

POOR ORIGINAL

THREE MILE ISLAND NUCLEAR STATION  
STATION HEALTH PHYSICIS PROCEDURE 1630-2  
REACTOR BUILDING ENTRY (UNIT 2 ONLY)

1630-2  
Revision 2  
11/6/77

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Unit 1 Staff Recommends Approval

Approval NA Date \_\_\_\_\_  
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

NA Date \_\_\_\_\_  
Chairman of PORC

Unit 1 Superintendent Approval

NA Date \_\_\_\_\_

Manager Generation Quality Assurance Approval

NA Date \_\_\_\_\_

Unit 2 Staff Recommends Approval

Approval NA Date \_\_\_\_\_  
Cognizant Dept. Head

Unit 2 PORC Recommends Approval

NA Date 11/1/78  
Chairman of PORC

Unit 2 Superintendent Approval

OK Date 11/1/78

THREE MILE ISLAND NUCLEAR STATION  
STATION HEALTH PHYSICS PROCEDURE 1630.2  
REACTOR BUILDING ENTRY (UNIT 2 ONLY)

1.0 PURPOSE

The purpose of this procedure is to list the requirements necessary to enter the Reactor Building during Reactor shutdown, power operation or an emergency.

2.0 DISCUSSION

To ensure personnel safety during a Reactor Building entry, several tests must be made of the Reactor Building atmosphere. The biological hazards that exist inside the Reactor Building are radiation, oxygen deficient atmosphere and explosive gases.

- 2.1 Radiological Hazards--Airborne radioactivity comes from leaks mainly around the reactor coolant pump seals. Penetrating radiation (gamma and neutron) comes mainly from the reactor, and from the main coolant piping. (Neutrons only when reactor is critical.)
- 2.2 Oxygen Deficient Atmosphere--Due to the fact that the Reactor Building is sealed and normally not purged during operation, it is possible that an oxygen deficient atmosphere might exist.
- 2.3 Explosive Gas--The explosive gas is hydrogen coming from leaks in the primary coolant system.

3.0 REFERENCES

- 3.1 Three Mile Island Operating Procedure 2102-4.1, "Reactor Building Purging & Venting."
- 3.2 TMI Radiation Protection Manual
- 3.3 1622 - Releasing Radioactive Gaseous Waste



- 3.4 1963 - Gas Analysis using a Gas Chromatograph
- 3.5 1602 - Radiation Dose Rate Surveys
- 3.6 1605 - Portable Air Sampling for Radioactive Particulates
- 3.7 1606 - Air Sampling for Radioactive Iodine
- 3.8 1607 - Air Sampling for Radioactive Gas
- 3.9 1608 - Air Sampling for Tritium
- 3.10 1609 - Surface Contamination Surveys
- 3.11 1613 - Radiation Work Permits
- 3.12 1632 - Radiation Shutdown Survey
- 3.13 2311-5 Containment Integrity.

#### 4.0 EQUIPMENT

- 4.1 Oxygen Explosive Gas Meter, MSA Model 250, or equivalent.
- 4.2 Eberline Rad Owl Ion Chamber Instrument or appropriate doserate instrument.
- 4.3 Air Sampler
- 4.4 Self-contained Breathing Apparatus
- 4.5 Tritium Sampler
- 4.6 Personnel Dosimetry
- 4.7 Syringe
- 4.8 Appropriate Protective Clothing
- 4.9 Gas Sampling Flask
- 4.10 Neutron Instrument (Eberline Model PNR-4)/(Eberline Model PNC-4)
- 4.11 Gas Partitioner

#### 5.0 OPERATING INSTRUCTIONS

ENTRY WHEN REACTOR IS AT POWER OR SHUT DOWN and Containment Integrity is established.

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- 5.1 Before Reactor Building entry, insure that the following steps have been accomplished.
- 5.1.1 Samples of the Reactor Building have been collected and analyzed for radioactivity, explosive qualities and oxygen content. or
- 5.1.2 Readings taken from the RMS and recorded on form 1630.2-1 with the oxygen levels and explosive levels to be determined upon entry.
- NOTE: Entry into the building may be made, in the event of an emergency, without first conducting an air quality survey if proper respiratory equipment is worn and, as soon as possible, the air quality is determined. Perform Section 2 of Form 1630.2-1.
- 5.1.3 Oxygen levels greater than 19.5% in the Reactor Building as read on an Oxygen Explosive Gas Meter, or Gas Partitioner, as per 1963, are acceptable.
- 5.1.4 Hydrogen levels less than 2.5% in the Reactor Building as read on an Oxygen Explosive Gas Meter, or Gas Partitioner, as per 1963, are acceptable.
- 5.2 Submit Form HPP 1630.2-1, with Step 1 complete, to the Shift Foreman/ Supervisor and Radiation Protection Supervisor/Foreman for signatures and approval for entry.
- 5.3 Personnel Criteria
- 5.3.1 Routine entry to the Reactor Building, when at power, or initial entry to the Reactor Building after shutdown for purposes of surveying and testing will require a minimum of two (2) persons. One of the two (2) must be a Radiation-Chemistry Tech/Jr., Auxiliary operator or an alternate that is

