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September 13, 1993
C312-93-2059
C000-93-2190

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Solid Waste Staging Facility
System Description

Dear Sir:

Pursuant to NRC letter dated February 4, 1982, GPU Nuclear has performed the annual review of the Solid Waste Staging Facility (SWSF) System Description (SD). Revision 6 of the SWSF SD is attached for your information.

Sincerely,

R. L. Long
Director, Services Division/TMI-2

200116

EDS/dlb
Attachment

cc: M. G. Evans - Senior Resident Inspector, TMI
T. T. Martin - Regional Administrator, Region I
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A001

SD 3184-007 REV E

ISSUE DATE August 1993

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DIVISION

SYSTEM DESCRIPTION

FOR

Solid Waste Staging Facility

COG ENG _____ DATE 9/20/93

RTR _____ DATE 8/27/93

MGR., TMI-2 ENG _____ DATE 9/2/93

DOCUMENT PAGE 1 OF 20

Rev.	SUMMARY OF CHANGE	Approval	Date
0	Initial issue per GPU Nuclear letter 4400-82-L-0059.		4/82
1	Reissued per GPU Nuclear letter 4410-83-L-0078.		3/83
2	Annual Update.		7/85
3	Annual Update.		7/87
4	Annual Update. Revised Section 2.1.2, 2.1.3.2, 2.4.9, and 2.4.3.1.		8/89
5	Annual Update. Minor changes to Sections 2.4.1, 2.4.7, 2.4.8, and Table 3.		8/90
6	Annual Update. Revised following Sections to clarify information or modify to improve flexibility for anticipated interim storage period: 2.1.1, 2.1.3, 2.1.3.2, 2.1.3.3, 2.2.4, 2.3.2, 2.4.7, 2.4.8, Table 3, and Attachment 1.		8/93

TABLE OF CONTENTS

SECTION			PAGE
1.0	INTRODUCTION		4
2.0	DESIGN DESCRIPTION		4
	2.1	Facility Function	4
	2.2	References	6
	2.3	Design Basis	7
	2.4	Summary System Description	8
Table 1		Solid Waste Staging Facility Instrumentation	14
Table 2		Instrument Setpoint Index	15
Table 3		Operating Procedures	16
Attachment 1		- Shielding Analysis - Types of Wastes	17
Figure 1		TMI Unit 2 Plot Plan	19
Figure 2		Sump Module A & B Flow Diagram	20

1.0 INTRODUCTION

The Solid Waste Staging Facility (SWSF) performs no active function. The facility is a passive system for temporary staging of nuclear radioactive waste prior to preparation for shipment and disposal to approved off-site burial grounds. The SWSF has been designed and is operated in such a manner as to provide assurance that:

A. The health and safety of the public will be protected;

B. Occupational exposures will be as low as reasonably achievable (ALARA); and

C. There will be no significant adverse impact on the environment.

2.0 DESIGN DESCRIPTION

2.1 Facility Function

2.1.1 The SWSF is designed and used for the collection and temporary staging of the radioactive waste (e.g., solidified/dewatered resins, filters, sludges) generated during the cleanup operations at TMI-2, and operations at TMI-1.

2.1.2 The SWSF is located as shown on Figure 1, south and east of Unit 2 Natural Draft Cooling Towers within the area protected by the Flood Control Dikes.

Space was allocated to accommodate six (6) modular structures. Two modules ("A" and "B") are completed and space is available for three (3) of the four (4) additional modules. At this time, there is no intention to construct any of the additional modules.

2.1.3 Reference 2.2.3.2 shows the typical layout of the SWSF.

2.1.3.1 Each module is designed with 60 cells forming the compartments for storing the radioactive waste generated.

2.1.3.2 Each cell is designed to stage the radioactive waste contained in either one (1) 6 ft. diameter by 6 ft. high

liner, or two (2) 4 ft. diameter by 4 ft. high liners, or 18 55-gallon DOT specification drums.

