Met-Ed / GPU

Metropolitan Edison Company
Post Office Box 480
Middletown, Pennsylvania 17057
717 944-4041

Writer's Direct Dial Number

TMI-II-R-4029

January 15, 1980

Mr. J. T. Collins
Nuclear Regulatory Commission
Trailer #1
P.O. Box 480
Middletown, Pa. 17057

Re: Request for Information Concerning the Mini Decay Heat Removal

Dear Mr. Collins:

The enclosed documents are provided to satisfy the requests for MDHR Ventilation System requirements, and the re-transmittal of the MDHRS Design Criteria Document, Revision 6 and Scope Document, Revision 3, per telecon M. Greenberg (NRC), W. Papproth (GPUSC).

We hope that the enclosed documents satisfy your information needs.

If there are any questions, please contact W. J. Papproth at extension 8303.

Sincerely,

R. F. Wilson
Director - TMI-2
Recovery

RFW/JED/DMS/WJP/kd

Attachment

cc: J. G. Herbein *
D. K. Croneberger *
J. C. DeVine, Jr. *
J. L. C. Bachofer, Jr. *
G. R. Skillman *
R. F. Wilson *
W. N. Moreau *
J. J. Barton *
L. W. Harding *
J. B. Logan *
J. J. Chwastyk *
L. C. Rogers *
H. R. Lane *
GRC Chairman *

Chairman - TMI-2 PORC *
Chairman - RORC *
File: 02.0016.0001.0001.02
Data Reduction File *

* w/Attachment 1 only

8002040534

ATTACHMENT 1

Attachment Table of Contents

Attachment No.	Description
1	Table of Contents
2	Letter, R. F. Wilson (GPU) to J. Collins (NRC) of 11-02-79 re: transmittal of MDHR Design Criteria Document Rev. 6 and Scope Document Rev. 3, with attachments.
3	Memo (GPUSC) E. C. Dye/B. D. Elam to J. Daniels of 08-14-79, re: MDHRS - Calculation for Airborne Radioactivity Releases.
4	A/E Work Assignment R-1005 of 09-20-79, re: MDHS Ventilation.
5.	Memo (B & R, Inc) H. W. Young to H. R. Lane of 10-02-79 (without enclosure).
6	Memo (GPUSC) J. A. Daniel/J. J. Barton to B. D. Elam of 10-02-79 re: MDHS - Airborne Leakage.
7	Memo (B & R, Inc.) C. W. Hess to H. R. Lane of 10-26-79 re: TS-27 HVAC Proposal, and attachment.
8	Memo (B & R, Inc.) G. J. Sadauskas to H. R. Lane of 11-14-79 re: MDHR H & V System Radiation Monitoring, and attachments.

Service

GPU Service Corporation
260 Cherry Hill Road
Parsippany New Jersey 07054
201 263-4900
TELEX 136-482

ATTACHMENT 2

November 2, 1979

Mr. John Collins
Nuclear Regulatory Commission
Trailer #1
Three Mile Island

RE: Letter Collins to Wilson, dated 10/15/79

Dear Mr. Collins:

Attached is the Criteria Document, Revision 6 and Scope Document, Revision 3, for the MOHR System for your information.

The Changes made by Revision 6 are identified in the right hand margin.

If you have any questions, please contact E. C. Dye at Extension 8267.

Approved: R. F. Wilson

w/ Attachment

cc: J. G. Herbein	J. B. Logan
D. K. Croneberger	J. J. Chwastyk
J. C. Devine	L. C. Rogers
J. L. C. Bachofer, Jr.	H. R. Lane
B. D. Elam x	GRC Chairman
R. F. Wilson	Chairman - TMI-2 PORC
W. N. Moreau	Chairman - RORC
B. C. Rusche	Rediscovery Room
J. J. Barton	FILE: 02.0016.0001.0001.02
L. W. Harding	Data Reduction File

8002040541

THREE MILE ISLAND - UNIT NO. 2

MINI DECAY HEAT REMOVAL SYSTEM

DESIGN CRITERIA

8002040546

REVISION	DATE	PREPARED BY	APPROVED BY
A	7/10/79	E. C. Dye	B. D. Elam
1			B.D. Elam
2	8/01/79		B.D. Elam
3	8/16/79	E.C. Dye	B.D. Elam
4	9/10/79	E.C. Dye	B.D. Elam
5	9/20/79	E. C. Dye	B.D. Elam

THREE MILE ISLAND - UNIT NO. 2

MINI DECAY HEAT REMOVAL SYSTEM

DESIGN CRITERIA

REVISION	DATE	PREPARED BY	APPROVED BY
6	10/30/79	E.C. Dye	B.D.Elam

MINI DECAY HEAT REMOVAL SYSTEM

DESIGN CRITERIA

1.0 SCOPE

This document establishes the design criteria for a small scale decay heat removal system to be used to cool the reactor core for three years. The system consists of a pump/heat exchanger subloop to be installed in parallel with the existing decay heat system and in parallel with the Westinghouse designed Alternate Decay Heat Removal System. The system will be used to remove decay heat from the reactor core until full defueling has been performed.

