel is the major fluid/mechanical component of the Post-Accident Sample System. The LGSP is shown schematically in Figure A-1. All PASS analysis and sample components which contain post-accident liquids and gases are mounted in the LGSP behind a shield structure. The panel incorporates integral lead shot and steel shielding to limit operator radiation exposure levels from the panel components. The rear of the panel is enclosed and includes provisions for exhausting to the plant ventilation system to prevent airborne contamination of the sample area. An integral spray system is provided in the panel for washdown and decontamination prior to maintenance.

The panel can be used for routine in-line chemical analysis. Reactor coolant gas stripping and sampling during normal operation will also be provided. Under accident conditions, the panel provides reactor coolant gas stripping, liquid and gas dilution, in-line chemical analysis, and liquid and gas grab sample capabilities. All high-level samples are confined to the heavily shielded areas.

Gas Sampling

The gas section of the LGSP provides the capability to sample containment atmosphere. Samples are obtained with an internal vacuum pump, thereby providing assurance that samples can be obtained under positive or negative containment pressures. To ensure representative sampling, the entire system is purged prior to sample acquisition and analysis. Post-accident gas samples are routed to the containment after exiting the panel.

After adequate purging has been completed, gas samples may be routed directly to the LGSP mounted gas chromatograph for in-line hydrogen and oxygen analysis. The analysis portion of the instrument is located in the LGSP and the control and readout portion is located on the Instrument Panel.

Gas samples may also be routed through a dual range dilution loop to reduce the specific activity to a level that is acceptable for grab sampling. Adequate dilution capability is provided by this loop to allow isotopic analysis of post-accident gas samples with existing hot-lab equipment.

The basic concept of the dilution loops involves capturing an undiluted gas sample "bite" in either of two dilution loops of

pre-set fixed volume. The captured gas is then purged with argon into a pre-evacuated vessel of fixed volume. Finally, additional argon is added to achieve a preselected vessel pressure. The use of two dilution loops of different volume provides a dual-range dilution capability. The final vessel pressure set point can also be changed to provide variation in the ultimate dilution ratio.

The panel provides the capability of obtaining grab samples of primary coolant dissolved gases and containment atmosphere through septum ports located on the front of the LGSP. A shielded syringe is used for sample acquisition. Normal operation undiluted gas samples can also be obtained. Valve interlocks are provided to prevent undiluted gas sampling under accident conditions.

The gas system can be evacuated and purged with nitrogen after each sample operation to reduce radiation levels.

Liquid Sampling

System pressure or existing sump pumps are the motive force to obtain liquid samples from all sources. A new pump may be installed in containment or the auxiliary building for sampling the containment sump. The liquid system can be purged prior to each operation to ensure that representative sampling and analysis is achieved. During normal operation, the purged liquid will be routed to the waste disposal system. Under accident conditions, valve interlocks will be provided to ensure that the purge can only be routed to the PASS waste tank and, ultimately, returned to the containment. (The equipment required to obtain a sump sample, not required by NUREG 0737, will be provided at a later date due to design and procurement lead times.)

After the system is purged, liquid samples can be routed to various in-line instruments for analysis. Each device has been modified, as required, and subsequently qualified for use during normal operation as well as under post-accident conditions. Conductivity, pH, and dissolved oxygen are measured in-line using modified probes. Boron analysis will be provided by an automatic titration device. Chloride analysis will be provided by provisions for use of a portable analyzer. Analysis parameters are displayed on the Instrument Panel.

Liquid samples can be processed through a gas stripping loop to remove dissolved gases. The stripped gas can then be routed to the gas system described previously for hydrogen analysis, dilution, and/or grab sampling. Normal operation stripped gas may be collected undiluted for routine isotopic analysis. Interlocks will be provided to allow grab sampling of only diluted stripped gas in a post-accident situation.

The basic concept of the gas stripping loop is as follows: A liquid sample of small fixed volume is collected in a vessel. Nitrogen is then used to force this liquid through an atomizer into a larger collection vessel. Stripped gases are then removed from this vessel.

Post-accident liquid samples from the stripping loop are processed through a dilution loop prior to grab sampling. The loop provides a 1:1,000 diluted sample for isotopic analysis, chemical analysis, or off-site shipment.

The liquid section of the LGSP incorporates features to flush components with demineralized water after each operation to

reduce radiation levels. Liquid wastes from the analysis and dilution sections of the panel are routed to the waste holdup tank during normal operation and to the PASS waste tank during post-accident use.

Instrument Panel (IP)

The Instrument Panel provides remote indication of analytical parameters associated with operation of the LGSP. The panel also houses the controls for the gas chromatograph. Chemicals required for operation and calibration of the in-line instruments are located in the IP. The necessary support equipment for the in-line boron analysis will be housed in the IP.

The IP will contain its own controls, instruments, and mechanical components necessary for its operation. Since no sample fluids enter this panel, shielding is not required. The IP be located in an area away from the LGSP in a low dose rate area to reduce operator exposure associated with monitoring and control functions.

The following display devices are provided:

- digital pressure and temperature indicators;
- pH indicator;
- conductivity monitor;
- oxygen monitor;
- recorders for hydrogen and oxygen concentration;
- boron concentration meter (integral with analyzer controls).

