NSP

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February 9, 1990

10 CFR Part 30.36

U.S. Nuclear Regulatory Commission
Region IV
Material Radiation Protection Section
611 Ryan Plaza
Arlington, TX 70611

Byproduct Material License No. 22-08799-02
Response to NRC Comments Dated January 11, 1990
Pathfinder Decommissioning Plan - Response to 1/90 Comments

Enclosed please find two copies of "Pathfinder Decommissioning Plan - Response to 1/90 Comments". This document presents our responses to comments on the Pathfinder Decommissioning Plan put forth by the NRC staff in a letter dated January 11, 1990.

The responses presented document NSP's intended course of action for the Pathfinder decommissioning project. As detailed engineering is currently ongoing, there is a potential for changes in areas of the plan which outline the details of specific decommissioning work. The NRC staff will be notified in writing of significant changes to the Decommissioning Plan, or NSP's responses to the NRC staff's comments, which result from the completion of detailed engineering work.

The response to comment number 8, of the new comments section, is not being submitted at this time. NSP's contractor must rerun the computer code, which was originally used to develop the Pathfinder Decommissioning cost estimate, to extract the intermediate results that are being requested in comment 8. Our response to comment 8 will be forwarded to you on or before February 28, 1990. This schedule was agreed to during a February 6, 1990 telephone conference between NSP, NRC staff and TLG Engineering.

This document is intended to be used as companion document to the previously submitted "Pathfinder Decommissioning Plan", and "Pathfinder Decommissioning Plan - Response to NRC Comments". It is intended that this document and the preprinted index tab be included in the three ring binder which was previously submitted with "Pathfinder Decommissioning Plan - Response to NRC Comments".

	Ltr	Encl
Don Martin	1	1
Region 4 - Original	1	1
NRC PDR	1	1
NUDOCS Abstract	1	1

Z1ZZ
1/1

Northern States Power Company

Please contact us if you have any questions or comments regarding this submittal.

for Thomas M Parker
Manager
Nuclear Support Services

c: Director NMSS, NRC (14 copies)
D Martin, NRC, NMSS (8 copies)
W Fisher, NRC, Region IV (6 copies)
South Dakota Department of Water and Natural Resources
Attn: Michael Pochop

Attachments : Pathfinder Decommissioning Plan - Response to 1/90 Comments

COMMENTS AND RESPONSE ON PATHFINDER DECOMMISSIONING PLAN

1. Original Comment 9

COMMENT:

Please provide the operating efficiency of the HEPA filters used in both temporary local area ventilation equipment and in the RB and FHB building exhausts for the particle sizes expected. Please provide overall minimum expected operating removal efficiencies.

RESPONSE:

The operating efficiency of the HEPA filters used in both temporary local area ventilation equipment and in the Reactor Building (RB) and Fuel Handling Building (FHB) exhaust system will average not less than 99.97 percent on thermally generated, monodispersed 0.3 micrometer particles. Filters will meet UL Standard 586 and each filter will be factory tested and certified as having an overall operating efficiency of not less than 99.97 percent by the DOP test method.

2. Original Comment 9

COMMENT:

Please confirm that temporary ventilation equipment will exhaust inside the RB and FHB, and that this exhaust air must pass through a second HEPA filter in the building exhaust(s) before release to the environment. Please provide a diagram of the building exhaust system, and indicate where the local area ventilation equipment will exhaust.

RESPONSE:

The temporary ventilation equipment will recirculate air inside the Reactor and Fuel Handling Buildings. Recirculated air will pass through a HEPA filter located inside the temporary ventilation equipment. This exhaust air will pass through a separate HEPA filter in the building ventilation system before being exhausted to the atmosphere. Refer to Figures 2-5a and 2-5b for diagrams illustrating the above system.

3. Original Comment 12

COMMENT:

Please provide a description of the "milling cutter" and how it will be used.

RESPONSE:

The "milling cutter" is a pipe cutting machine that is mounted on the outside of the pipe. These machines can be air or hydraulic driven. These machines can sever, bevel and counter bore in one setup. Pipe cutting machines will be used when thermal cutting is not feasible. Two typical models of such equipment are presented in Attachment 1.

4. Original Comment 21

COMMENT:

Please provide diagrams and text which illustrate the size, shape, location, thickness and permeability of the clay and earth caps to be placed over the buried RB. Please provide bounding estimates of the total inventory by nuclide of residual activity in the concrete to be left in place (include all assumptions and data), the mass of concrete to be left in place, the projected water flow rate into the buried containment, and the time required for the "water table" in the buried containment to rise to the upper edge of the buried structure.

RESPONSE:

Figure 4-1 shows the size, shape, location, and thickness of the clay cap. The clay cap as designed has a permeability of 10^{-6} cm/sec. The clay cap has a 2% grade sloping away from the turbine building to avoid any future ponding.

The maximum radionuclide inventory that could remain in the Reactor Building is 376 microcuries. This is based on a remaining building surface area of 21,025 ft^2 (consisting of the pump, plug, equipment and operating floors, reactor shield pool, reactor inner and outer shields, building perimeter walls, and pump wing walls), and a free release criteria of 4300 dpm/100 cm^2 above background (see response No. 8). If the available interstitial void space in the Reactor Building were to fill with water, 163,000 gallons of water (conservatively based on an assumption of a fill requirement of 62,200 ft^3 and void fraction of 35%) would be contained in the demolished building. If all of the remaining residual radionuclide inventory were to mix instantaneously with this water, a mixture concentration of 6.1×10^{-7} microcurie(Co-60)/ml would be produced. The resulting concentration would be less than 2 percent of 10 CFR Part 20 Appendix B Table II Column 2 concentration for Co-60 in unrestricted area water. Based on the 1980 PNL survey data, Co-60 is the predominate radionuclide. Co-60 was found to be at least 100 times more predominate than the other radionuclides (Cs-134, Cs-137, Eu-152,and Eu-154) which were found. Instantaneous mixture of the radionuclides with the leachate, and instantaneous filling of the available voids with water are very conservative assumptions.

An analysis was performed on a design utilizing a clay cap liner to determine the time required to fill the demolished reactor building with water. This analysis used a permeability of 10^{-6} cm/sec. The percolation rate for this case is 2.18 inches per year. The corresponding water filling time would be about 78 years.

The analysis of the water percolation through the cap was performed using computer program HELP, Reference 1. The HELP program was developed to facilitate rapid, economical estimation of the amounts of surface runoff, subsurface drainage, and leachate that may be expected to result from the operation of a wide variety of possible landfill designs. The program models the effects of hydrological processes including precipitation, surface storage, runoff, infiltration, percolation, evapotranspiration, soil moisture storage, and lateral drainage using a quasi-two-dimensional approach. The following assumptions were employed:

- Rainfall data for the site was based on the computer program's built-in data for Huron, South Dakota, which is 100 miles from the site. The rainfall data was modified to correspond to the site precipitation data included in the Pathfinder Environmental Report (see Table 4-6, Pathfinder Environmental Report).

- The ground surface was assumed to be grass-covered.

- The granular fill inside the Reactor Building was assumed at 20 percent saturation at the start, and to have 0.35 porosity.

It is the conservative intent of the project to utilize a clay cap water barrier system.

The mass of concrete remaining on site following demolition of the Reactor Building is estimated at 6,800,000 lb.

Based on the extremely conservative analysis which resulted in 7.1×10^{-7} microcuries/ml concentration in the Reactor Building water, the Reactor Building filling with water is not a safety concern.

References

1. The Hydrologic Evaluation of Landfill Performance (HELP) Model, EPA Office of Solid Waste & Emergency Response, EPA/530-SW-84-009, June 1984.

5. <u>Original Comment 23</u>

COMMENT:

The response provided here is too general. A detailed discussion is needed of the radiation control procedures to be used and when they will be used. This should specify when isolation tents, respiratory protection, etcetera, would be used.

RESPONSE:

The criteria and guidelines of the Radiation Protection Program are discussed in Section 3.2 of the Decommissioning Plan. The titles of procedures implementing these criteria are listed in the response to Comment 13. These procedures are reviewed for ALARA and QA program requirements and are modeled after Radiation Protection Procedures currently in use at the Monticello Nuclear Generating Plant.

In addition to exposure control guidelines and limits of Section 3.2.1.4 of the Decommissioning Plan, we will implement guidelines for use of respiratory protection and protective clothing per Attachments 4 and 5 respectively. The use of respiratory protection and protective clothing will be dictated by the guidelines presented in Attachments 4 and 5, and the results of pre-job radiation surveys of the work area. Surveys will be analysed for Beta-Gamma contamination levels.

All work tasks in contaminated areas will be evaluated for respiratory protection and protective clothing requirements using the guidelines presented in Attachments 4 and 5 prior to the initiation of the task. Special attention will be given to the need for the use of respiratory protection when the task involves any of the following operation:

- Thermal Cutting
- Concrete Scabbling
- Welding
- Grinding
- Concrete Demolition

We do not have similar documents for the use of local isolation containments. However, we will implement the following:

1.) Whenever a specific work activity requires the use of respiratory protection, we intend to use local isolation containments. We do anticipate cases where this is not practical, cost effective, or efficient and in these cases will provide respiratory protection, as needed, for workers in adjacent work areas per Attachment 5.

2.) Even when not required for airborne protection, we intend to use isolation containments if the surrounding work area is uncontaminated or is much cleaner than the work area to minimize the spread of contamination.

6. Original Comment 25

COMMENT:

Please specify what kind of torch cutting will be used for cutting rebar, and other materials, and the respiratory protection to be used during these operations.