It is anticipated that offsite radioactive waste disposal will not be available after June 1994. After that date, waste will have to be stored at the generator's site (i.e., TMI) until offsite disposal becomes available. This interim storage period will require that all onsite radioactive waste facilities be flexible in their capability for use in storing waste. Actual waste streams and storage containers may then vary from those specified in the facility design. However, design dose rates and total activity levels must not be exceeded.

2.1.3.3 Each module is designed to accommodate any combination of the radioactive waste containers as follows:

Container	Total Quantity	Wt. of One Filled Container (lb).
6'x6' Liners	60 (1 per cell)	7,000 - 22,000 max.
or		
55 gallon drums	1080 (18 per cell)	840
or		
4'x4' Liners	120 (2 per cell)	4,500 - 5,000 max.

Due to the likely removal of the disposal option (discussed above), additional storage flexibility is desired. For this reason, other waste containers may be stored in the facility if they can be safely handled radiologically and industrially and are within the facility design dose rate. Examples of what may be stored in the modules are provided below:

Container	Total Quantity	Wt. of One Filled Container (lb).
4'x4'x6' Box	60 (1 per cell)	4,500
or		
Steel Drum	1260 (21 per cell)	840
or		
Poly or Metal HIC or Liner > 4'x4'	60 (1 per cell)	22,000
or		
Poly or Metal HIC or Liner ≤ 4'x4'	120 (2 per cell)	10,000

2.1.3.4 A floor drainage system is incorporated into the module design which discharges into a common sump located between Modules "A" and "B". The total capacity of the sump is approximately 2750 gallons.

2.2 References

2.2.1 U.S. Nuclear Regulatory Guide 1.143, July 1978, Design Guidance for Radioactive Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants.

2.2.2 Design Criteria/Input Record. GAI W.O. #04-4283-070.

2.2.3 Gilbert Associates, Inc. (GAI) Drawings:

2.2.3.1 Excavation and Grading Plan. E-774-151

2.2.3.2 Plant Layout. E-012-006
E-014-004

2.2.3.3	Structural.	E-430-006 E-430-007 E-430-008 E-430-011 E-430-012 E-430-013 E-430-014 E-430-015
2.2.3.4	Building Services-Piping.	E-311-873 E-311-874
2.2.3.5	Electrical.	SS-308-417 B-256-031 E-266-011

2.2.4 GPU Nuclear memo 6615-92-0117, "Fenceline Dose Rate Limit," dated August 5, 1992.

2.3 Design Basis

2.3.1 The SWSF is designed to comply with the requirements of Regulatory Guide 1.143, July 1978. The facility is designed to provide a controlled but ready access for material handling operations and to ensure that the operator exposures are as low as reasonably achievable (ALARA).

2.3.2 The facility is designed to maintain the dose rates in accordance with 10 CFR Part 20 and to meet the requirements of 40 CFR Part 190 at the site boundary and beyond. Site Boundary dose rate is required to be 0.2 mrem/hr or less.

2.3.3 The shielding thickness was calculated to limit the contact dose rates at the outer surfaces of the module walls and the top of the cell covers to within 0.5 mr/hr and 2.5 mr/hr, respectively. The analysis was based on the types of waste defined in Attachment 1. No credit was taken for the structure being partially underground.

2.3.4 Quality Assurance requirements for the design, construction, and operation of the SWSF are consistent with those specified in Regulatory Guide 1.143.

2.4 Summary System Description

2.4.1 The concrete structure and individual cell covers provide the necessary shielding from the radioactive waste housed in the SWSF Module Storage Cells.

The cell covers with gaskets protect the waste containers from the elements and the ingress of precipitation. Slots and weep holes in the upper module structure are provided to direct rainwater to the module sides. A drainage piping system prevents any spillage/leakage of fluids from accumulating in the cells (i.e., floor drain hub in each cell); the system manifold discharges into a common sump.