qualified by previous H.P. Training as determined by the Radiation Protection Supervisor/ Foreman.

NOTE: For special entries Radiation Protection personnel entering the Reactor Building to perform a survey for completion of an RWP do not require an RWP when authorized by the Radiation Protection Supervisor/ Foreman. Radiation Protection personnel may accompany other individuals into the Reactor Building without a completed RWP. The Radiation Protection personnel will provide the level of safety and control normally provided by the RWP. Immediately after exiting the area an RWP will be completed. Routine entry into the Reactor Building, when at power, for purposes of a general inspection will require an RWP.

- 5.3.2 The approval of the Shift Supervisor, Radiation Protection Supervisor, and Unit Superintendent must be obtained if maintenance or operations inspections must be performed within the secondary shield, on top of the "D" Rings, or in the reactor head area when the reactor power is greater than 1%. Reactor power must not be increased until such work is completed or the situation is re-evaluated and further approval is obtained from the Radiation Protection Supervisor, Shift Supervisor, and Unit/Station Superintendent.

NOTE: Standing approval to enter the "D" Rings to perform routine survey No. 48 has been given by the Radiation Protection Supervisor and the Unit Superintendent. Notification of the Shift Supervisor

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will be required, however, for each entry of this nature.

- 5.3.3 Protective clothing requirements for entry for purposes of surveying and testing will be specified by the Radiation Protection Supervisor/Foreman.

NOTE: If HPR-227 alarms, Control Room Personnel will notify personnel to exit the Reactor Building immediately.

- 5.3.4 Equipment requirements for initial entry for purposes of surveying and testing will consist of a portable radiation survey meter, sampling equipment necessary to perform the required atmospheric surveying and appropriate respiratory equipment, if required.

- 5.4 Notify the Control Room prior to entry into Reactor Building.

- 5.5 When making entry into the Reactor Building, insure that Containment Integrity is maintained as follows:

- 5.5.1 Before attempting to enter access lock observe the red indicating lights above the handwheel. If the opposite door is in use these lights will be lit indicating that a mechanical interlock will prevent opening the exterior door.

- 5.5.2 Observe differential pressure across door on local DPI. Rotate handwheel very slowly in the open direction. A mechanical interlock should stop rotation at 29° until D.P. is less than 1 PSID.

CAUTION: Do not continue rotation if DP is greater than 1 PSID.

CAUTION: Always stay clear of the doors as a higher pressure on the exterior can cause the door to swing open and motion of the door is NOT controlled by the handwheel.

- 5.5.3 Continue rotating handwheel in open direction until door is unlatched and the mechanical stop is felt.
- 5.5.4 Open exterior door and enter air lock.
- 5.5.5 Close door. Do Not bang door against seals.
- 5.5.6 Rotate handwheel at exterior door in close direction to latch door closed. Turn handwheel until mechanical stop is felt and indicating lights at interior door go out.
- 5.5.7 Check seal on interlock system. If seal is broken, and containment integrity is required, notify the Shift Foreman and perform section 7.1.
- 5.5.8 Proceed to interior door. Repeat steps 5.5.2 and 5.5.3 to unlatch interior door.
- 5.5.9 Open interior door and enter Reactor Building.
- 5.5.10 Close interior door. Do Not bang door against seals.
- 5.5.11 Rotate handwheel in close direction to latch door closed. Turn handwheel until mechanical stop is felt and indicating lights at exterior door as viewed through sight glasses, go out.

WARNING Insure interior door is closed so that entrance can be made through the air lock.

- 5.5.12 Proceed immediately to the opposite airlock and insure it is open so that 2 entrances exist for emergencies.

#### 5.6 Exiting the Reactor Building.

- 5.6.1 Before attempting to enter access lock observe the red indicating lights above the handwheel. If the opposite door is in use these lights will be lit indicating that a mechanical interlock will prevent opening the interior door.