2.0 INTRODUCTION

The reactor coolant system is currently in a natural circulation mode with heat being removed through Steam Generator "A" in a steaming mode. In order to reduce the vulnerability of the plant cooling mode, a force circulation system with a minimum of supporting systems is preferred.

A small scale decay heat system capable of removing the small amount of decay heat remaining ($\leq$1 MW) in the Unit 2 core will suit this purpose. All system components shall be enclosed in the existing Unit 2 Fuel Handling Building or Auxiliary Building to minimize the potential for release of radioactivity to the environment.

3.0 FUNCTIONAL AND DESIGN REQUIREMENTS

3.1 Performance Requirements

3.1.1 The system shall recirculate reactor coolant through the core for removal of decay heat. The ultimate heat sink shall be river water with the Nuclear Services closed cooling loop to transfer heat from the reactor coolant to river water.

3.2 Applicable Codes and Standards

Piping shall be:

Description	Manufacturing Code	Installation Code
Connection to the decay heat system downstream of DH-V3 up to and including the first isolation valve.	ASME - Section III Class 2	ANSI B31.7 Class 2
Connection to the decay heat system downstream of DH-V3 from the first isolation valve up to and including the second isolation valve	ASME - Section III Class 3	ANSI B31.7 Class 2
Connection to the decay heat system upstream of DH-V48 up to and including the second isolation valve	ASME - Section III Class 2	ANSI B31.7 Class 2
Connections to the existing Nuclear Services closed cooling system		
piping up to isolation valve	ANSI B31.1*	ANSI B31.1*
isolation valves	ASME - Section III Class 3	ANSI B31.1*
Balance of piping	ANSI B31.1	ANSI B31.1
Heat Exchangers	ASME - Section VIII TEMA Standard (ASME Section III if available)	- - -
Pumps	Hydraulic Institute Standards (ASME Section III if available)	- - -
Filter	ASME - Section VIII	- - -

* Seismically supported for Category I loadings

3.3 Design Basis

3.3.1 The portions of the system that are ANSI B31.7 Class 2 shall be seismic Category I. The remaining portions of the system that convey reactor coolant shall be designed to operating basis-earthquake (OBE) loads. The balance of the system can be designed as nonseismic except the NSCC tie-in lines up to the isolation valves shich shall be category I seismically supported. Rev 3 Rev 5

3.3.2 The system shall be designed to operate with a loss of offsite power.

3.3.3 The system shall be equipped with test and instrumentation connections for system pre-operational testing and nurmal operation.

3.3.4 The system shall be designed to supply cooled reactor coolant water to the RCS through the Decay Heat Injection lines and receive heated coolant through the Decay Heat return lines.

3.3.5 The system design shall employ all welded connections to the greatest extent possible to minimize system leakage. All two inch and larger piping shall be welded except flanges at equipment connections. All connections to the process piping shall be welded or screwed with seal weld up to the root valve. Rev. 2

3.3.6 The piping system and equipment shall be provided with adequate vent and drain connections.

3.3.7 The system design shall minimize the use of auxiliary support systems (bearing cooling water, lubrication oil and instrument air). Loss of instrument air shall not change the operating parameters (flow and temperature) of the system.

3.3.8 The system shall be designed to remove the required heat load at the temperature of the cooling water shown in Section 3.4.

3.3.9 The system shall have provisions for the future installation of a water purification system with the capability (resin disposal and shielding) to handle radioactive water. Installation and startup of this equipment shall not interrupt system function.

3.3.10 The system shall be provided with proper overpressure relief devices. The discharge of the overpressure relief devices shall be piped such that they minimize the spread of contaminated fluids and shall be provided with some means of visual indication of leakage. Rev 5

3.3.11 The system shall have proper connections and other provisions for flushing of new piping and components prior to startup. New piping and components shall be in a clean and neutralized state when installed. Chemical cleaning shall not be used after installation.

3.3.12 Provisions shall be made to handle system leakage or drainage such as pump seal leak-offs, flanges, and valve stems. Consideration shall be given to containing both gaseous and liquid effluents, and safely delivering the wastes to GPU approved processing systems.

3.3.13 A recirculation line to meet the startup flow requirements of the pumps shall be provided. Rev. 2

A system recirculation line is acceptable for this service. Rev. 3

3.3.14 The system shall be designed for long-term continuous cooling for a minimum of three years.

3.3.15 For increased system availability considerations, the system shall have redundant heat exchangers and pumps.

3.3.16 The system shall be designed to be isolated from the existing plant safety systems. The system, when in the isolated mode, shall not jeopardize the operability or pressure integrity of the existing plant safety systems. The isolation from the Decay Heat Removal System shall be with double isolation valves.

3.3.17 The system shall have provisions for remote isolation, draining, and flushing to minimize radiation exposure to maintenance personnel Rev

3.3.18 The system shall have provisions for a replacable, disposable filter unit installed in the supply line to the MDHR system. The filter shall be capable of removing suspended particles that may have accumulated in the decay heat drop line so that damage to the MDHR pumps can be avoided.