RESPONSE:

There will be two primary means of thermal cutting used during decommissioning; plasma and oxygen-acetylene. The oxygen-acetylene method will be used on the rebar and most structural steel components. The metal cutting referred to in the response to original question #25 takes place only after contaminated materials have been removed and remaining materials meet the release criteria; thereby allowing standard demolition techniques to be employed. OSHA Section 1926.55 will be observed with respect to gases, vapors, fumes, dusts, and mists. It is not anticipated that respiratory protection will be required. When demolition of the concrete operating floor commences, the containment building above grade will have been removed, and work will be performed in the open air.

7. Original Comment 42

COMMENT:

Please clarify the second sentence of this response.

RESPONSE:

Each work crew will be under the control of a Radiation Protection Specialist (RPS).

Anticipated requirements for Radiation Protection Specialists are:

- A minimum of three at the following locations

  one RPS at access control
  one RPS in the Reactor Building
  one RPS in the Fuel Handling Building

There will be a need for additional Radiation Protection Specialists as the work load dictates for the following:

- One for Radioactive waste shipping

- Two for other tasks such as instrument calibration, laundry monitoring and to fill in for vacation, sick time, etc.

8. Original Comment 55

COMMENT:

The stated release criteria for fixed radiation is "100 CPM above background... using a pancake GM survey meter at 1 cm." Please convert CPM to dpm, and indicate the minimum efficiency and size (area) of the pancake survey meter to be used. Please indicate the minimum detectable contamination in units of dpm per 100 square cm.

RESPONSE:

A typical radiation detection instrument to be used on the Pathfinder Decommissioning Project is a TGM Pancake GM tube detector, model number N1002/8767 (see Attachment 2 for information on the N1002/8767 detector).

Diameter = 4.45 cm
Probe eff. = 15% for Co-60 (the predominate isotope)

Conversion of 100 CPM to dpm

Area of window

$$\frac{\pi D^2}{4} = \frac{\pi \times (4.45\ \text{cm})^2}{4} = 15.55\ \text{cm}^2$$

$$\frac{100\ \text{CPM}}{15.55\ \text{cm}^2} = \frac{6.43\ \text{CPM}}{\text{cm}^2} \times \frac{100\ \text{cm}^2}{100\ \text{cm}^2} = \frac{643\ \text{CPM}}{100\ \text{cm}^2}$$

$$\frac{643\ \text{CPM}}{100\ \text{cm}^2} \times \frac{1\ \text{dpm}}{.15\ \text{CPM}} = \frac{4286.46\ \text{dpm}}{100\ \text{cm}^2}$$

100 CPM = 4286.46 dpm per 100 cm^2 at 1cm (for Co-60)

The minimum detectable contamination of a pancake probe detector is approximately 4300 dpm per 100 cm^2 above background (for Co-60).

9. Original Comment 57

COMMENT:

Please justify and provide the detailed procedure by which background levels will be determined. Please specify how anomalous results (high and low) will be identified and used or dismissed. The justification should address the effects of building geometry where background is determined and relate those to the geometry of the FHB and RB where they will be applied.

RESPONSE:

The following outlines our proposed protocol for characterizing the applicable average background radiation levels for free release of buildings, material and soil associated with this decommissioning project. Detailed procedures will be developed to implement this protocol.

Decommissioning criteria will be evaluated at acceptable levels above site background. Background will include both "instrument background" and background due to naturally occurring radioactive materials including enhanced background radiations due to technology (nuclear weapons tests). Therefore, reliable background data will be obtained for each type of measurement or determination. These will be for:

* Direct surface beta, gamma and alpha contamination
* Removable surface beta, gamma and alpha contamination
* Gamma exposure rate

  Background levels will be determined for the following various surfaces to account for geometry in the FHB and RB:

  1. 1 meter from a wall of a room.
  2. 1 meter from a corner where two walls and floor meet.

  The backgrounds determined for these geometries will be applied to similar geometries in the FHB and RB, such as a planar source and a source that surrounds the detector.

* Soil sampling

Good background data will be obtained by using:

* Unbiased sampling
* Proper number of samples
* Selection of background sample areas least likely to be affected by Pathfinder
* Use of calibrated and stable instrumentation
* Quality assured results

Of primary importance will be selection of background sampling areas which closely resemble the Pathfinder site, yet, have not been affected by it.

The sampling scheme for background will use the concept of a wheel with its emanating spokes and concentric circles drawn around the Pathfinder site with varying radii which will be adopted for sample location selection. Before a decision has been reached as to the segments to be used for obtaining data, consideration will be given to the elimination of those segments of the "pie" represented as downwind, downstream and the lower slope of the site since these locations may be influenced by contamination from the site. Acceptable segments will be chosen that have the types of sample media needed (i.e. concrete, soil, etc.). Background readings or samples will be taken at distances of 0.5, 1.5, and 3.0 km from the plant site in the various compass directions (distances may need to be increased to find sample points employing similar construction materials). There will be at least 30 background measurements of each of the previously listed determinations. By varying distance and direction and by taking at least 30 measurements of each type, individual anomalous results will be eliminated.

Background measurements may vary considerably from point to point. However, for each type of measurement, a "background level," B, will be determined. The definition of a "background level" is based on the assumption that the distribution of background data are lognormally distributed (i.e. their logarithms fit a normal [Gaussian] distribution).

The fit of the data to the lognormal distribution could be tested with statistical tests, but will be estimated by inspection of the data and the line through it. From a log-probability plot of the data it will be determined whether the data represent the distribution of a single or mixed lognormal population. The linear data plot, whose geometric standard deviation is generally around 2, describes the distribution of the background population while other constituents of higher value are due to contaminating sources.

All site release measurements less than or equal to B will be considered background and all measurements greater than B will be used as reflecting contamination. We have elected to determine B so that the probability that x (the random variable for the given radiological condition) is less than or equal to B is 90 percent or symbolically, probability ($x \leq B$) = 0.9. Some measurements less than B could be due to slight contamination, but there will be background measurements at the same levels. Measurements that are above B will have a small likelihood of being background measurements or, conversely, a large likelihood of reflecting contamination.

Once the sample background measurements are made, the natural logarithms of each will be determined and the sample mean ($\ln x$) and sample standard deviation s, will be computed:

$$(\ln x) = (\Sigma \ln x_k)/n$$

$$s = \sqrt{\frac{\Sigma [(\ln x) - \ln x_i]^2}{n-1}}$$

The "maximum likelihood" estimate of ln B is then:

$$\ln B = (\ln x = 1.28 \sqrt{(n-1)/n}\ S)$$

so that B can be estimated from the formula

$$B = \exp(\ln x + 1.28 \sqrt{(n-1)/n}\ S)$$

The preceding equation will be used to obtain an estimate of the background level B for each radiological determination to be made.

10. Original Comment 64b

COMMENT:

It is our belief that the Security Group could best carry out its duties independent of the Decommissioning Project Manager, whose primary duties relate to the completion of decommissioning work. Close communications could still be attained with the Security Supervisor reporting to the Plant Superintendent.

RESPONSE:

The security force is being established to provide around the clock security and accountability of personnel during the decommissioning project. The Decommissioning Project Manager will be responsible for a majority of the personnel on site and the entire radionuclide inventory of the Pathfinder site for the duration of the Pathfinder decommissioning project. As such, there needs to be enhanced communications between the security force and the Decommissioning Project Manager during all phases of the project. It is our feeling that the best way to provide this open line of communication is to have the security organization reporting to the Decommissioning Project Manager.

11. Original Comment 64e

COMMENT:

Security patrols once per shift appear to be too infrequent to detect an intrusion or other security event within the secured area. We would prefer that security patrols be conducted at least twice per shift.

RESPONSE:

Security patrols will be conducted at least twice per shift.

12. Original Comment 64h

COMMENT:

Please indicate the height of the fence around the Temporary Loading and Storage Building.

RESPONSE:

The Temporary Loading and Storage Building is part of the Secured Area and is wholly within the secured area perimeter fence. There is a minimum of 10 feet between the building and the perimeter fence. The fence is nine feet high with three strands of barbed wire. Figure 2-3 of the original comments has been updated to show the current configuration and is attached.

13. Original Comment 65

COMMENT:

As previously requested, please identify the titles of all procedures whose implementation is subject to oversight in the Quality Assurance (QA) Plan, and the specific procedures which govern the conduct of QA staff in executing the QA functions for which they are responsible.

