NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

300 ERIE BOULEVARD WEST
SYRACUSE, N Y 13202

July 2, 1970

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U.S. ATOMIC ENERGY COMMISSION
Regulatory
Mail Section

Dr. Peter A. Morris
Director of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Morris:

Re: Docket No. 50-220

Your letter of June 19, 1970 authorizing the return to operation of the Nine Mile Point Nuclear Station requested information on our plans regarding one additional leak detection system and the analysis of the biological shield surrounding the reactor vessel under the prescribed conditions. We report on the analysis to date of these items as follows:

Additional Leak Detection System

Systems which are presently installed to detect leakage within the primary containment include sump accumulation rate and dew point measurement. A third leak detection system will be installed as recommended by the ACRS. This system will recirculate a portion of the primary containment atmosphere through an external loop by means of a positive displacement type blower. Samples will be drawn continuously from this loop through a constant air monitor having a belt type filter and alarm.

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Conceptual engineering for this new system is proceeding. Delivery of the major equipment component, the constant air monitor is 3 to 4 months. Consequently, this order will be placed just as soon as the conceptual design is finalized. This is expected to be within a month. Installation will be accomplished at the first convenient outage following receipt of the air monitor.

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Biological Shield Analysis

The biological shield consists of an approximately 24 foot diameter circular cylinder attached to the vessel support pedestal and extending upward about 45 feet. As shown in the attached Figure 1, this cylinder forms the outer shell of the annulus. The inner shell is the vessel wall and support skirt. The pedestal forms the base of the annulus with the top open to the drywell. The shield wall is nearly 27 inches thick and consists of 27 inch vertical WF beam columns tied together by horizontal WF beams and 5/8 inch plates. These plates are welded to the column flanges, both inside and outside; thereby, forming a double walled shell. The shell is filled with concrete thus providing the shielding capability. Pipes leaving the vessel at elevations below the top of the shield wall penetrate the wall. The penetrations in the vicinity of the core utilize removable shield gates fitting around the penetrating pipes which were provided to allow access to the pipe welds for in-service inspection. These gates are made of 6-inch thick steel plates having top and bottom halves which open and close. Permali blocks are placed behind the gates in the shield wall penetration to provide further shielding capability.

Pipes having safe ends which penetrate through the biological shield wall include the following:

	Number	Nominal Size	Condition of Safe Ends
Recirculation Inlet	5	28"	Furnace Sensitized Stainless Steel (F.S.S.S.)
Recirculation Outlet	5	28"	F.S.S.S.
Core Spray	2	6"	Non-F.S.S.S.
Control Rod Drive Hydraulic Return	1	3"	F.S.S.S.
Instrument Lines	7*	2"(Max.)	Non-F.S.S.S.

* The 2" core differential pressure line shown in Figure 1 represents a "worst case" for the various instrument lines.

These configurations have been analyzed to confirm that the pressure effects resulting from safe end failures within the biological shield annulus up to and including the Design Basis Loss-of-Coolant Accident will not cause failure of the biological shield. The nozzles are considered a part of the reactor vessel and were not separately analyzed because (1) the minimum wall thickness in all cases is at the safe end to pipe joint and (2) no aspect of the recent evaluations of furnace sensitized stainless steel materials suggests the necessity for re-evaluation of the Design Basis Loss-of-Coolant Accident.

However, the results reported herein for safe end failures can be related to any type failure within the biological shield annulus to the extent that break or rupture areas are similar.

The wide range of variables which might be postulated; i.e., break size, shape and location, can be bounded by two general conditions: (1) complete circumferential pipe ruptures which, at least for the larger safe ends, would result in a high velocity flashing stream being directed almost entirely through the shield wall opening into the drywell rather than into the shield wall annulus and (2) other types of failures for which this relieving mechanism would not be available.

Calculations involving complete circumferential pipe failures show that the maximum hypothetical pressure rise would be about 40 psi if flows from a double ended recirculation line break were to be directed entirely into the annulus. However, this condition is not plausible because reaction forces would be sufficient to force the severed pipe from the shield wall opening and the high velocity flashing stream would be directed through this opening to the drywell. That portion of the flashing stream which might find its way into the annulus would be inconsequential compared with the overall capability discussed below for the shield wall.

Lesser failures of the large recirculation pipe safe ends might also be postulated that could release significant amounts of coolant to the shield wall annulus. However, it is extremely difficult to conceive of failures of this type having a break area larger than about 1 or 1.5 square feet. The resultant pressure rise for this break area would be in the range of 5 to 7 psi. The failure of smaller pipe safe ends, including the case of complete circumferential breaks, would also result in modest pressure increase in the shield wall annulus. The most severe of these cases is complete failure of the core spray safe end for which a 2 psi pressure increase is calculated.