2.4.2 The sump compartment, a radwaste seismic concrete structure, houses the pump, valves, piping, instrumentation, etc., necessary to perform the intended functions and control the disposal of any effluent which may collect in the sump. The compartment is divided into two (2) levels, with the upper operator level shielded by a thick concrete floor from the sump. Access to the upper compartment is via a manhole in the concrete slab roof. Access to the sump is via a removable ladder at the sump plug opening and a permanently installed ladder into the sump.

2.4.3 The flow diagram (Figure 2) shows the pumping system for the sump effluent. All operations are local/manual. The local alarms and sump level indication are housed in a weatherproof instrumentation panel mounted outside the Module "A" structure adjacent to the sump compartment.

The sump pump, Solenoid Valve #WS-5 and three-way valve #WS-1 (extension spindle) are located in the lower sump while the electrical distribution and control panels, valves, etc. are mounted in the operators compartment.

Sump level is measured by a variable capacitance sensor (SWS-LE-01) which transmits the signal to local and remote (Unit 2 Control Room) alarms. Sump influent flow alarms are provided. The sensing elements (conductivity) Nos. SWS-CE-07 and SWS-CE-08 are mounted in the Module "A" and "B" drain system manifold.

2.4.3.1 Sump Pumping Operations (See Figure 2)

The SWSF sump is controlled and disposal of the effluent is in accordance with the Unit 2 Procedures 4210-OPS-3011.01 and 4215-OPS-3232.14. The sump compartment is posted as a radiological controlled area and surveillance is required prior to entry to ensure operator exposure will be as low as reasonably achievable (ALARA).

On receipt of the alarm signal (approximately 50% sump level) in Unit 2 Control Room, the above procedures are put into effect and the sequence of operations is as follows:

2.4.3.1.1 Recirculation Mode (sump effluent mixing to obtain representative sample for analysis)

A. All valves to be checked closed;
B. Operate three-way valves WS-1 to route pump discharge returned to sump; and
C. Start pump.

2.4.3.1.2 Sampling Mode (during Recirculation Mode)

NOTE: Radiologically monitor the collection of the sample with the appropriate instrument.

A. Solenoid valve WS-5 open;
B. Valve WS-7 open;
C. Collect sample;
D. WS-5 and WS-7 closed; and
E. Stop pump.

2.4.3.1.3 Discharge Mode (Only after sample analysis is completed)

A. All valves to be checked closed;
B. Connect hose to the tank truck (or portable vehicle) connection for effluent disposal;
C. Operate three-way valve WS-1 to route pump discharge to truck discharge manifold;
D. Valve WS-4 (WS-3) open;
E. Start pump;
F. Stoppump, disconnect tank truck (or portable vehicle);
G. Valve WS-4 (or WS-3) closed; and
H. Operate three-way valve WS-1 for recirculation mode and secure.

2.4.4 Major Equipment

A. Sump Pump (1): Gould Model 3171 1 x 1-1/2-6

Capacity:	50 gpm
TDH:	100 ft
Fluid:	Radioactive waste water/resin slurry Ph approx. 7
Materials:	Cast iron/bronze fittings
Impeller:	Open type
Discharge Conn.:	Flanged above mtg. plate
Service:	Intermittent 5 year life

B. Solenoid Valve (1):

1/2" nom. bore. 120 volt AC

C. Instrumentation: See Table 1.

2.4.5 Facility General Arrangement: The general arrangement, layout, and details of the SWSF systems are shown in the drawings in Section 2.2.3.

2.4.6 Instrumentation and Controls

2.4.6.1 The SWSF has three (3) instrument loops as follows:

A. A level instrument string provides the alarm and level indication both local and remote. In addition, this loop provides a sump pump permissive at greater than 10% level.

B. The other two (2) instrument strings are conductivity flow loops providing local alarms. One (1) loop senses input from the drain discharge manifold from Module "A" and the other from Module "B".

2.4.6.2 Instrument Setpoint Index (See Table 2).

2.4.7 System Interfaces

There are five (5) interfaces associated with this facility:

1. Processing Systems: Access road to and from waste and fluid processing facilities for transportation of materials and equipment.