RESPONSE:

Below are listed the titles of procedures whose implementation is subject to oversight in the QA program:

	PDP	TITLE
*	PDP-1-0	Organization
*	PDP-2-0	Procurement
*	PDP-3-0	Design and Design Document Control
*	PDP-4-0	Preparation and Control of Pathfinder Decommissioning Procedures
*	PDP-5-0	Work Control/Work Request Authorization (WRA)
*	PDP-5-1	Special Processes

	PDP-5-2	Safety Practices
	PDP-5-3	Housekeeping
	PDP-5-4	Fire Prevention and Combustion Source Use Permit
	PDP-5-5	Safety Tagging
	PDP-5-6	Control of Temporary Service Installations
	PDP-6-0	Material Control/Nonconforming Items
*	PDP-6-1	Receipt Inspection
	PDP-7-0	Quality Records
	PDP-8-0	Calibration/Control of Measuring & Test Equipment
*	PDP-9-0	Audits/Surveillances
	PDP-10-0	Training
	PDP-EP	Emergency Plan Implementing Procedure
	PDP-FS	Final Survey
	PDP-SP-1	Security Procedures
	PDP-SP-2	Emergency Numbers
	PDP-SP-3	General Emergency Procedures
	PDP-SP-4	Plant Personnel Badging System
	PDP-SP-5	Owner Controlled Area Access Procedure
	PDP-SP-6	Owner Controlled Area Patrol/Enforcement
	PDP-SP-7	Protected Area Control Measures
	PDP-SP-8	Protected Area Patrol/Enforcement
	PDP-SP-9	Communications
	PDP-SP-10	Security Records

Radiation Protection Program implementing procedures follow:

PDP-ERM	Environmental Radiological Monitoring

PDP-AL ALARA

(R.01 Series - Radiation Work Permits (RWP))

R.01.01 RWP Preparation and Issuance

R.01.02 WRA/Procedure Assignment to Existing RWP

R.01.03 RWP Revision

(R.02 Series - Radiological Surveys)

R.02.01 Dose Rate Surveys

R.02.02 Surface Contamination Surveys

R.02.03 Airborne Radioactivity Sampling

R.02.04 Analysis of Airborne Radioactivity Sampling

(R.03 Series - Instrumentation)

R.03.01 Instrument Requirements

R.03.02 Operation of Portable Radiation Survey Instruments

R.03.08 Smear Counter and Miniscalers

R.03.11 BBA System Background Check

(R.04 Series - Personnel Dose Assessment & Monitoring)

R.04.01 TLD/DRD Issuance

R.04.02 MPC-Hour Tracking

R.04.04 Personnel Contamination Assessment

R.04.06 Monthly TLD Change-Out

R.04.07 Terminations

R.04.08 Extension of Quarterly Allowable Exposure

R.04.09 TLD/DRD Discrepancy Resolutions

R.04.10 Termination Letters

R.04.11 Special Dosimetry Issuance

R.04.12 Exposure Requests

R.04.13 Control of Personnel in High Radiation and Airborne Areas

R.04.14 Casual TLD Issuance

R.04.15 Monthly Routine BBA Notification

R.04.16 Radiation Work Restrictions

R.04.17 Lost Dosimetry Tracking

(R.05 Series - Respiratory Protection)

R.05.01 Respirator Fitting

R.05.02 Respirator Maintenance

R.05.03 Respirator Issuance

(R.06 Series - Radioactive Material Handling)

R.06.01 Radioactive Source Control

R.06.02 Clearing Material from the Protected Area

R.06.03 Clearing Equipment/Material from the Controlled Area

R.06.04 Clearing Bulk Material from Controlled Area

R.06.05 Moving Radioactive Material through Clean Area

R.06.06 Use of Controlled Area Portals (CAP's)

R.06.07 Moving Equipment and Material Within the Controlled Area

R.06.08 Receipt of Radioactive Material

R.06.10 Clearing Equipment/Material from Contaminated Area

(R.07 Series - Posting and Identification)

R.07.01 Use of Tags and Labels

R.07.02 Area Posting, Special Status Signs and Hot Spot Stickers

(R.09 Series - HP Equipment Checks)

R.09.04 Smear Counter Functional Checks

R.09.07 RO-2 Calibration Procedure

R.09.08 RO-2A and Ludlum Calibration Procedure

R.09.10 Johnson Teletector Calibration

R.09.22 Frisker Calibration Procedure

R.09.28 HPGE Detector Calibration

R.09.37 NNC Friskall Whole Body Contamination Monitor (WCBM)

(R.10 Series - GDE System)

R.10.01 DRD Data Entry

R.10.02 RWP Data File Operations

R.10.03 Body Burden Analysis Data Entry

R.10.04 Personnel Activation Data Entry

R.10.05 Duplication Check

R.10.06 Personnel Termination Data Entry

R.10.07 RWP Acknowledgment Check

R.10.08 Routine Monthly TLD Data Entry

R.10.09 Training Verification

R.10.10 Exposure Report Program

R.10.12 Master Exposure File Update

R.10.13 Alert List

(R.11 Series and R.8000 Series - Radwaste Shipping)

R.11.01 Radioactive Material Shipping, Tracking and Filing

R.11.02	Radioactive Material Shipping Document Preparation
R.11.03	Radioactive Waste Segregation
R.11.04	Waste Classification
R.11.06	Shipping LSA Containers for Disposal
R.11.07	Shipping Stabilized Radioactive Resins
R.8077	Radioactive Material Shipments - LSA - Not Exceeding Type A Quantity in Exclusive Use Vehicles
R.8084	Procedure for Shipping Limited Quantities of Radioactive Materials
R.8089	Radioactive Material Shipments - Type A Quantity, Fissile Exempt
R.8091	Procedure for Shipping Radwaste to U.S. Ecology in Washington
R.8110	Master Radioactive Material Shipping Procedure
R.8129	Advance Notification of Nuclear Waste Shipment
R.8152	Shipping Empty Radioactive Material Packages

(R.12 Series - Miscellaneous RPP's)

R.12.01	Contract RPS Qualification
R.12.02	Radiation Protection Key Control
R.12.04	Personnel Decontamination
R.12.11	Temporary Change and Revision of RPP's

(R.13 Series - Job Specific RPP's)

R.13.01	Job Coverage

The work control process will be implemented for tasks which are subject to QA approval and oversight. In addition to the above procedures, technical work activities, as discussed in the Decommissioning Plan, shall be controlled using specific procedures. These procedures will be generated for more complex technical activities as they are identified (eg, removing the RPV, asbestos removal, etc).

Specific procedures which govern the conduct of the QA staff include: 1) the procedures listed above that are prefaced with an asterisk '*' and, 2) the following procedures maintained by NSP Power Supply QA (PSQA) department:

3QAP 2.1	Standard Audit Procedure
3QAP 2.2	Audit Plans
3QAP 2.3	Audit Checklist
3QAP 2.4	Audit Reports
3QAP 2.6	Audit Conferences
3QAP 2.8	Quality Assurance Surveillance
3QAP 2.11	Finding Issuance
3QAP 2.13	Finding Response
3QAP 2.14	Finding Closeout
3QAP 2.16	Deficiencies
3QAP 2.18	Pathfinder Decommissioning Project/PSQA Interface
4QAP 2.1	Conduct of Vendor Audits
4QAP 2.2	Vendor Audit Reports
4QAP 2.3	Vendor Audit Findings
4QAP 2.4	Source Surveillance

New Comments Decommissioning Plan

1. Attachment 1, Waste Storage Inventory

COMMENT:

Note item no's. 451, 452, and 495. These are probable mixed wastes and should be addressed in the decommissioning plan.

RESPONSE:

Items 451 and 452 are described as lead pipe and item 495 is a fuel cask which likely contains lead shielding. These items and all other lead materials dismantled during the project will be disposed in of one of the following methods.

- Non-radiologically contaminated lead will be disposed of in licensed hazardous waste disposal facilities or sold for salvage.
- Radiologically contaminated lead will be transferred to another licensed nuclear facility owned by Northern States Power Company, or stored at the Pathfinder site in the existing Reactor Building Penetration Cage area. This area will be maintained for storage of radioactive waste generated under the 10 CFR Part 30 license which will be retained following the decommissioning operations.

2. Radionuclide Inventory Report, p. 7 of 32

COMMENT:

It is stated that other materials besides Type 304 stainless steel, Zircaloy-2, and carbon steel were used. Please provide a list of these materials. Were any Inconel components used? Inconel has a high niobium content that can substantially affect waste classification. All components in the RPV should be identified with their materials.

RESPONSE:

During the compilation of data required for the activation analysis, several reactor internals were identified, whose material compositions were not one of the three (Type 304L stainless steel, Zircaloy-2, and carbon steel) subsequently used in the ORIGEN-2 calculations. Most of these components were small (i.e., bolts and nuts), and were manufactured from materials (Type 304 stainless, Type 316 stainless, etc.) very similar to one of the three analyzed. It was determined that their exposure to the neutron flux would not impact the final results.

One relatively large component, the steam dryer assembly, was determined to be substantially made of Inconel. However, this component is located in a region of the vessel minimally 9 feet above the top of core. In this region, it is conservatively estimated that the maximum total neutron flux is at least four orders of magnitude (approximately 3.5E+9 n/cm2-sec) below the average total neutron in-core flux.

For Inconel components, the niobium content can approach 50,000 to 70,000 ppm, up to 800 times the niobium concentration assumed in the stainless steel in this analysis. However, with the neutron flux at the location of interest so low, the activation of niobium in this component will contribute negligibly to the total radioactive niobium calculated by this analysis.

Additionally as part of the Pacific Northwest Laboratory (PNL) investigation of residual radionuclide distribution and inventory at the Pathfinder Generating Plant, Nb-94 was postulated to be of significant abundance in aged, neutron-activated stainless steel and Inconel. However, during the PNL work at the plant Nb-94 was nondetectable in the Pathfinder radioactive material which was translocated from the reactor pressure vessel, which confirms the analysis presented in this response.

The materials used to manufacture the components of interest are identified in Appendix B of the report "Radionuclide Inventory and Dose Rate for the Pathfinder Atomic Plant Reactor Package", October 1989, prepared by TLG Engineering, Inc. (Attachment 3). This report is an update to "Radionuclide Inventory and Package Dose Rate for the Pathfinder Atomic Power Plant" which was previously submitted as part of the "Response to NRC Comments". This report was updated to include additional detail in support of licensing action for reactor vessel certification as a shipping package.

3. Radionuclide Inventory Report, pp. 8 and 9 of 32

COMMENT:

The material composition data for the activation analysis was based on data from NUREG/CR-3474 and not on elemental composition analyses from material certifications, which we understand are unavailable for Pathfinder. The elemental compositions of Type 304 stainless steel and vessel carbon steel were taken as averages of samples presented in NUREG/CR-3474. NUREG/CR-3474 also presents ranges of compositions. What is the effect of using the highest elemental concentrations of Co, Nb, and Ni on the waste classification?

