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U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

References:
1. Docket Number 50-73, License R-33.
2. "Request for Additional Information (TAC No. MA0099)", Marvin M. Mendonca to G. L. Stimmell, dated October 20, 1998.
3. NEDO-32740, "General Electric Nuclear Test Reactor Safety Analysis Report"; August, 1997.
4. NEDO-32765, "Technical Specifications for the General Electric Nuclear Test Reactor, Facility License R-33"; August, 1997.
5. Letter, B. M. Murray to Marvin M. Mendonca, August 23, 1999.

Dear Marvin:

The response (Reference 5) to the remaining questions of the request for additional information (Reference 2) regarding the General Electric Nuclear Test Reactor Safety Analysis Report (NTR SAR, Reference 3) contained a statement that replacement pages to the SAR were enclosed. These replacements were inadvertently omitted from the submitted material. Sections 6.3, "Ventilation", and 6.4, "Bases for the Stack Action Levels", were revised and are enclosed as replacement pages 6-5 through 6-10 to the SAR.

During the review and revision of the ventilation material, some errors and inaccurate statements were discovered in Section 3.4, "Reactor Cell and Ventilation System", of the Technical Specifications document (Reference 4). Therefore, changes were also made to the Technical Specifications. The most significant of these changes is the correction of the annual average release rate limit for beta-gamma particulate emissions. It was presented as a factor of 100 lower than intended. The corrections are enclosed as a replacement page 3-12 to NEDO-32765 (note that the cover page of NEDO-32765 contains a typo in the document number – "NEDC", instead of "NEDO").

If there are additional questions related to this response, please contact me at (925) 862-4455.

Very truly yours,

B. M. Murray
Senior Licensing Engineer

cc: Mr. Steve Hsu
Radiologic Health Branch
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1. A 24-inch-diameter hole through the north wall at approximately core centerline height (blocked on the south end by an aluminum plate and a motor-driven shutter; blocked on the north end by the Modular Stone Monument).

2. Stepped hole (6-8 inches in diameter) through the east wall approximately 10 feet above the cell floor.

3. Hole for future thermal column through the east wall (presently filled with unmortared concrete bricks).

4. Two holes (3 and 4 inches, respectively) in the north wall, penetrating into the north room. The 3-inch hole contains radiation area monitor cables and the 4-inch hole is used for the CHRIS experiment facility.

6.3 VENTILATION

The NTR exhaust system includes a 3,000-ft^3/min fan located on the reactor cell roof. The fan draws air from the reactor cell, south cell and the north room modular stone monument. The air goes through a prefilter and a bank of absolute filters and is then discharged through a stack of sufficient height to disperse the exhaust upward.

An air monitoring system provides continuous indication of the concentration of radioactive material in the ventilation effluent and energizes an alarm at the reactor console if the concentration reaches a set point which has been selected to ensure that the airborne release does not exceed established limits (Table 6-1). Separate detection channels and alarms are used for particulate material and for nonfilterable radioactive gases. A continuous sample is drawn from the discharge of the NTR ventilation stack and passes through the particulate detector, a charcoal cartridge, the nonfilterable radioactive gas detector, flow control valve, and a central blower (Hoffman). It is then released through the Building 105 NTR Furnace Exhaust. Particulate materials are collected on a high-efficiency filter paper and their emissions measured with a

Table 6-1

STACK RELEASE ACTION LEVELS

Stack	Nominal Flow Rate, cfm	Noble Gas Ci/wk µCi/cc	Halogen mCi/wk µCi/cc	Alpha µCi/wk µCi/cc	Beta µCi/wk µCi/cc
105, NTR	1.80E+03	18 *1.9E-04	1.74E+02 1.9E-06	8.69E+00 9.5E-11	8.69+E02 9.5E-09

*The NTR noble gas concentration limit during non-operating time, i.e., when the reactor is shut down and the cell can be open, is set at 2E-6 µCi/cc.

shielded Geiger-Müller detector. Nonfilterable radioactive gases are detected by an internal gas flow ionization chamber with a relatively high sensitivity for beta emitters. Current from the chamber is measured by a picoammeter. Each channel is recorded on a multipoint recorder. The charcoal cartridge and particulate filter are changed periodically (normally weekly) and counted by the VNC Counting Lab for I-131 and gross β-γ and α, respectively. Figure 6-3 presents a line diagram of the system.

6.4 BASES FOR THE STACK ACTION LEVELS

The stack release action levels are defined as the release rates for each radionuclide group (noble gas, I-131, beta particulate, or alpha particulate) at which action should be taken to reduce the release rate. The design basis for setting the action levels is the objective to maintain doses to members of the public from airborne releases to a maximum of 10 mRem per year. The method for establishing these action limits is described below.