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- 5.6.2 Observe differential pressure across door on local DPI.  
Rotate handwheel very slowly in the open direction. A mechanical interlock should stop rotation at 29° until D.P. is less than 1 PSID.

CAUTION Do Not continue rotation if D.P. is greater than 1 PSID.

CAUTION Always stay clear of the doors as a higher pressure on the exterior can cause the door to swing open and motion of the door is NOT controlled by the handwheel.

- 5.6.3 Continue rotating handwheel in open direction until door is unlatched and the mechanical stop is felt.
- 5.6.4 Open interior door and enter airlock
- 5.6.5 Close door. Do not bang door against seals.
- 5.6.6 Rotate handwheel at interior door in close direction to latch door closed. Turn handwheel until mechanical stop is felt and indicating lights at exterior door go out.
- 5.6.7 Check seal on interlock system. If seal is broken and containment integrity is required, notify the Shift Foreman and perform section 7.1.
- 5.6.8 Proceed to exterior door. Repeat steps 5.6.3 and 5.6.4 to unlatch exterior door.
- 5.6.9 Open exterior door and exit airlock.
- 5.6.10 Close exterior door. Do Not bang door against seals.
- 5.6.11 Rotate handwheel in close direction to latch door closed. Turn handwheel until mechanical stop is felt and indicating lights at interior door as viewed through sight glasses, go out.



5.6.12 Insure surveillance test on airlock(s) per 2311-5 is performed if required per Tech. Spec. 4.6.1.3.

5.7 The surveying and testing will consist of radiation, contamination, and air surveys for the following conditions:

5.7.1 For Initial Entry at shutdown conditions follow steps 5.7.1 through 5.7.4.

5.7.2 Routine Inspection at Power will consist of radiation surveys in the area of the inspection.

5.7.1 The radiation survey will be conducted as per 1602, "Radiation Dose Rate Surveys", and/or 1632.2, "Radiation Shutdown Survey".

NOTE: All areas over 100 mrem/hr. will be roped off and posted.

5.7.2 The contamination survey will be conducted as per 1609, "Surface Contamination Surveys", in areas specified by the Radiation Protection Supervisor/Foreman.

5.7.3 The air surveys will be conducted as per 1605, "Portable Air Sampling for Radioactive particulates", 1606 "Air Sampling for Radioactive Iodine"; 1607, "Air Sampling for Radioactive Gas"; and 1608, "Air Sampling for Tritium", in areas specified by the Radiation Portection Supervisor/Foreman.

NOTE: If the air surveys indicate that the atmosphere is not hazardous for occupancy of personnel, further surveying and testing of the Reactor Building may proceed without the use of respiratory devices.

5.7.4 The additional air testing, if specified by the Radiation Protection Supervisor/Foreman, will be accomplished by sampling with a portable oxygen/explosive gas meter, or utilizing the gas partitioner as per 1963.

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- 5.7.4.1 Record results as mentioned in Step 2 of Form 1630-1 and submit to the Shift Foreman/Supervisor and Radiation Protection Supervisor/Foreman for approval.

NOTE: If oxygen and explosive gas samples were taken at HPR 227 prior to entry, steps 5.7.4 and 5.7.4.1 need not be completed.

- 5.8 At this point, the Radiation Protection Department will complete a Radiation Work Permit (See 1613) and Form 1630.2-1, "Reactor Building Entry Survey Log", and submit to the Shift Foreman/Supervisor and Radiation Protection Supervisor/Foreman for approval. Form 1630.2-1 will be filed in the H.P. Lab.
- 5.9 A log of Reactor Building entries and exits will be maintained at the entrance of the Reactor Building Personnel Access Hatch. This log book will be used during reactor critical and not critical Reactor Building entries. When the reactor is critical the Control Room also maintains a log of Reactor Building entries and exits therefore during this time notify the Control Room Operator when entries and exits are made.
- 5.10 The Control Room must ensure that the access hatch seals are leak tested and the Containment inspected, if applicable, per 2311-5.

6.0 EMERGENCY UNSCHEDULED ENTRANCE INTO REACTOR BUILDING

This section refers to emergency entry into the Reactor Building.

- 6.1 Personnel initially entering Reactor Building during an emergency must wear a full set of protective clothing, a self-contained breathing apparatus, carry a high range Ion Chamber, neutron instrument, and appropriate dosimetry.