RESPONSE:

The material composition data for the activation analysis contained average concentration values for trace elements in Type 304L stainless steel, as given by NUREG/CR-3474. This included average concentrations of cobalt, nickel and niobium, whose concentrations in Type 304L stainless steel are given as 1,414 ppm, 100,000 ppm, and 89 ppm, respectively. If the maximum concentrations of cobalt (2,570 ppm), nickel (110,000 ppm) and niobium (300 ppm) given in NUREG/CR-3474 were assumed in this analysis, an estimated two-fold increase in the estimated exposure rates calculated for the vessel package (due to Co-60) would be realized. Additionally, the total curie content of the vessel package would increase by roughly 50% (due primarily to Co-60 and Ni-63). Under the analytical conditions of assuming maximum natural cobalt and nickel concentrations as given by NUREG-3474, the average radionuclide concentration of the package would be no greater than 0.0178 mCi/gram. Even with greater than three-fold increase in niobium concentrations the package would not exceed the Class A waste criterion of 0.02 microcuries per cubic centimeter of Nb-94.

4. <u>Radionuclide Inventory Report, Section 6, pp. 18-20 of 32</u>

COMMENT:

This section identifies reactor internal components. However, complete material characterization and dimensions are not provided. Please provide detailed material identifications (not simply stainless steel) and dimensions, including volumes and masses of theses components. Please also provide a detailed drawing identifying these components and their spatial arrangement within the RPV. This information is needed to verify the neutron flux regions used and the waste classification data presented.

Detailed dimensions of all of the individual components inside the reactor pressure vessel are not readily available. Figure B-1 of Appendix B in the report "Radionuclide Inventory and Dose Rate for the Pathfinder Atomic Plant Reactor Package" gives masses for each of the reactor pressure vessel components. Component dimensions and masses were derived from a large number of detailed design drawings. These drawings are available for inspection at the Pathfinder Site.

RESPONSE:

The information requested is contained in Figure B-1 of Appendix B in the report "Radionuclide Inventory and Dose Rate for the Pathfinder Atomic Plant Reactor Package", October 1989, prepared by TLG Engineering, Inc. This report and a drawing of the reactor pressure vessel are included in Attachment 3.

5. Radionuclide Inventory Report, Section 6.16, p. 20 of 32

COMMENT:

How does the elemental composition in the SA 212 carbon steel pressure vessel material compare with the summary data in NUREG/CR-3474? Are the elemental composition data available to make this comparison.

RESPONSE:

Elemental composition of the reactor vessel is unavailable. Therefore, no direct comparison can be made to the data found in NUREG/CR-3474.

6. Radionuclide Inventory Report, Section 7.1, p. 22 of 32

COMMENT:

What components identified in Section 6 make up the regions identified in this section?

RESPONSE:

The information requested is contained in Figure B-1 of Appendix B in the report "Radionuclide Inventory and Dose Rate for the Pathfinder Atomic Plant Reactor Package", October 1989, prepared by TLG Engineering, Inc. This report and a drawing of the reactor pressure vessel are included in Attachment 3.

7. Radionuclide Inventory Report, Section 9.2, p. 26 of 32

COMMENT:

What is the elevation of the core midplane? It is unclear how the calculated exposure rate for the core midplane is consistent with the data presented in Table 9.1.

RESPONSE:

The core midplane is located roughly at Elevation 1290'. Based upon the data in Table 9.1 and the data indicating the volume of gravel poured into the reactor vessel, it was determined that the measured exposure rates found in Table 9.1 compared well with calculated exposure rates. As noted in Table 9.1, there appears to be one "hot spot" where the measured exposure rate of roughly 600 mr/hr exceeds the calculated maximum core midplane exposure rate of 254 mr/hr (assuming a gravel packing factor of 75%). This "hot spot" is currently believed to be a region where the gravel did not pack well, therefore providing less self-shielding than the surrounding areas.

8. Decommissioning Cost Reports

Comment 8 will be addressed separately on or before February 8, 1990 as discussed in our telephone conference of February 6, 1990 between NSP, NRC and TLG Engineering. The computer code which performs the cost estimates must be rerun to provide the type of intermediated results that are requested in comment 8.

9. Drawings

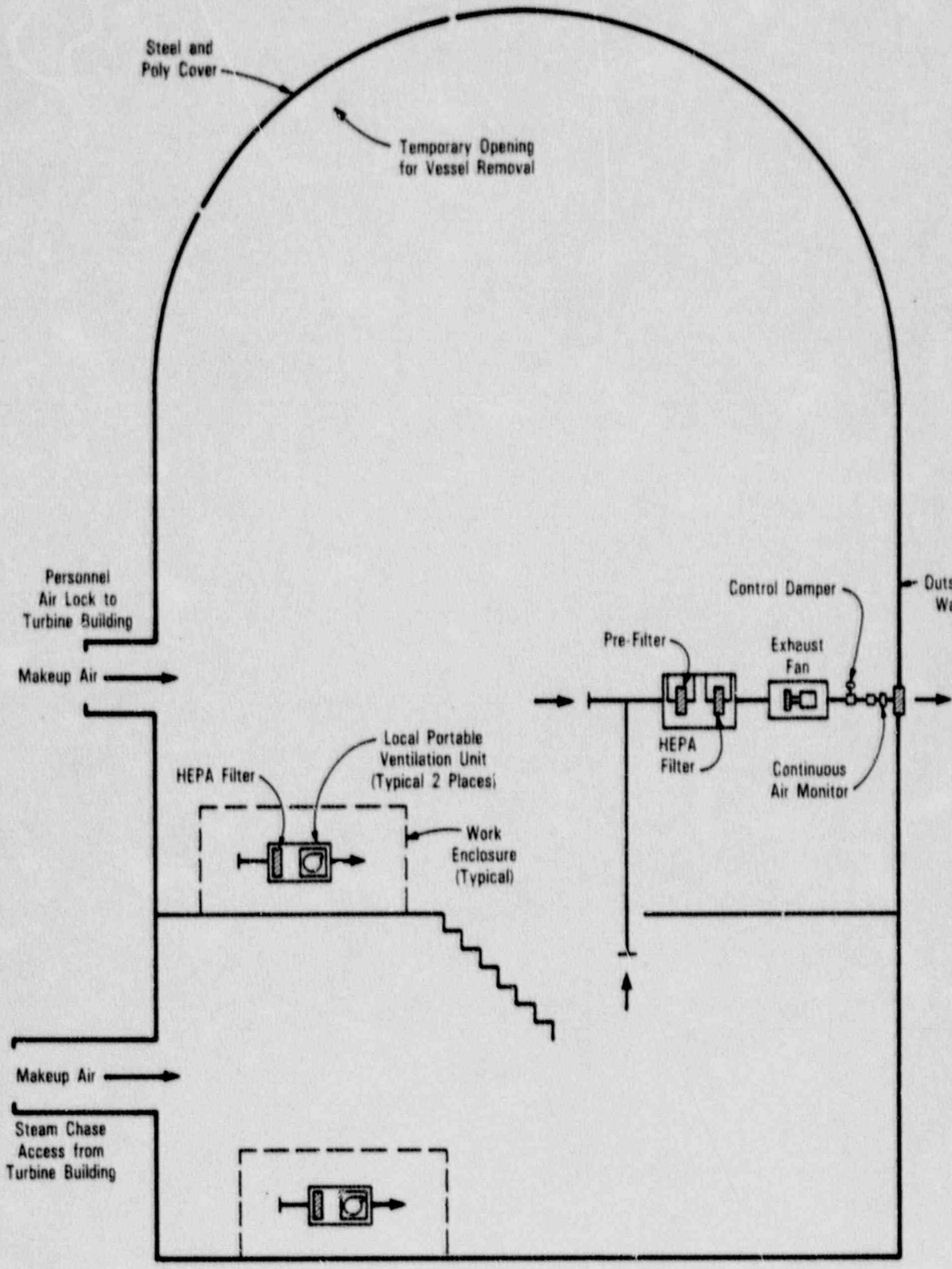
COMMENT:

Please provide a set of as-built drawings for the containment and the fuel handling buildings.

RESPONSE:

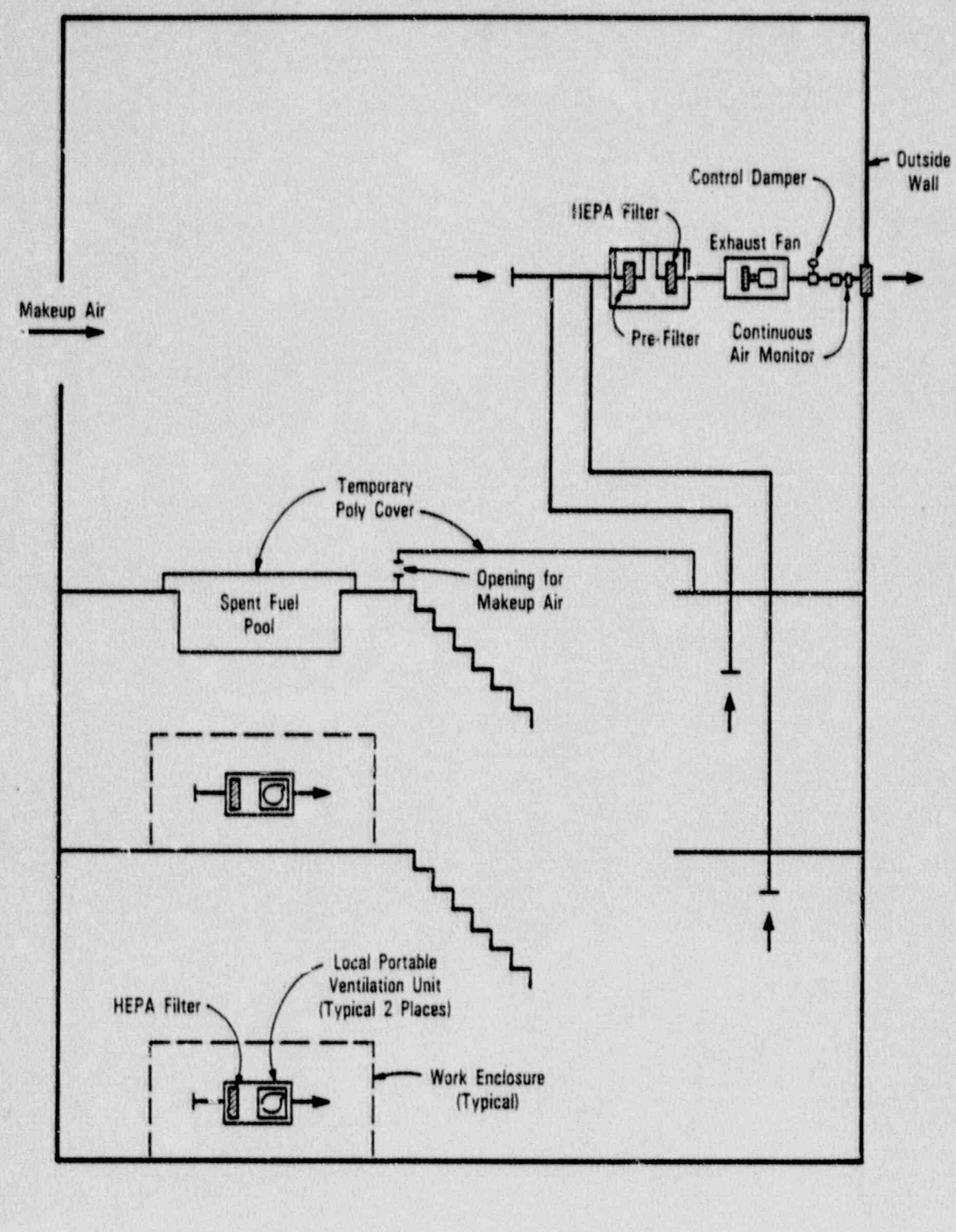
The following construction drawings are included for your reference in Attachment 6. They are not as-built drawings and they depict the condition that existed before SAFSTOR.

AA-84202-N	GENERAL PLOT PLAN
AA-84791-K	BASEMENT FLOOR PLAN ELEVATION 1297'-0"
AA-84792-L	MEZZANINE FLOOR PLAN ELEVATION 1310'-0"
AA-84793-K	OPERATING FLOOR PLAN ELEVATION 1327'-0"
AA-84794-J	SECOND FLOOR PLAN
AA-84795-E	CROSS SECTION OF TURBINE BUILDING
AA-84796-J	CROSS SECTIONS OF FUEL HANDLING, REACTOR, AND WATER TREATMENT BUILDINGS
AA-84276	CONCRETE OUTLINE ELEVATION 1270'-6"
AA-84279	CONCRETE OUTLINE ELEVATION 1279'-0"
AA-84280	CONCRETE OUTLINE ELEVATION 1313'-0"
AA-84281	CONCRETE OUTLINE ELEVATION 1327'-0"
AA-84282	CONCRETE OUTLINE SECTIONS & ELEVATIONS