Rev. 6

3.4 Sizing Requirements

3.4.1 The system shall be designed to meet the following requirements:

(a)	Flow through reactor core	120 to 175 gpm
(b)	System inlet temperature	180° F
(c)	System outlet temperature	130° F
(d)	Design Pressure	
	Coolers and pump suction	235 psig
	Pump and discharge piping	235 psig
(e)	NSCC water temperature	100° F (maximum)
(f)	NSCC water flow rate	200 gpm
(g)	Heat Exchanger duty	See Curve 1

Rev 6

Rev. 2

3.5 Layout Requirements

3.5.1 The system equipment shall be located to facilitate construction and future modifications and ease of access during operation.

3.5.2 The system flow path shall consist of cooled reactor coolant entering the Decay Heat Removal System upstream of valve DH-V48, flowing through the reactor core and returning back to the heat exchanger through the Decay Heat Removal drop line and the new system connection downstream of DH-V3. On the cooling water side, the Nuclear Services closed cooling system shall be connected to the shell side of the new Mini Decay Heat Exchanger (refer to Figure 1, attached).

3.5.3 The ultimate heat sink shall be provided by the Nuclear Services River Water System.

3.5.4 Radiation shielding shall be provided between the pumps and other equipment and piping to minimize the radiation exposure to maintenance personnel while working on either of the pumps. This shall include shielding between the two pumps.

Radiation shielding shall be provided to minimize the exposure to operating personnel when realigning system valving. (The use of reach rods is anticipated). Rev. 2

3.6 Environment Requirements

3.6.1 All equipment shall be located inside the Fuel Handling Building and Auxiliary Building.

3.6.2 Consideration shall be given to the integrated radiation exposure to all sensitive materials (electrical equipment, elastomers, etc.) over the design life of the system. If equipment cannot be satisfactorily shielded, the materials shall be compatible with expected exposure.

3.6.3 If area radiation levels at the pumps are expected to inhibit routine maintenance operations on the pumps, consideration shall be given to provide remote bearing lubrication to the pumps and motors.

3.7 Sampling Requirements

Connections shall be provided for future sampling lines.

3.8 Materials Requirements

All wetted materials shall be compatible with fluids having water chemistry specified in Section 3.12. It is expected that austenitic stainless steel type 304 or 316 shall be used. Rev. 2

3.9 Electrical Requirements

3.9.1 Electrical equipment shall be capable of being started and powered from an on site 1E diesel generator set in the event of a loss of off site power. Loads shall be sequenced on to the diesel generator set manually. Rev 3

3.9.2 Electrical classification of the system is non-1E, however the electrical power to the operators on the system isolation valves and the pump motors shall be class 1E. The instrumentation shall be powered from one class 1E bus. Rev. 5

3.9.3 Motor rated starting voltage shall be verified and consistent with the voltage regulation capability for the diesel generator to be used. Motor feeders shall be protected consistent with the original plant design and the normal trips for overload, etc., shall be used.

3.9.4 Electrical Load list: will be provided in the system description. Rev. 5

3.9.5 "Criteria for General Modification to the BOP Electrical System" are applicable. Also, refer to "Criteria for Loss of Offsite BOP Electrical Power".

3.9.6 The power supply to the pump motors shall be supplied from separate 1E buses.

3.9.7 The Mini Decay Heat Removal pump motor power supplys are to be interrupted when the installed decay heat removal pumps are started. This provision shall not inhibit the operation of the decay heat pumps. Rev. 5

3.10 Testing Requirements

Provisions shall be made for pre-operational testing of the system, including hydrostatic tests, flushing of new piping, and demonstration of required pumping capability.

3.11 Instrumentation and Control Requirements

3.11.1 The system shall be designed to provide instrumentation to monitor functional performance requirements, including but not limited to:

(a) Pump discharge pressure 0-300 psig

(b) Heat Exchanger inlet and outlet 50-250° F

(c) Flow Rate

Nominally	120 gpm
Maximum	200 gpm

(d) N.S.C.C. inlet and outlet

Temperature	50-150° F

(e) Pump Suction Pressure 0-200 psig | Rev. 2

3.11.2 Control circuits for existing eqipment shall be reviewed to ensure that no spurious automatic, or interlock signals will cause incorrect operation of the system.

3.11.3 Provisions shall be made for installation of controls and remote indicators in the Unit 2 Control Room. (It is assumed a new panel will be used).

3.11.4 Control shall be manual. The pump control switch shall have start, normal, stop and spring return to normal positions. Run/off indicator lights shall be provided for motors and open/close lights shall be provided for the system isolation valves. (Both lights shall be on when valves are in intermediate position). | Rev. 3

3.11.5 Control cables should have 50%, and preferably 100%, spare conductors to allow for future modifications.

3.11.6 Loss of system flow shall be alarmed locally and in the main control room.

3.11.7 (Deleted) | Rev. 4

3.11.8 The isolation valve(s) on the NSCC system shall automatically close on detection of a leak, i.e., imbalance in the flow to and from the Mini Decay Heat Removal cooler.