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- 6.2 Personnel requirements --A minimum of two (2) persons.
- 6.3 Radiation limits are 2.5 REM per person (not to exceed 5 (N-18) for the emergency, with the concurrence of the Radiation Protection Supervisor/Foreman.
- 6.4 After exit, a "Reactor Building Emergency Entrance Log," (Form 1630.2-2) report must be submitted to the Station Superintendent stating the following information:
  - 6.4.1 Why the entry was made.
  - 6.4.2 Who entered.
  - 6.4.3 What work or action was completed.
  - 6.4.4 What radiation exposures were received.

#### 7.0 REACTOR BUILDING AIRLOCK INTERLOCK OPERATION

- 7.1 Restoring interlock.
  - 7.1.1 Obtain seal to seal interlock cabinet.
  - 7.1.2 Enter airlock per section 5.5.
  - 7.1.3 Insure both doors are closed.

NOTE: Reference figures 1 & 2 for detailed drawing of interlock system.
  - 7.1.4 Remove clamp knob (#48) and open cover (#52).
  - 7.1.5 Press down on camyoke (#49) until it is parallel with shaft as in Fig. 1 and interlock disks are together.
  - 7.1.6 Close cover (#52) screw in clamp knob (#48) and apply seal.
  - 7.1.7 Notify Shift Foreman that interlock is in force, and seal is applied.
- 7.2 Violating the interlock system
  - 7.2.1 Obtain Shift Supervisor/Foreman approval prior to violating interlock.

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7.2.1 Enter airlock per section 5.5.

NOTE: See Figures 1 & 2 for detailed drawing of interlock system.

7.2.2 Break seal and remove clamp knob (#48).

7.2.3 Open hinged cover (#52) and pull or push on cam yoke (#49) until yoke is perpendicular to the shaft. Upper interlocking disk (#50) should slide toward clamp yoke violating interlock as in Fig. 2.

7.2.4 Close cover and start clamp knob (#48) into hole. Do not turn in fully and do not apply seal.

7.2.5 Notify Shift Supervisor/Foreman that interlock is violated.

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# REACTOR BUILDING ENTRY SURVEY LOG

Date \_\_\_\_\_

Start Time \_\_\_\_\_ Rad./Chem. Technician/Jr. \_\_\_\_\_

1.	HPR-227 Monitor Readings	HPR-227 Lab Analysis	Limit
Particulate	_____ c/m _____ uci/cc	_____ uCi/cc	$<3 \times 10^{-10} *$
Gaseous	_____ c/m _____ uci/cc	_____ uCi/cc	*
Iodine	_____ c/m/m _____ uci/cc	_____ uCi/cc	$<9 \times 10^{-9} *$
O <sub>2</sub> Reading at HPR227 _____	% on Gas Partioner _____		$>19.5\%$
Explosive Gas at HPR227 _____	% on Gas Partioner _____		$<2.5\% \text{ LEL}$
Tritium 3 <sub>H</sub> _____	uCi/cc _____		$<5.0 \times 10^{-6} \text{ uCi/cc}$

Check appropriate box:

☐ Reactor Building purge prior to entry.

☐ Iodines & Particulates < MPC

Reviewed Above Information

\_\_\_\_\_ Shift Foreman/Supervisor

\_\_\_\_\_ Radiation Protection Supervisor/Foreman

## 2. Readings Inside Reactor Building

O<sub>2</sub>


 Portable O<sub>2</sub> Meter  
% Gas Partioner

Explosive Gas 


 Portable Explosive Gas Meter  
% Gas Partioner

Reviewed above information and authorization is granted for entry into Reactor Building without respirator, but with protective clothing.

\_\_\_\_\_ Shift Foreman/Supervisor

\_\_\_\_\_ Radiation Protection Supervisor/Foreman

\*Respiratory Protection, protection clothing and radiation areas will be indicated on a Radiation Work Permit.