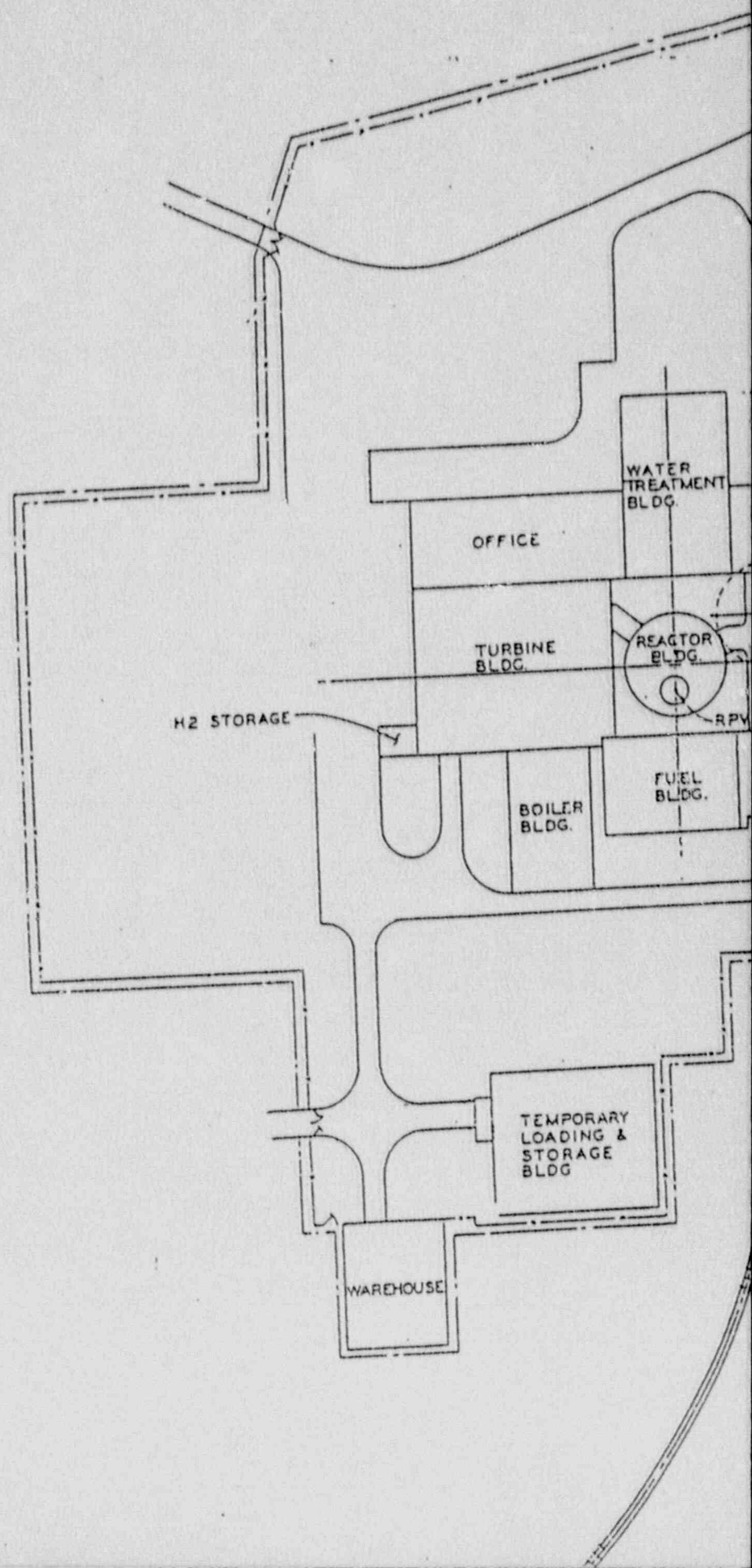
REACTOR BUILDING VENTILATION

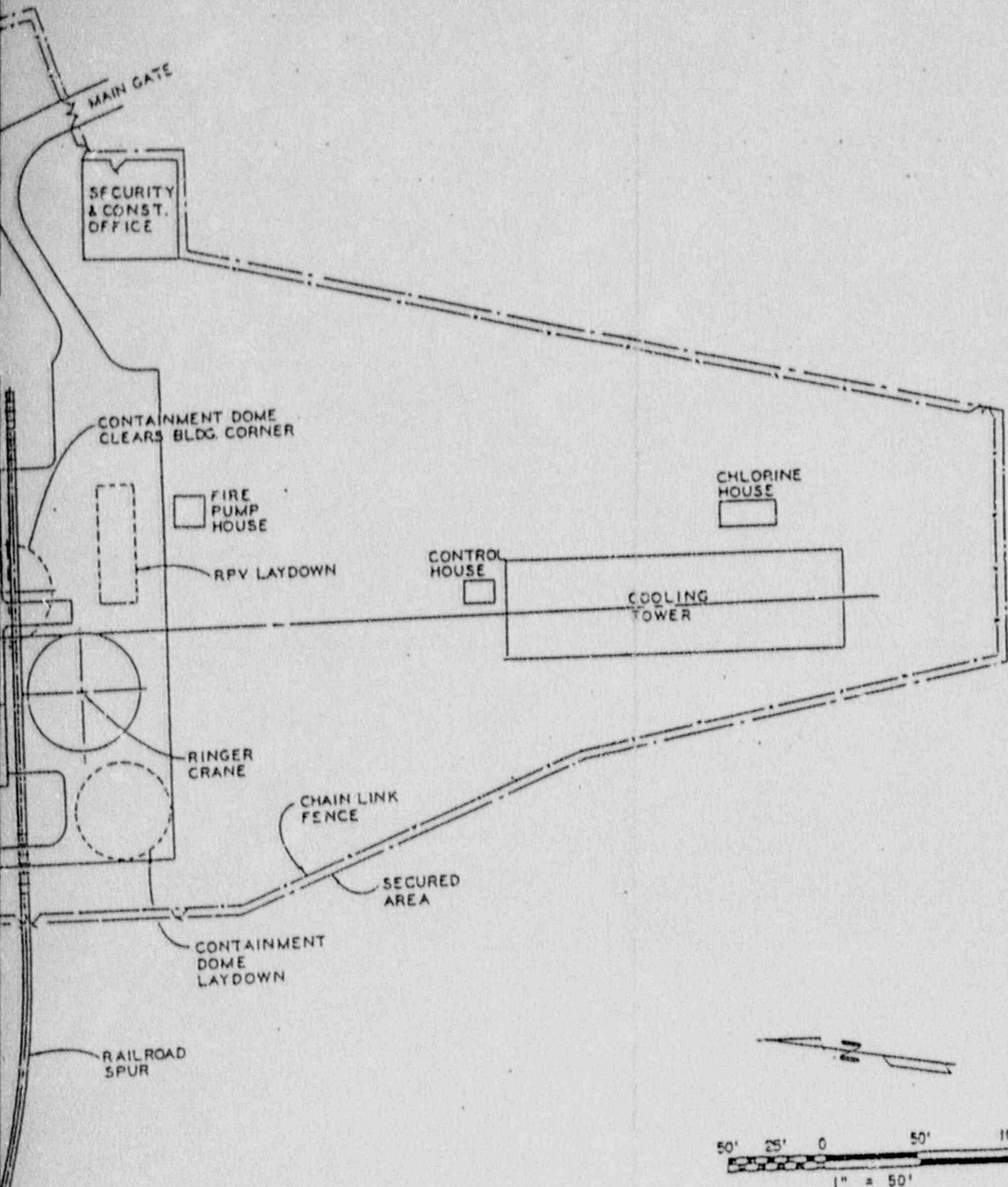
Figure 2-5a



FUEL HANDLING BUILDING VENTILATION

Figure 2-5b


WATER TREATMENT BLDG.
OFFICE
TURBINE BLDG.
REACTOR BLDG.
RPV
H2 STORAGE
BOILER BLDG.
FUEL BLDG.
TEMPORARY LOADING & STORAGE BLDG
WAREHOUSE

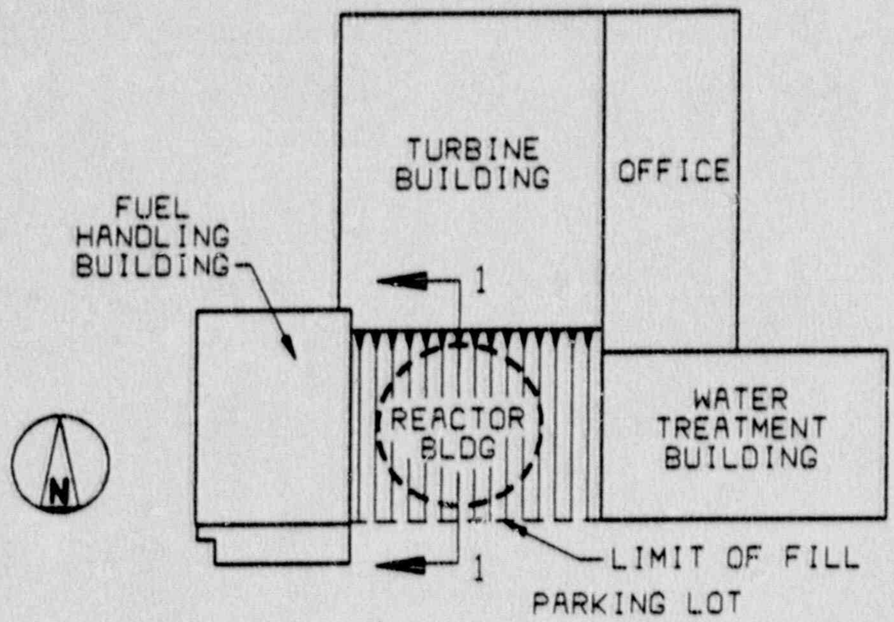


SI
APERTURE
CARD

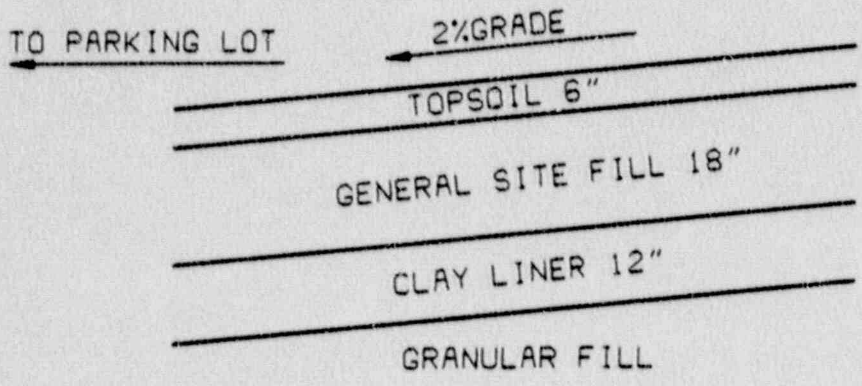
Also Available On
Aperture Card

FIGURE 2-3
PATHFINDER
SITE ARRANGEMENT

9002090364-01



PLAN

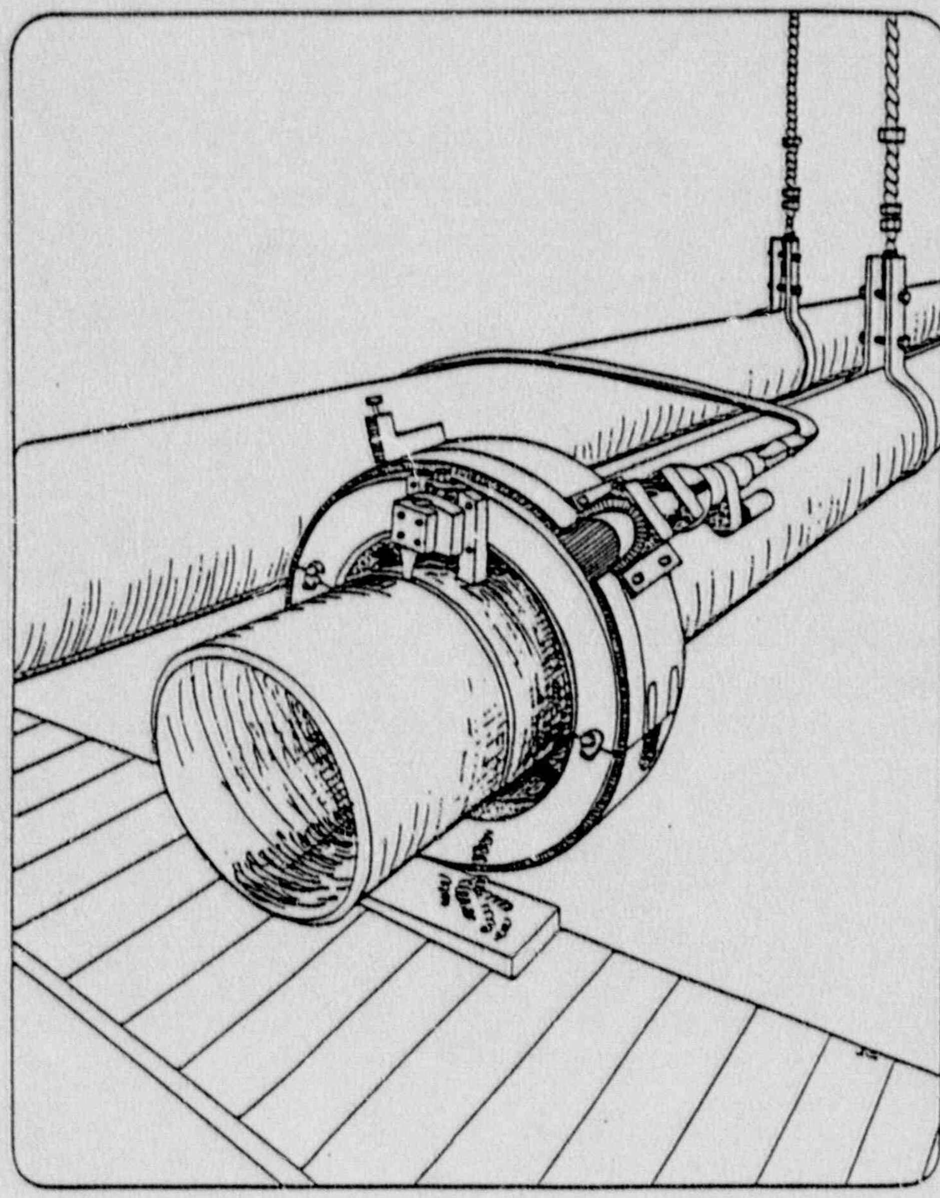


SECTION 1-1

PATHFINDER
FIGURE 4-1

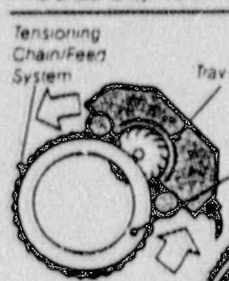
ATTACHMENT 1

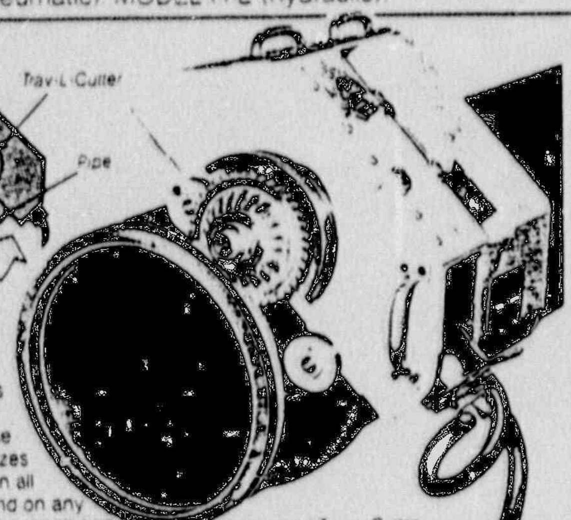
Illustration of Typical Milling Cutters



MILLING CUTTER MOUNTED ON PIPE

TRAV-L-CUTTER
MODEL E (pneumatic). MODEL H-E (hydraulic).