2. Material Handling System: Facility will accept radioactive waste containers from the processing systems or packaging that are compatible with transportation and lifting equipment (i.e., transfer shield, site cranage and appropriate crane).

3. Cooling Water Pump (CHP) House: 480 V, 3 Φ 200 A feeder cable from Bus 2-61 shall provide power for the following:

   A. 460 volts to the sump pump;

   B. 480 volt welding receptacle; and

   C. 25 KVA, 240-120V power center to energize lighting, convenience receptacles, instrumentation, and control devices.

NOTE: No permanent heat tracing required for sump compartments.

4. Control Room: Sump level alarm.

5. Chemistry Laboratories: Sump effluent samples for chemistry and radiological analysis prior to distribution.

NOTE: The sump pump discharge is not directly connected to any plant systems; a local hose station is provided.

2.4.8 Operations-Radwaste Handling

The major operation performed at the SWSF is handling the radioactive waste containers while loading/unloading the individual cells in accordance with the types of containers specified in Section 2.1.3. Handling of these containers is performed in accordance with Unit 2 procedures. The appropriate crane(s) is utilized for handling activities along with appropriately shielded equipment.

Each cell has an individual concrete cover 8'3" square x 3'0" deep (Dwg. #B-430-015) weighing approximately 14 tons. Normally only one (1) cell containing radioactive waste containers within a module system will be uncovered at any given time. If more than one (1) cover is to be removed at any one time, additional safety procedures will be exercised.

2.4.9 Maintenance

Most operations including maintenance requires a RWP. Inner surfaces of the sump are epoxy coated to ease decontamination of the facility.

2.4.10 Acceptance Testing

2.4.10.1 Mechanical Drawings #E-311-873 and E-311-874

A. Module "A" and "A" Drain Piping Systems.

i. Leak Test in accordance with ANSI B31.1, 1977.

Criteria: Static Head. (Fill system, water level top of drain hubs)

Holding Period: No minutes minimum

Acceptance: No visual leakage

ii. Flow verification, allow leak test water to drain to sump.

Criteria: No visible fluid in system.

B. Sump Pump "A" and associated piping

Initial Service Leak Test in accordance with ANSI B31.1, 1977.

Criteria: Pump discharge pressure

Acceptance: No visual leakage, all welded joints leaktight

2.4.10.2 Electrical/Instrumentation: Drawings #B-356-031, B-248-011, and SS-261-011

A. Continuity and megger tests were performed for all circuits.

B. Instrument and control were tested and calibrated in accordance with MTX 507.

C. Sump Pump "A" tested in accordance with Electrical Preoperational Test Procedure WG-E01.

D. Solenoid Valve #WS-V05, tested in accordance with Electrical Preoperational Test Procedure WG-E02.

TABLE 1

SOLID WASTE STAGING FACILITY INSTRUMENTATION

Instrument Designator	Model or Type	Locations	Functions
SWS-LE-01	Drexelbrook 700-2-57	Mod A Sump	Sump Level Sensor
SWS-LT-11	Drexelbrook 408-6230	Mod A Opr. Floor	Sump Level Transmitter
SWS-LI-01	370-1104-401	Mode A Opr. Floor	Sump Level Indication
SWS-LI-01A	Intern'l Instr. 1151	Mod A Top Panel	Sump Level Indication
SWS-LSL-01	SETCON 401-100x	Mod A Top Panel	Sump Level Switch Low (Pump Permissive)
SWS-LSH-01	SETCON 401-100x	Mode A Top Panel	Sump Level Switch High
SWS-LAH-01	PANALARM	Mode A Top Panel	Sump Level Alarm High
SWS-LAH-01A	PANALARM	CR Panel 17E-24	Sump Level Alarm High
SWS-CE-07	Level Lance 14-115V	Sump	Influent Flow Conductivity Element
SWS-CAH-07	PANALARM	Mod A Top Panel	Influent Flow Alarm
SWS-CE-08	Level Lance 14-115V	Sump	Influent Flow Conductivity Element
SWS-CAH-08	PANALARM	Mod A Top Panel	Influent Flow Alarm