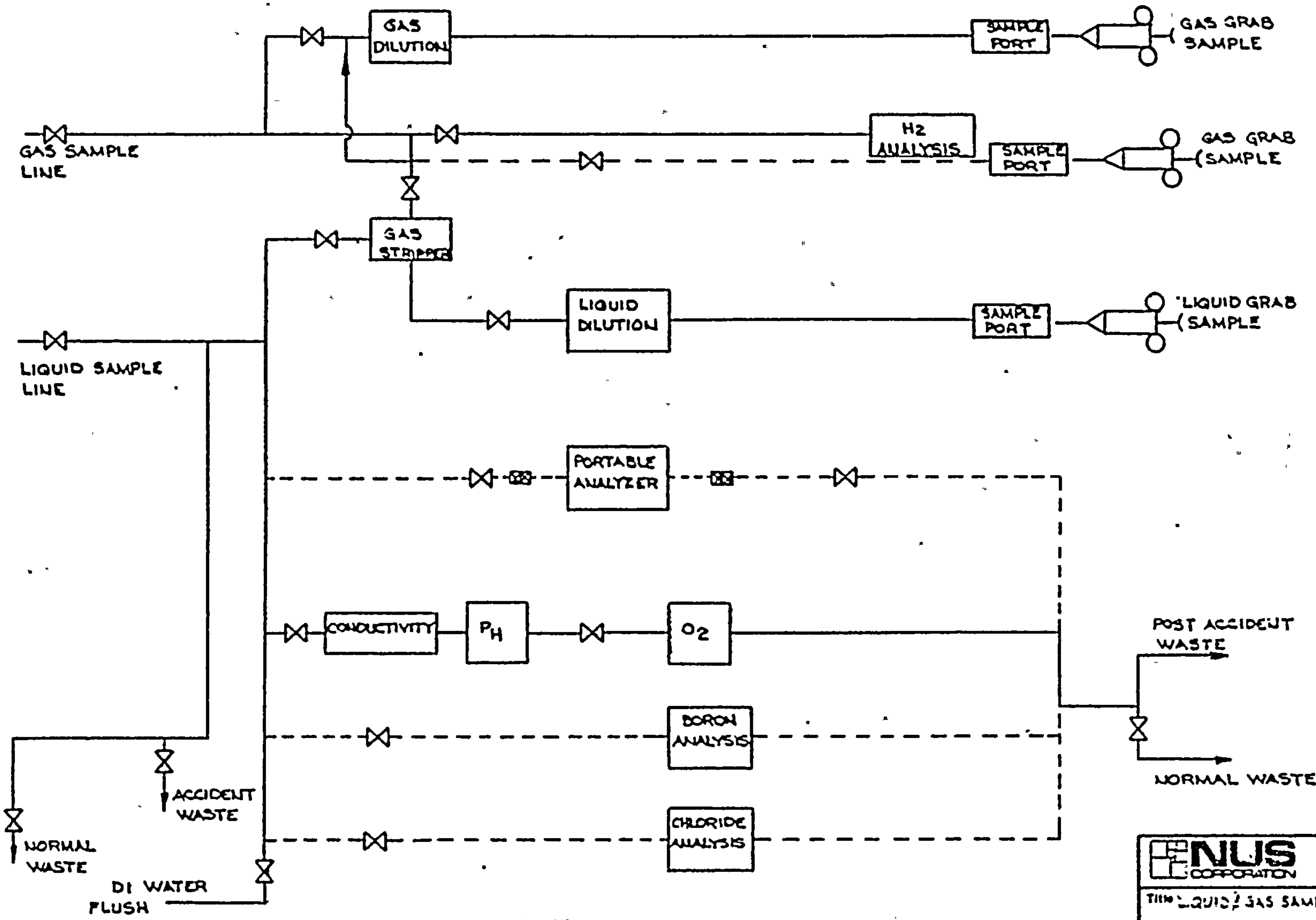
Electrical Control Panel

The Electrical Control Panel (ECP) will house all electrical support equipment necessary for operation of the Liquid and Gas Sample Panel. All remotely operated valves in the LGSP will be operated from the ECP. A lighted mimic display showing the status of valves and equipment will be provided as part of the ECP. The accident isolation switch which locks out all normal sampling functions under accident conditions is also located on this panel. The panel in-corporates human engineering concepts in the arrangements of controls and displays.

Analytical Techniques and Specifications

Various methods of quantifying the concentrations of boron, dissolved oxygen, hydrogen, pH, and conductivity were evaluated. Each analytical technique was evaluated with respect to its ability to meet the required analytical specifications, operability under post-accident conditions, associated operator exposures, contamination potential, and radiation effects on equipment. The program has also been expanded to include the evaluation and development of techniques able to meet normal operation analytical requirements as well.

The measurement technique selected, and instrument range and accuracy for each of the liquid and gas sample parameters is shown on Table A-1.



------ OPTIONAL

NOTE:
VALVES SHOWN ARE REMOTELY OPERATED

NUS CORPORATION — CLEARWATER FLORIDA

Title LIQUID & GAS SAMPLE PANEL

Project GINNA PASS

Date | Fig. No. 1.2-1

FIGURE A-1

TABLE A-1

ANALYTICAL EQUIPMENT

Parameter	Measurement Technique	Range	Accuracy
LIQUID SAMPLES:			
pH	Probe; Cole-Parmer, or Equal	1-13	±0.1 pH unit
Conductivity	Probe; Beckman, or Equal	0.1-500 umho/cm	±3%
Dissolved Oxygen	Probe; Yellow Springs Instrument	0.1-20 ppm	±10%
Dissolved Hydrogen	Gas Chromatograph; Baseline, or Equal	10-2,000 cc/kg	±15%
Boron	Automatic Titrimeter; Ionics	50-6,000 ppm	±1%
Chlorides	Ability to add a Portable Analyzer		
GAS SAMPLES:			
Hydrogen	Gas Chromatograph; Baseline or Equal	0-10%	±5%
Oxygen	Gas Chromatograph; Baseline, or Equal	0-30%	±5%