Air powered Trav-L-Cutter cold cutting and beveling at the same time

The Wachs Trav-L-Cutter is a portable milling machine. It makes cold cuts, and/or bevels at the same time on all pipe sizes from 6" and up, on all pipe schedules and on any material that can be machined. Secured by its own tensioning chain, it crawls around the pipe, cutting and/or beveling at the same time.

Operates Anywhere.

With air or hydraulic power, the Trav-L-Cutter will operate on horizontal or vertical pipe, in the field or in the shop. It cuts and bevels in a mud filled ditch or under water, where it has been used in chambers and free diving to depths of 600 ft.

All Pipe Diameters, Including Tanks.

Any machineable material such as carbon steel, stainless steel, ductile iron, cast iron and most alloys, in all pipe sizes from 6" to 72" can be cold cut and beveled simultaneously. Even tanks and vessels up to 33 feet in diameter can be precision cut.

The Cutting Method.

Wachs high-speed, milling cutters remove ³⁄₁₆" of metal while cutting, eliminating possible strains or cracks in the pipe, leaving the pipe end with a machined finish and the physical properties unchanged.

This cutting method facilitates section removal in the field. New sections, pre-cut by the same method are easily dropped in place.

Machine Shop Accuracy within .005"

A smooth machined finish with typical tolerances of up to ¹⁄₁₆" closure is normal. The chain feed system provides positive drive under all conditions for accurate, clean cuts while maintaining continuous out of round compensation.

Accuracy of up to .005" is maintained by using this accessory Guide Track, available for all pipe diameters.

Use of the track allows cutting with machine shop accuracy in zero visibility situations. On all vertical pipe cuts; underwater cuts and for all multiple pass cutting.

Special Guide Track Wheels are required when using the Guide Tracks.

Safe, Cold Cutting.

The Trav-L-Cutter can be used in explosive conditions, on natural gas, crude, product and fuel lines. It has even been used to cut missile fuel cells.

Fast, Reliable.

A standard wall pipe can be cut and beveled with a cutting speed of approximately 1 minute per 1" of pipe diameter. Cutting time varies for heavier walls and harder alloys. Due to its rugged construction, it is not unusual to find machines still operating after 10 or 20 years of severe service.

Compact Design, Easy Set-Up.

Lightweight, low profile design needs only 10" to 12" of clearance and set up time is 10 minutes or less.

Once the adjustable drive chain is pinned together and tensioned around the pipe the machine is ready to operate.

Standard Weld Prep Capability.

Any type of weld prep detail can be achieved from a common 30° or 37½° bevel on standard wall carbon steel to multiple-angle J bevels, with counter-bore and taper, on extra heavy wall chrome-moly.

Grooved, Mechanical Joint Preparation.

The Trav-L-Cutter can simultaneously cut-off and groove pipe in one cut. Cutters are available for Victaulic and other grooved coupling systems.

Offshore or Pipe Line Maintenance

The Wachs Hydraulic Trav-L-Cutter offer the inherent advantages of a completely sealed and self lubricating closed loop system.

The Model HE is particularly suited to field machining operations under the type of hostile conditions often found in pipe line maintenance and construction such as dirt, sand and water.

It is a portable pipe cutting machine that can be used conveniently on off-shore drilling rigs, pipe lines and on construction work in rivers and harbors.

Corrosion Resistant.

Corrosion from constant exposure to salt water can be minimized with an accessory package that includes extensive use of stainless steel fasteners, special bearings and seals and high zinc coating.

TRAV-L-CUTTER
MODEL E (pneumatic), MODEL H-E (hydraulic)

Variable Speed.
The speed of the cutter can be infinitely varied as can the feed, which is reversible – the kind of control needed for cutting heavy wall alloy steel pipe.

Maintenance Free. Quiet Operation.
Self-lubricating hydraulic motors are maintenance free.
The Model HE is also specially recommended for use where quiet operation is important. The hydraulic drive has no exhaust and can be coupled with a power source such as the Wachs Hydraulic Cutting Systems.

Specifications

Capacity: 6" thru 72" *(153 to 1829 mm)* pipe, large diameter vessels. All schedules

Cutter Drive:
Pneumatic: 4 H.P. Governed Air Motor coupled with worm gearbox
Hydraulic: As above, with hydraulic motor

Cutter Speed:
Pneumatic: 55 R.P.M. internally adjustable from 35 to 55 R.P.M. for use on alloys that might become work hardened.
Hydraulic: Adjustable, 0-60 RPM

Feed:
Pneumatic: ¾ H.P. Air Motor coupled through overload clutch, gearbox and chain reduction to final machine drive sprocket.
Hydraulic: 4 H.P. Hydraulic Motor

Feed Method: Positive, non-slip chain drive

Air Requirements: 100 cfm @ 90 psi *(2.8m² @ 6.3 bar)*

Hydraulic Requirements: 15 gpm @ 1500 psi *(57 l/s @ 106 bar)*

Work Speed: 3" of surface feed per minute, maximum (1 Dia. in/Min), i.e. 10" pipe – 10 minutes, 20" pipe – 20 minutes. Reduced feeds required over ½" wall and most alloys.

Clearance: 10" to 12" *(254 to 305 mm)* radial, depending on pipe diameter, 20" axial *(508 mm)*

Weight: Operating – 215 lbs. *(97.7 kgs)*
Shipping (typical) – 418 lbs. *(190 kg)*

Dimensions:
Length: 24" *(61 cm)*
Width: 20" *(51 cm)*
Height: 10¾" *(28 cm)*

Controls:
(Pneumatic and Hydraulic):
- Cutter On-Off, Feed On-Off, with interlock to prevent machine feed unless cutter is turning
- Adjustable Feed Speed Control

(Hydraulic Only)
- Flow Control Valves. Separate controls provide adjustable feed and cutter speed
- Forward/Reverse Valve. Permits machine to be backed up

Shipping and Storage Case:
41" x 25" x 18" *(104 x 63.5 x 45.7 cm)*
10.7 cu. ft. *(0.53m³)*

Finish: Paint

Standard Equipment:
- Operating Manual and Isometric Parts list
- Operating Tools, and spare Chain Connecting Pins
- Basic Mounting Chain for 6" dia. pipe
- Steel Storage Case
- 6 ft. Hose Whip with oiler (air only)

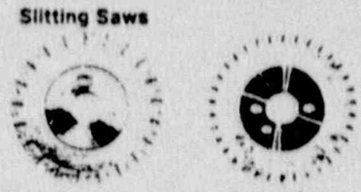
Options:
- Additional Chain for any diameter
- Cutters, Slitting, for cut off. Bevel, 30° 37½°, 20°, 10° and Specials. Roughing and Grooving
- Spray Mist Cooling System
- Halogen-free Cutter Coolant
- Internal Counter Bore and Taper Attachment
- Reversible Feed Motor
- Guide Track and Guide Track Wheels to fit all pipe sizes up to 48" for vertical cutting multiple pass cutting or high accuracy (.005") cutting
- Long Cutter Spindle for use with grooving cutters
- Corrosion Resistant Package

Hose Assemblies (Hydraulic):
- ⅝" hose sets with quick couplers in 45' lengths

Hydraulic Power Sources (Model H-E):
- Electric, Gasoline or Diesel Engine driven

Cutter Availability.
Wachs maintains a cutter inventory of all commonly used sizes and types for same day shipment.
These include: slitting blades for all pipe materials and schedules.
beveling cutters for 37½°, 30°, 20°, 10°, J bevels for wall thicknesses up to 1¾", grooving blades for Victaulic, Lok-Tyton and Gustin Bacon mechanical joints.
Cutters for all other weld prep configurations and wall thicknesses are available on special request.

Slitting Saws



High Speed Steel / Carbide Tipped
Carbide: for concrete lined pipe
HSS: for all other pipe

Bevel Cutters

Left Hand Bevel Cutter / Gang of Cutters* / Right Hand Bevel Cutter

Cutter Dia.	for use with wall thicknesses up to:
6"	1¼" *(31.7 mm)*
7"	1¾" *(44.4 mm)*
8"	2¼" *(53.9 mm)*

Cutter Dia.	Bevel Angle	Max. Wall Penetration
5"	37½°	⅝" *(15.8 mm)*
6"	37½°	⅞" *(20.9 mm)*
7"	37½°	1¾" *(44.4 mm)*
5"	30°	¾" *(19.0 mm)*
6"	30°	1" *(25.4 mm)*
7"	20°J	1¾" *(44.4 mm)*
6"	10°	1" *(25.4 mm)*
7"	10°	1¾" *(44.4 mm)*

Gang of Cutters For Beveling Pipe
1 R.H. Bevel, 1 Slitting Saw and 1 L.H. Bevel

E.H.WACHS COMPANY
P.O. Box A • 100, Shepard St., Wheeling, Illinois 60090
(312) 537-8800 • Telex: 283483 • Telecopier (312) 520-1147
or call toll-free **1-800-323-8185**

ATTACHMENT 2

TGM Model N1002/8767 Radiation Detector

N1002/8767

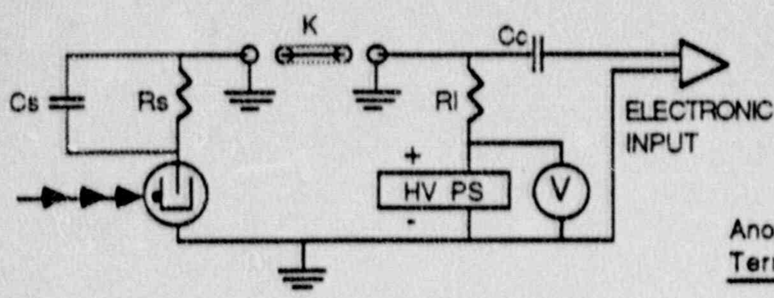


FIG.1. Geiger-Mueller counter test circuit.