TABLE 2

INSTRUMENT SETPOINT INDEX

Instrument Tag. No.	Instrument Description	Component Type	Setpoint Description	Action
SWS-LSL-01 (GAI: LB-S-4)	Solid Waste Staging Facility Sump Level Switch Low (Sump Pump Permissive)	Current Switch	10% level (5.6 ma) Increasing	Contact Closure
SWS-LSH-01 (GAI: LB-S-3)	Solid Waste Staging Facility Sump Level Switch High	Current Switch	42% level (11.2 ma) Increasing	Contact Closure
SWS-CE-07 (GAI: CE-S-7)	Solid Waste Staging Facility Sump Influent Flow Module "A" Conductivity Element	Conductivity Element	Maximum Sensitivity	Contact Closure
SWS-CE-08 (GAI: CE-S-8)	Solid Waste Staging Facility Sump Influent Flow Module "B & C" Conductivity Element	Conductivity Element	Maximum Sensitivity	Contact Closure

TABLE 3

OPERATING PROCEDURES

Procedure Number	Description
4215-OPS-3232.14	SWSF Sump Pump Operation
4231-OPS-4440.01	Transfer of EPICOR 4'x4' Liners
4231-OPS-4450.08	On-site Transfer of Radioactive Liners to SWSF/Shipping Cask/ Staging Area
4231-OPS-4450.09	On-site Transfer of Radioactive Liner from SWSF
4231-OPS-4450.20	Movements of 4'x4' Liner/HIC from SWSF
4231-OPS-4450.22	Transfer of TMI-1 HIC to Solid Waste Staging Facility/Shipping Cask

ATTACHMENT 1

SHIELDING ANALYSIS - TYPES OF WASTES

Types of wastes considered are given below. A 3-month decay period was used in the analysis.

1. Natural Circulation Evaporator with Solidification
   Waste Form: 55 gallon drums (solidified)
   Design Basis for Cell: C-D waste at VR* = 4.5, n** = .6
   18 drums per storage cell
   C-D waste analysis is given below

   or

2. Forced Circulation Evaporator/Crystallizer with Solidification
   Waste Form: 55 gallon drum (solidified)
   Design Basis for Cell: C-D waste at VR = 22, n = .6
   18 drum per storage cell

   or

3. EPICOR II Charcoal Filter
   Waste Form: Activated Charcoal in 4 ft. diameter x 4 ft. high liner
   Design Basis for Cell: 2500 R/hr on contact
   Two liners per cell

   or

4. EPICOR II Demineralizer Resins
   Waste Form: Dewatered Resins in 4 ft. diameter x 4 ft. high liner
   Design Basis for Cell: B-C waste at VR = 543
   B-C waste analysis is given below

* VR = volume reduction
** VR = Packaging efficiency: ratio of volume of waste to total container volume

A. Quantities: C-D Waste

83,000 Gallons - Reactor Coolant Bleed Tank - A
83,000 Gallons - Reactor Coolant Bleed Tank - B
250,000 Gallons - Reactor Building Sump

B. Isotopic Analysis (μCi/ml) - Design Basis: C-D Waste

Isotope μCi/ml

Mo-99 -	180	Cs-138 -	120	Ce-144 -	100
I-131 -	8200	Ba-140 -	290	H-3 -	1.2
I-132 -	20	La-140 -	160		
Cs-134 -	82	Sr-89 -	1400		
Cs-137 -	330	Sr-90 -	120		

C. Isotopic Analysis (μCi/ml) - Design Basis: B-C Waste

B-C Waste

Isotope	μCi/ml	Isotope	μCi/ml
Ba-133	2 E-1	Ba-140	7.5 E-1
Co-60	1.4 E-4	La-140	2.4 E+0
Cs-134	1.6 E-1		
Mo-99	2.7 E-1		
I-131	2.3 E+1		
Bi-207	2.2 E-2		
Co-58	1.2 E-3		
Cs-137	7 E-1		