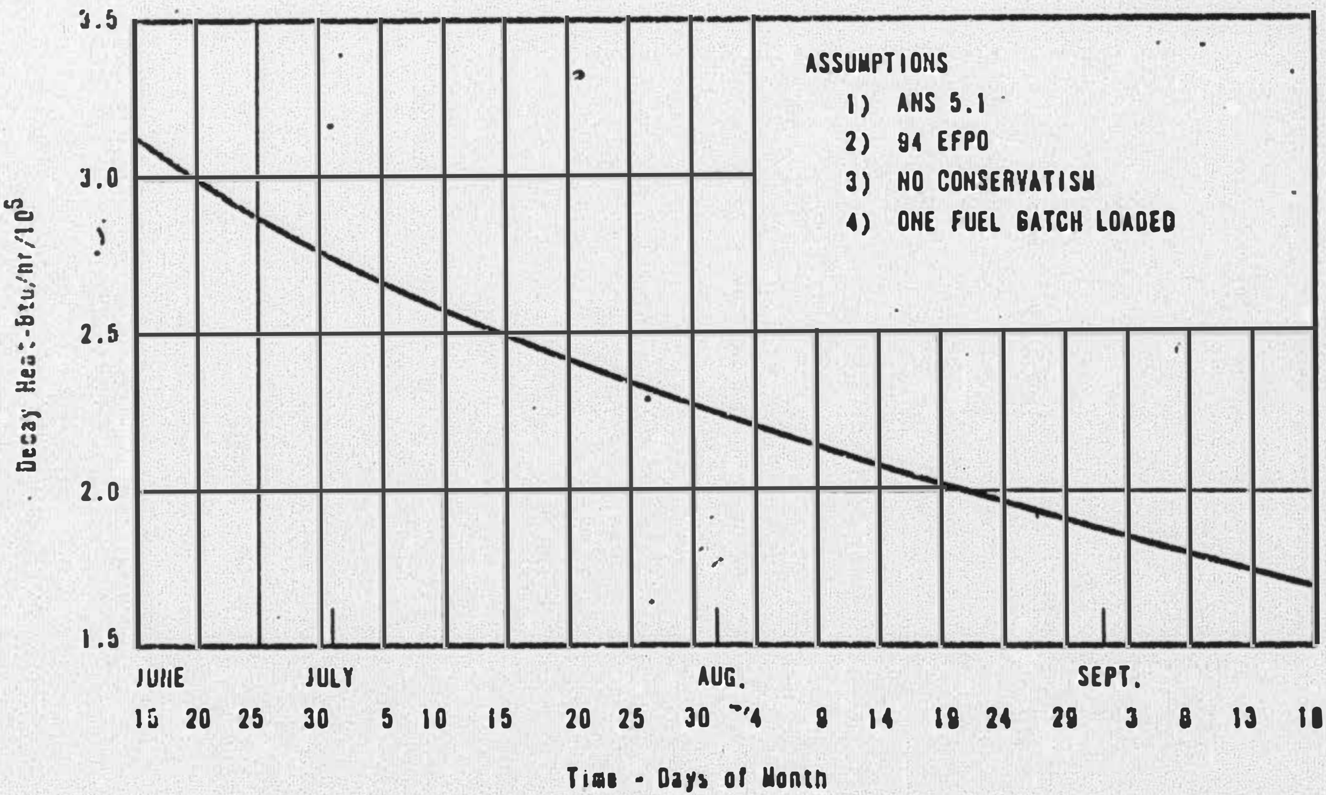
3.11.9 Area radiation monitors shall be provided and shall alarm on the local control panel and in the Control Room.

3.12 Water Chemistry

pH	7.5 - 9.5 (nominal 8.5)
Boron	3000 - 4000 ppm.
Hydrogen	5-40 cc/Kg (nominal 15-40 cc/Kg)
Chloride	<4 ppm
Fluoride	<1 ppm
Dissolved Oxygen	<0.1 ppm