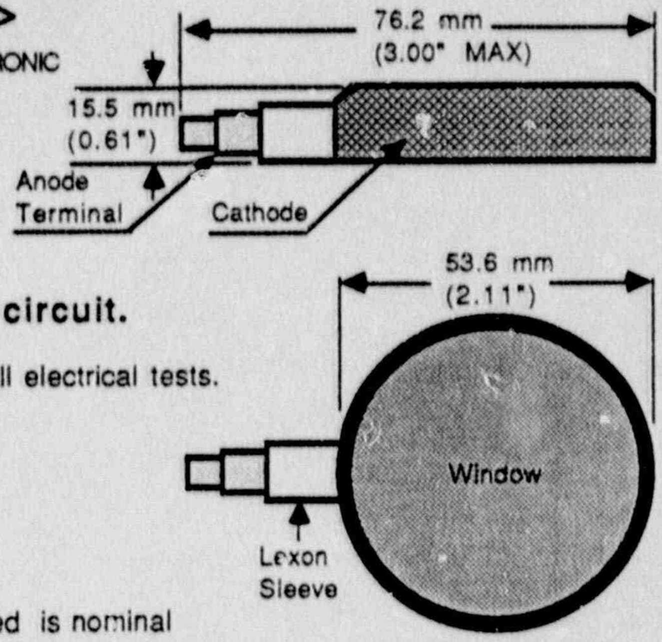


FIG. 2. GM TUBE N1002 (Not to scale).

Unless othervise specified , values below apply to all electrical tests.
Cs=1 pf (Stray capac.)
K= 50 pf: RG 58U or equiv. (Cable)
Rl= 1 M ohm (Load resist.)
Cc= 50 pf(Coupling capac.)
Rs= Value stated below (Anode Resistor)

NOTE: Response to ionizing radiation, whenever listed is nominal and measured in a 1 mR/hr Co-60 field with the tubes longitudinal axis perpendicular to the source of radiation.

ELECTROPHYSICAL CHARACTERISTICS

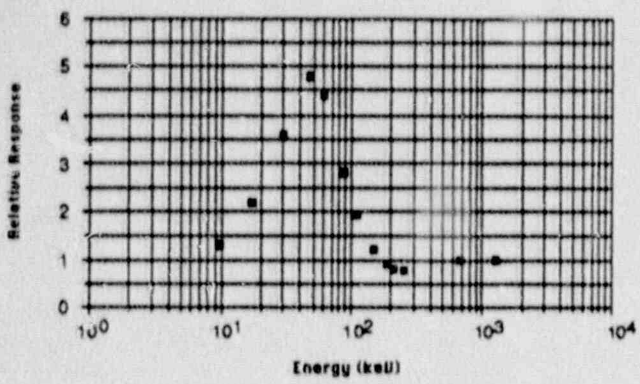
BACKGROUND	(V=900) < 25 cpm
RESPONSE TO IONIZING RADIATION (Nominal)	(V=900) 3500 cpm
ANODE RESISTOR	Rs ≥ 3.3 MΩ
PLATEAU LENGTH	850-950V
PLATEAU SLOPE	< 10% / 100V
DEAD TIME	(V=900) 100 µsec
RESPONSE TO IONIZING RADIATION	(V=900) Δ N < +/-2%
......VERSUS TEMPERATURE	(-20°C to + 55°C)
MAXIMUM TEMPERATURE	+ 55°C
MAXIMUM ALTITUDE	5,000 ft.
WINDOW	Mica, 1.4 - 2 mg/sq.cm
WINDOW DIAMETER	44.5 mm (1.75")
GAS FILLING	Neon & Halogen
CATHODE WALL MATERIAL	28% Cr, 72% Fe
CATHODE WALL THICKNESS	4.6mm (0.18")
CATHODE WALL O.D.	53.6 mm (2.11")
CATHODE WALL EFFECTIVE LENGTH	10.7 mm (0.42")
BASE	Anode Pin

TGM DETECTORS, INC.

160 BEAR HILL ROAD, WALTHAM, MASS. 02154-1075 TEL. 617-890-2090

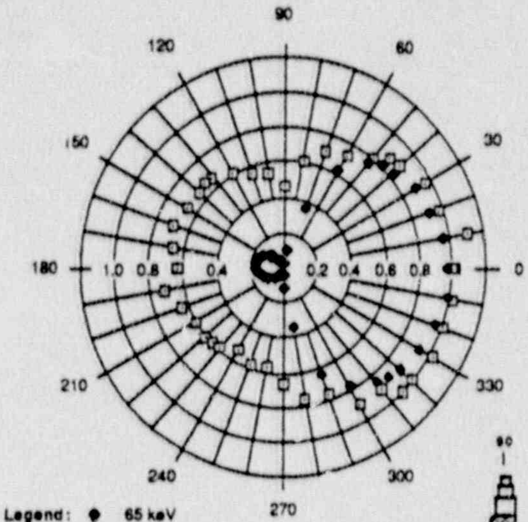
Response Data for the N1002/8767 "Pancake" GM Tube

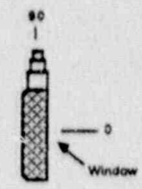
Tested at N.R.P.B. (UK), June 1987



Legend: ■ Beam perpendicular to detector window (with a 2 mm plastic cap for Cs-137 and Co-60).

Figure: Photon Energy Response of N1002/8767 "pancake" GM, normalized to 662 keV.





Legend: ◆ 65 keV
□ 662 keV

Figure: Polar Response of N1002/8767 "pancake" GM, normalized to unity at zero degrees.

N1002/8767 "PANCAKE" GM BETA RESPONSE AT 7 mg/sq.cm DEPTH IN SKIN

NUCLIDE	GEOM.	cps/µGy/hr
Sr-90/Y-90	30 cm	9.2
Tl-204	30 cm	4.5
Pm-147	20 cm	4.1

N1002/8767 "Pancake" GM BETA CONTAMINATION RESPONSE

NUCLIDE	GEOM.	RESPONSE
Sr-90/Y-90	Contact	6.6 cps/Bq/sq.cm
C-14	Contact	3.0 cps/Bq/sq.cm
Sr-90/Y-90	1.0 cm	0.44 cps/Bq

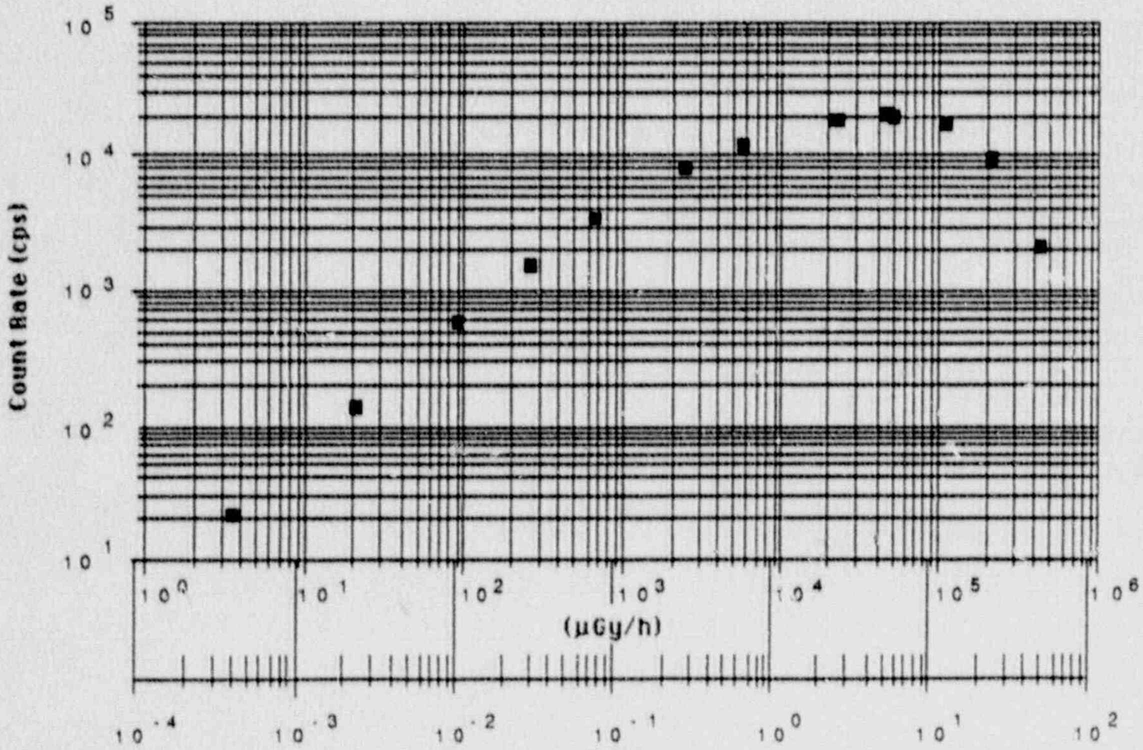


Figure: Dose Rate (air) vs. Count Rate for the N1002/8767 "pancake" GM.

ATTACHMENT 3

RADIONUCLIDE INVENTORY AND DOSE RATE FOR THE PATHFINDER ATOMIC PLANT REACTOR PACKAGE