FIGURE 1

TMI UNIT 2 PLOT PLAN

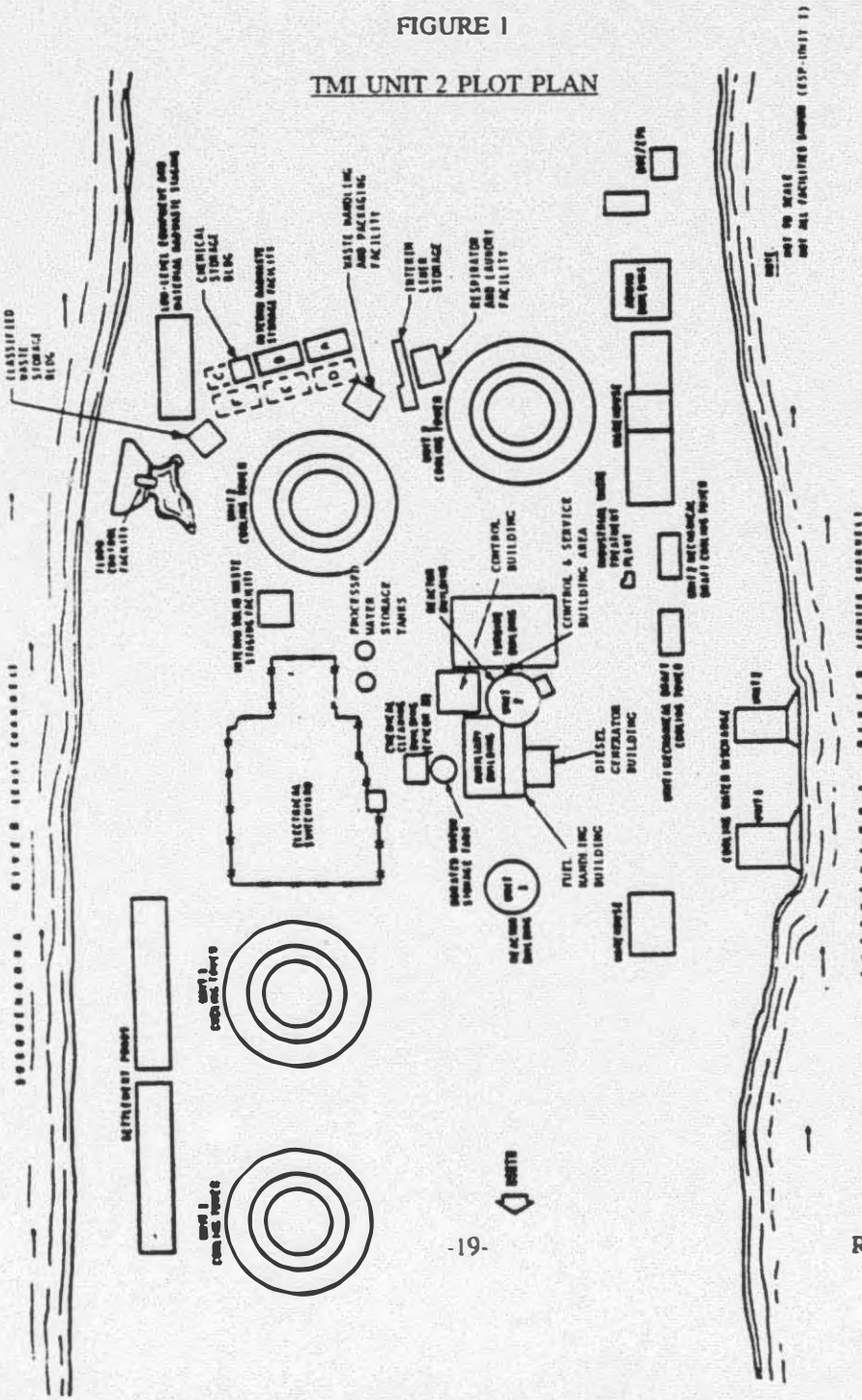

FIGURE 2

SUMP MODULE A & B FLOW DIAGRAM