Rev. 2

TMI-2 EXPECTED DECAY HEAT LOAD
VS. TIME, JUNE 15 TO SEPT 18

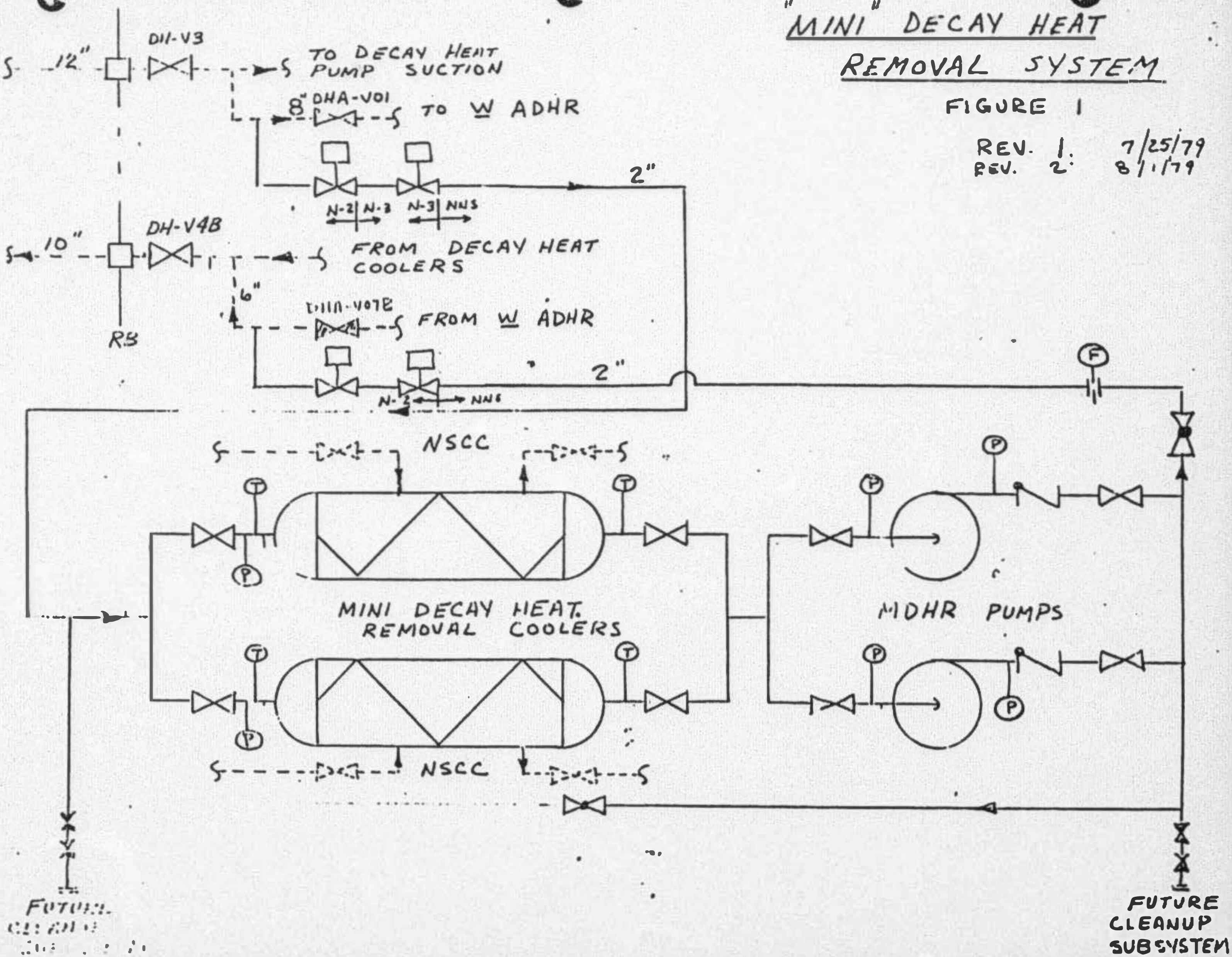


CURVE 1

"MINI" DECAY HEAT REMOVAL SYSTEM

FIGURE 1

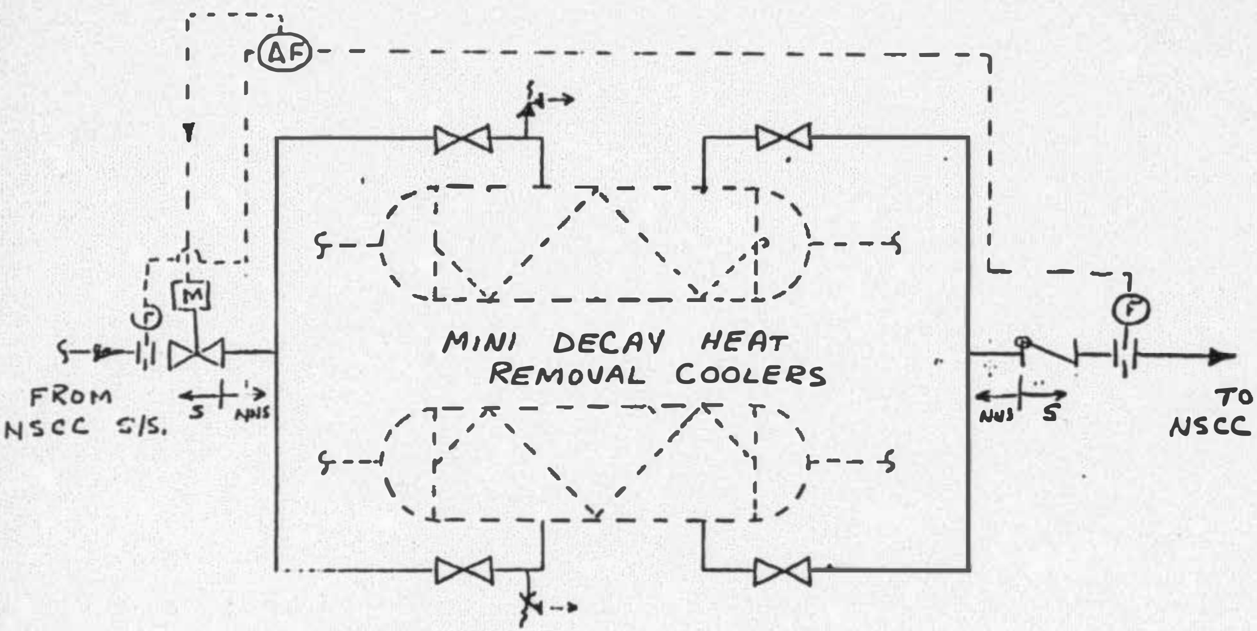
REV. 1. 7/25/79
REV. 2: 8/1/79



"MINI" DECAY HEAT REMOVAL SYSTEM NSCC SYSTEM CONNECTION

FIGURE : 2

REV. 1 7/19/79
REV. 2 8/1/79
REV 3 9/10/79
REV. 4 9/21/79



NOTES (1) NNS - B31.1 (NON-NUCLEAR SAFETY

(2) S - B31.1 SEISMICALLY SUPPORT FOR [illegible]

SCOPE DEFINITION DOCUMENT

FOR

'MINI' DECAY HEAT SYSTEM

TO BE ADDED TO

TMI UNIT 2 REACTOR COOLANT SYSTEM

Revision 3
8/15/79

SCOPE

This Scope Definition Document applies to the 'Mini' Decay Heat System intended for cooling the TMI Unit 2 reactor core through defueling.

8002040 555

PURPOSE