10CFR20, Appendix B, Table 2, Column 1 gives airborne radioactive material concentration limits for releases to the general environment. Inhalation of a single radioisotope at that concentration continuously over the course of a year would produce a total effective dose equivalent of 50 millirem. Therefore, the release rates from the effluent stacks at VNC must be controlled to a level which will not exceed 20% of the 10CFR20 effluent concentrations by a dilution-dispersion factor. Dilution-dispersion factors are calculated from the measured meteorological conditions for a year's period (or more). Consideration also is given to concurrent releases from the other stacks on site, and the release limit is further reduced to account for multiple releases.

The action level for the noble gas releases from the NTR stack is selected as the rate which would give an annual average concentration of Ar-41 at the site boundary of 20% of the effluent concentration limit (ECL), further divided by a factor of two for other stack releases. Ar-41 has been shown to be the predominant noble gas in the stack effluent (Climent, 1969). Fission-produced noble gases are a minor fraction unless fuel material is exposed to the effluent air. Ar-41 is produced by the neutron irradiation of the air passing through the reactor.

The action levels for all other isotope groups are more conservatively selected at 10% of the concentration limit for the restrictive, credible isotopes of each of the isotope groups: I-131, unidentified beta radionuclide and Np-237. These, too, are reduced further by a factor of two for other stack releases. The release limits are specified as release rates (μCi/sec); this makes the limit independent of the stack flow rate. A limit expressed as a concentration (μCi/ml) is dependent on the stack flow rate. However, radioactive concentrations are commonly used in measuring and reporting effluent releases.

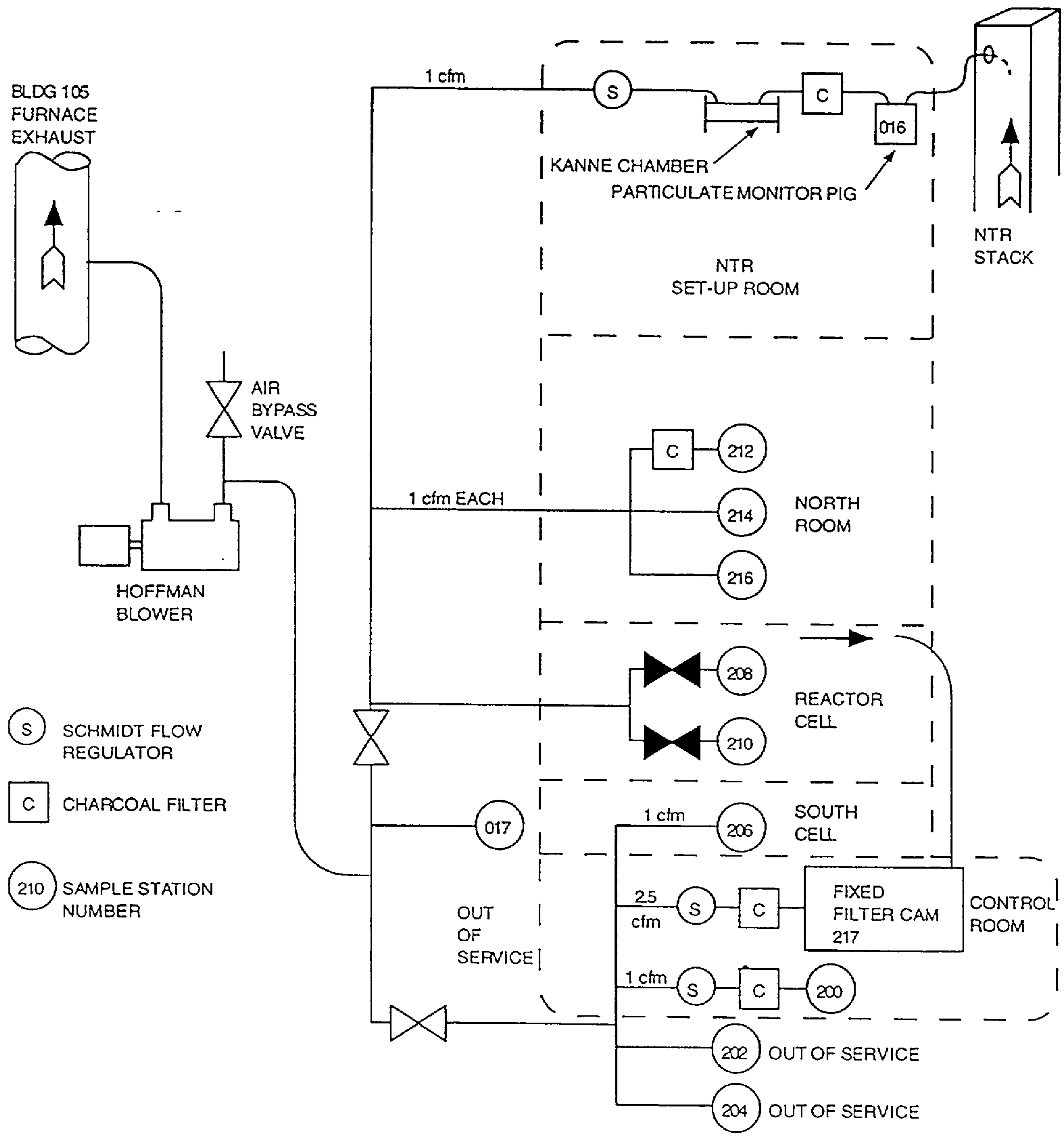

Figure 6-3. Line Diagram of System

Stack flow rates fluctuate, sometimes by design and sometimes randomly. For example, the NTR flow depends on the position of the cell door. The flow in all filtered systems varies as the dust loading on filters increases and as containment systems are changed. The following stack flow rate is the average flow rate during operation used for limiting concentrations and calculating measured releases:

Stack Location	Flow Rate, cfm
Building 105, NTR	1,800

The applicable effluent concentration limit values from Appendix B, Table 2, Column 1 of 10CFR20 are given below:

Release Category	Limiting Isotope	10CFR20 Effluent Concentration Limit, μCi/ml
Noble Gas*	Ar-41	1.00E-08
Halogen	I-131	2.00E-10
Alpha Particulate	Np-237	1.00E-14**
Beta-Gamma Particulate	***	1.00E-12

The dilution-dispersion (χ/Q) factor and reduction factor to account for releases from "other stacks" are given below:

Stack Location	χ/Q, sec/ml	"Other stack", reduction factor
Building 105, NTR	3.48E-11	2

*The NTR noble gas inventory available to the boundary has been found to be primarily Ar-41, which is an activation product of air. Fission products would be of concern in the event of fuel failure, an abnormal condition.

**There are several isotopes with more restrictive limits, but they can be shown to be insignificant fractions of the typical mix of alpha emitters found at VNC.

***Unidentified isotopes, where several natural, transuranic, and other rare elements are known to be absent. These are mainly alpha emitters which would be accounted for in the alpha analysis.

The annual average dilution-dispersion factor for the NTR, and the other stacks at VNC, was calculated from valid hourly records of measured meteorological conditions for a two-year period in 1976 and 1977. The sector average χ/Q factors were conservatively computer calculated for each of 16 sectors (22.5 degrees each) using:

- Scaled distances from a site layout map to determine the distances from the reactor to the center of the sector at the site boundary.
- A building cross-section of 281 square meters, for wake effects.
- A ground level release elevation.
- No credit taken for plume depletion.

The single maximum calculated annual average χ/Q value of 3.48E-11 sec/ml was selected from the 16 sector average values. This value, which happens to occur in the east-southeast sector at 622 meters from the stack, is used to determine the NTR stack release limits. The ECL release rate, i.e., the continuous release rate which would produce an annual average boundary concentration equivalent to the ECL, would be calculated by division of the ECL by the χ/Q value. The Action Level release rates are calculated by reducing the ECL release rates by a factor of 10 for noble gas (a factor of five and another factor of two for "Other Stacks"), and a factor of 20 for the other isotope groups. These release rate limits, in units of microcuries per second, are shown below.

Isotope Group	**Action Limit Release Rates (μCi/sec)**
Noble Gas	2.87E+01
Halogen	2.87E-01
Alpha	1.44E-05
Beta	1.44E-03

These conservative release rate limits are converted and presented as the Technical Specification weekly release rate limits of Table 3-3 in NEDO-32765 (Technical Specifications for the General Electric Nuclear Test Reactor). For convenience in monitoring operating conditions, these release limits are also presented in Table 6-1 of this section as concentrations, in units of μCi/cc. A normal maximum operating time for the NTR typically would not exceed 30 hours in a week. Therefore, this partial operating time is used to calculate the operating stack effluent concentration limits.

Table 3-3
STACK RELEASE RATE LIMITS

Isotope Group	Annual Average
Halogen, > 8d T1/2	180 mCi/wk
Particulate, > 8d T1/2	
Beta-Gamma	870 μCi/wk
Alpha	8.7 μCi/wk
All other (including Noble Gas)	18 Ci/wk

3.4.3.4

During operation of the reactor above 0.1 kW or the performance of activities that could release radioactivity to the ventilation system, the stack particulate activity monitor and the gaseous activity monitor shall be operating.

If either the gas or particulate monitor is not operable, the reactor shall be shut down, or the activity involving releases shall be terminated, or the unit shall be promptly repaired or replaced with one of comparable monitoring capability. During this period, any indication of abnormal reactor operation shall be cause to shut down the reactor immediately.

3.4.4 Bases

Operation in accordance with Specification 3.4.3.1 and 3.4.3.2 ensures that potentially contaminated reactor cell air due to reactor operation is released and monitored through the ventilation system.

The ventilation system release limits in Specification 3.4.3.3 are based on the following:

The annual average dilution factor from the NTR stack to the site boundary based on 1976 and 1977 meteorological conditions and stack flow rate of 1,800 cu ft/min equals approximately 33,000. That is, the concentration at the site boundary from a continuous uniform release from the NTR stack will be ≤ 1/33,000 of the concentration at the stack when averaged over 1 year.