The capability of the shield wall to withstand pressure effects is limited by the strength of the vertical welds which join the steel plates forming the cylindrical shell to the flanges of the vertical columns. No credit is taken for concrete strength. The allowable weld shear stress for this configuration is 1.5 times the code allowable stress. Using the allowable stress from the February 1969 American Institute of Steel Construction (AISC) Code, the allowable weld shear stress is thus calculated to be 27,000 psi and the resultant normal shield wall capability would be about 96 psi. However, if earthquake and jet reaction forces on the reactor vessel are conservatively assumed to occur simultaneously at their maximum values, the remaining shield wall capability to accommodate pressure effects is reduced to about 51 psi.

Very truly yours,

F. J. Schneider

F. J. Schneider
Vice President Operations

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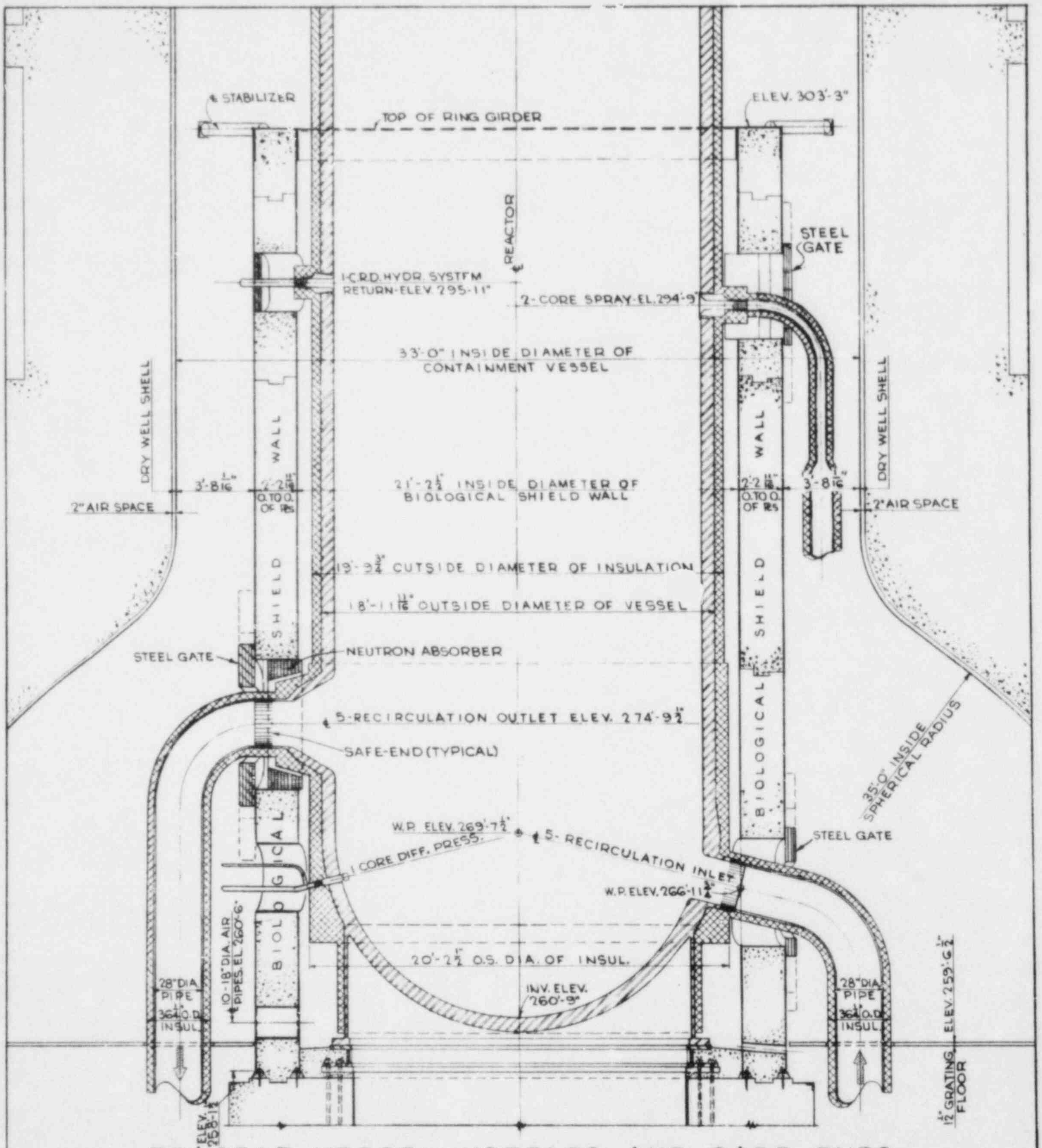
Enclosure 1



REACTOR VESSEL NOZZLES AND SAFE-ENDS

NINE MILE POINT

FIGURE I

JUNE 30, 1970