Define and assign responsibilities to the participants referenced herein, for accomplishment of the specification, design, engineering, procurement, fabrication, installation and check out of the 'Mini' Decay Heat System.

PARTICIPANTS

GPU - Includes all personnel providing technical, administrative and construction support, to and controlled by GPU.

Babcock and Wilcox (B&W)

Westinghouse (W)

Burns and Roe (B&R)

SCOPE DEFINITION AND ASSIGNMENT

TASK	SPEC	DESIGN & ENGR.	PROCURE-MENT	FABRICA-TION	INSTALL-ATION	START-UP TEST	INTERFACE REQUIREMENTS
B. Pipe hangers and supports	B&R	B&R	B&R	-	GPU	GPU	↓
3. Documents							
A. System design description	B&W						
B. Flow diagram (P& ID)	B&W						
C. Criteria Document	GPU						
D. Procedures, Operating, Startup	GPU						
4. Project Control							
A. Project Manager/Project Engineer	GPU						

BURNS AND ROE, INC.

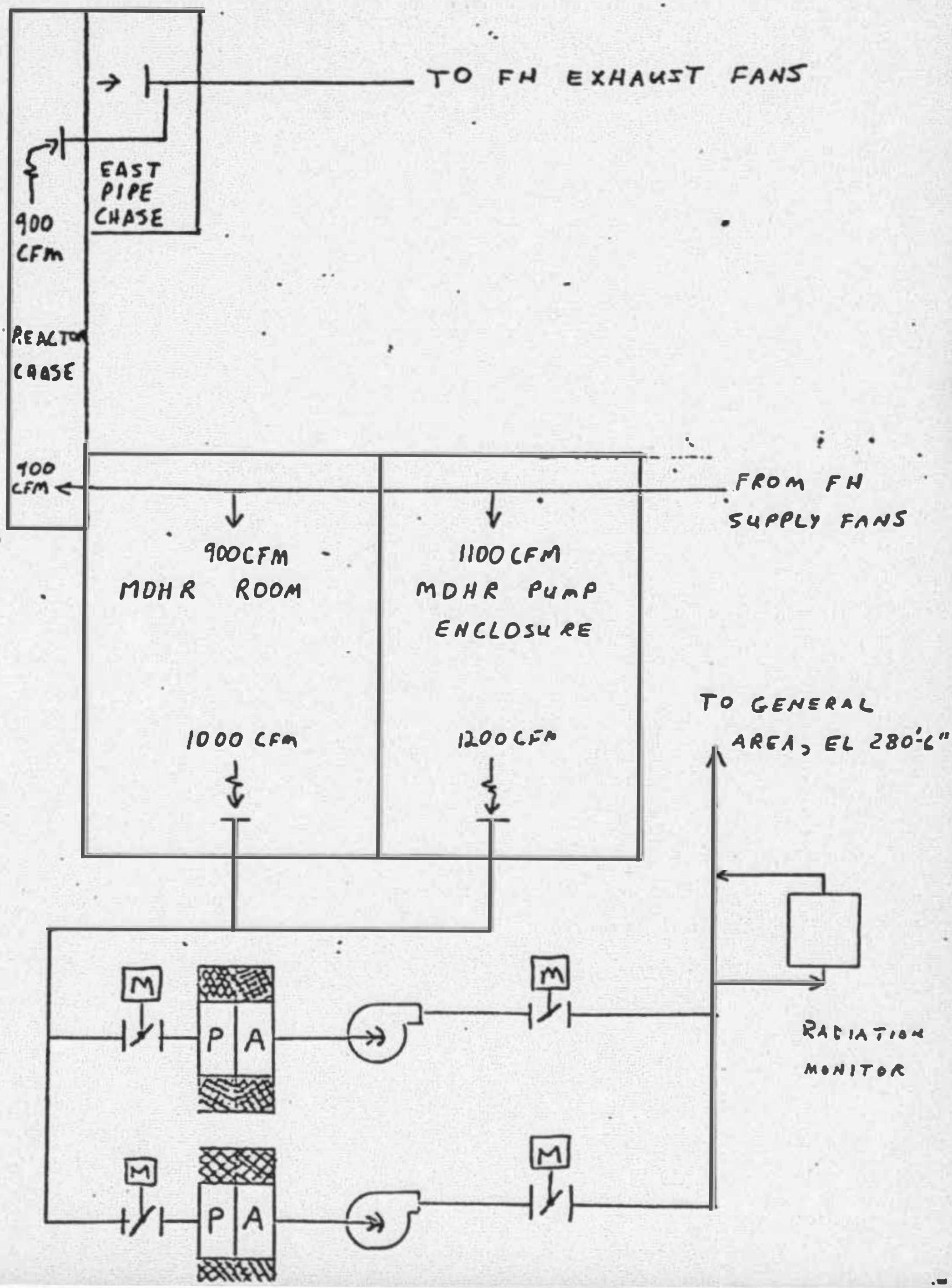
New Jersey • New York • Connecticut • California

W.O. No. ______ Date ______ Book No. ______ Page No. ______

Drawing No. ______ Calc. No. ______ Sheet ______ of ______

By ______ Checked ______ Approved ______

Title ______



POOR ORIGINAL

ATTACHMENT 4

Date 9/20/79

Task No. TS-27

File No. R-1005

TO: S. Dam (B&R)

SUBJECT: A/E Work Assignment

References/Attachments: Mini-Decay Heat System.

You are requested to perform the following work: per attachment.

Required completion date for this assignment is 10/28/79.
Your acknowledgement/acceptance of this assignment, by return copy of this memo, is requested.

CC: J. C. DeVine
J.G. Herbein

ORIGINATOR

B O Elam

GPUSC TECH SUPPORT SUPV.

A/E Acknowledgement

Scheduled completion date ____________________

Approximate A/E manhour/other costs ____________________

____
A/E Project Representative

Final Disposition

Assignment completed via ____________________

Work completed ____________________
A/E Project Representative

GPUSC Acceptance: ____________________

 ATTACHMENT 4

Review existing in-plant ventilation system design with respect to facilitating personnel access to the MDHS equipment for inspection and maintenance and recognizing the potential for RC leakage from the system from, e.g., a pump mechanical seal or valve packing.

If H&V system modifications are considered warranted, provide conceptual definition.

ATTACHMENT 5

MEMORANDUM

BURNS and ROE, Inc.

DATE 10/2/79

TO H. R. Lane

FROM H. W. Young

SUBJECT W.O. 3475
TMI #2 Recovery Program
A/E Work Assignment R-1005
MDHR HVAC Modifications

COPIES TO:

All w/att.
WRCobean, Jr.
ASDam
HWYoung
LHegyi
EEng
RPBrownewell
FASpangenberg
CWHess
pf (2), db

Please find attached the results of a study which we performed in response to the referenced A/E Work assignment.

Please transmit a copy of this attachment to GPU for comment. If you have any questions, please contact myself or Mr. E. Eng.

Harry Young

Harry Young

HY/sjm

ATTACHMENT 6

Inter-Office Memorandum

TMI-II-R-2111

GPU Service

Date: October 4, 1979

Subject: Mini Decay Heat System - Airborne Leakage

To: Branch Elam

Location: TMI/WMA
Trailer 102

Per your request, we have performed an analysis to determine airborne contamination in the vicinity of the Mini Decay Heat System pumps. Leakage was assumed to be 0.13 ml/sec. (approximately 1 pint/hr) of primary coolant. The results of this analysis indicate that MPC's for particulates will be exceeded at the specified leak rate. For this reason, it is recommended that:

1. HVAC exhaust hoods be installed over each of the pumps in question, with an exhaust rate of approximately 250 cfm.
2. Air flow be directed to flow from areas of low contamination toward the two pumps, to prevent spreading contamination in event of leakage.
3. Positive means of collecting leakage be installed. The purpose of this recommendation is to prevent water from collecting and standing around the pump, which would represent a hazard to maintenance personnel. This should be done with an easily removable drip tray with a hose connection to a drain.
4. Strippable vinyl coating be applied to all surfaces in vicinity of pump - i.e., concrete surfaces likely to be wetted, contiguous equipment, etc.
5. Surveillance program be established to determine leakage rate, levels of contamination, and dose rate build-up.

If there are any questions, please call.

Approved: J. J. Barton   J. A. Daniel

cc: R. C. Arnold
J. J. Barton
D. K. Croneberger
J. C. DeVine, Jr.
W. T. Gunn
J. G. Herbein
R. W. Heward
G. A. Kunder
P. E. Ruhter
B. C. Rusche
E. E. Walker
R. F. Wilson
W. Zurliene

ATTACHMENT 1

MEMORANDUM

BURNS and ROE, Inc.

DATE 10/26/79

COPIES TO:
All w/att.
WRCobean, Jr.
ASDam
FASpangenberg
DAMiller
LHegyi
HYoung
CWHess
NLacy
MPettigrew
pf (3)
db

TO H. R. Lane

FROM C. W. Hess

SUBJECT W.O. 3475
TMI Recovery Program
TS-27 HVAC Proposal

REFERENCES: (a) B&R Memo, H. W. Young to H. R. Lane, dated 10/2/79
(b) GPU Memo, D. A. Koch to H. R. Lane, dated 10/23/79
(c) B&R Memo, C. W. Hess to H. R. Lane, dated 10/24/79

ATTACHMENT: (1) Ventilation for MHDR System

Attached, you will find the Burns & Roe proposal for the air handling unit for the Mini-Decay Heat Removal Pump Enclosure described in Reference (c).

This, along with the proposal described in Reference (c), represents the complete HVAC package proosal for TS-27 requested by Reference (b).

Engineering and design for this effort can begin immediately upon receipt of a work request from GPU.

C. W. Hess

CW Hess

CWH/sjm

Ventilation for MDHR System

Our proposal for modifying the existing H & V system will adequately cool and decontaminate the areas, as well as prevent the spread of radioactive contamination. Our proposal is similar in concept to Proposal #2 in the memo from H. W. Young to H. R. Lane dated 10/2/79. One essential difference is that charcoal filters have not been included as a result of GPU memo, D.A. Koch to H.R. Lane dated October 23, 1979. The other is that redundant trains have been added for greater system reliability.

Due to conversations with filter enclosure manufacturers, we feel it would be too costly and take too long to procure complete fan-filter trains. It has been indicated by MSA that they can provide us with single HEPA enclosures with a relatively short lead time. The fan can be purchased separately, and the plenums can be furnished by the sheet metal contractor.

The following items are involved with this proposal:

1. Hard duct the supply and exhaust transfer grills from the Reactor Building Chase to their respective supply and exhaust ducts. This has the long term effect of preventing the spread of contamination from the MDHR room to the chase, after the chase has been cleaned up. It also has the short term effect of isolating the chase from the rest of the building, ventilation-wise.

2. Provide the enclosure discussed to create a sweep area around the pumps.

3. Provide new ducting to supply 900 CFM supply to the MDHR room and 1100 CFM to the pump enclosure. The rest of the supply ductwork must be rebalanced to provide the same supply CFM.

4. Provide an exhaust system consisting of redundant exhaust filters and fans, sheet metal ductwork, and instrumentation and controls as required.

The price of the MSA enclosures with filters will be approximately [redacted]. Fans and misc. H & V equipment will be approximately [redacted]. Ductwork and installation cost will be approximately [redacted].

MEMORANDUM Ned: For your info. ATTACHMENT 8

BURNS and ROE, Inc. DATE 11/14/79

POOR ORIGINAL

COPIES TO:
All w/att
HRLane
RPBrownewell
GSadauskas
RSGagliardo
RHennesy
WRichardson
RYoung
LHegyi
JCarscadden
pf. 2
db

TO H. R. Lane

FROM G. J. Sadauskas

SUBJECT W.O. 3475
Metropolitan Edison Company
Three Mile Island Recovery
Task TS-27
MDHR R&V System Radiation Monitoring

In accordance with GPU's request, we have evaluated the air monitoring requirements for the subject system. We would propose an isokinetic sampling system consisting of two nozzles. One nozzle would be installed at the inlet to the filter train and the other at the outlet. Normally the downstream nozzle would be connnected to the Particulate, Iodine and noblegas . monitor (PIG). A valve scheme at the PIG unit would allow the operator to monitor the incoming stream if he so desired. The PIG would provide remote readout and alarm at the local TS-27 control panel for each stream component and on the TS-27 control room panel. Attachment 1 is a sketch of the proposed system. Attachment 2 is a cost breakdown.

I apologize for the delay in providing you with this information and trust that our lack of response did not inconvenience you or the client to a significant degree. If you have any questions regarding this matter, please contact me.

G. Sadauskas

GS/gg

G. Sadauskas

POOR ORIGINAL

Equipment Summary for TS-27

Item	Quan.	Description	Manufacturer	Model
1	2	Isokinetic Nozzles	Nuclear Measurements Corp.	
2	1	PIG Unit	Victoreen	840
3	2	Alarm Rate meter Local	Victoreen	842
4	2	Alarm Ratemeter Remote	Victoreen	842
5	1000 ft.	Cable	Victoreen	50-100

Total cost for material for the above system is [redacted].