REACTOR BUILDING EMERGENCY ENTRANCE LOG

Date \_\_\_\_\_

Time \_\_\_\_\_

Entry Time \_\_\_\_\_ Exit Time \_\_\_\_\_

Why Entry was made \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Personnel Involved

Name

Exposure Received

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Work and/or action completed \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Supervisor of Operations \_\_\_\_\_

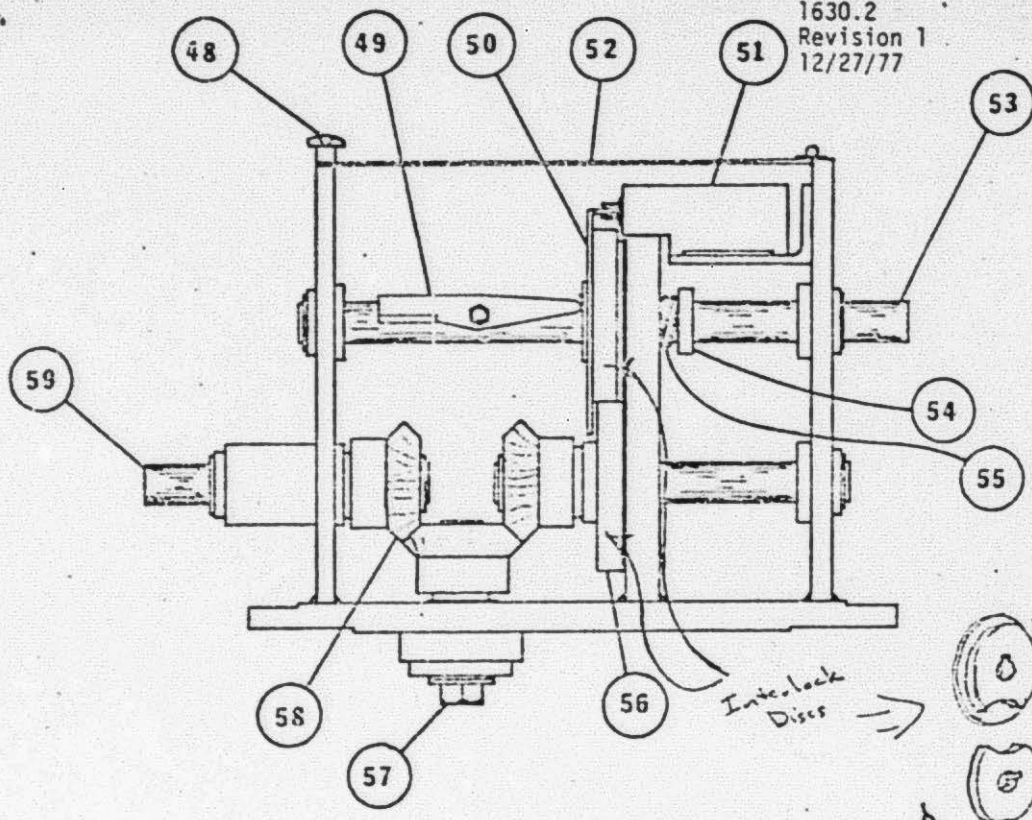
Date \_\_\_\_\_

Unit Superintendent \_\_\_\_\_

Date \_\_\_\_\_

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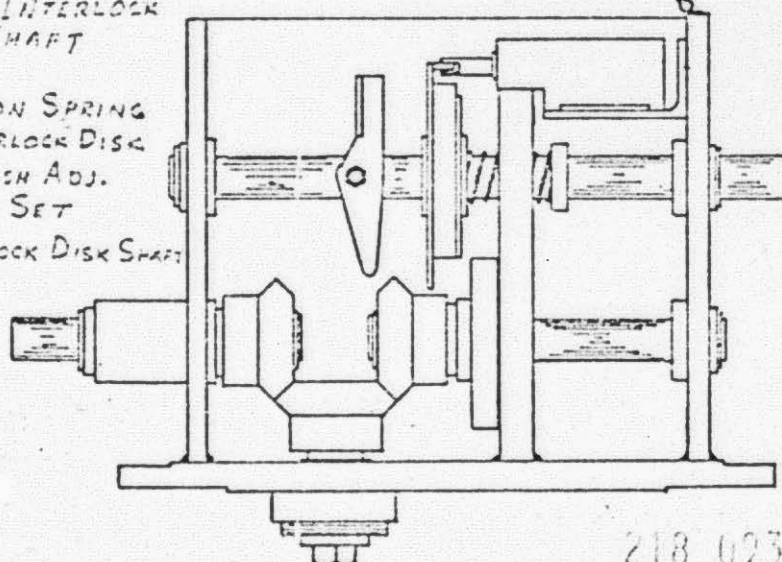




INTERLOCK ENGAGED

fig. 1

- 48 CLAMP KNOB
- 49 CLAMP YOKES
- 50 UPPER INTERLOCKING DISK
- 51 LIMIT SWITCH
- 52 HINGED COVER
- 53 UPPER INTERLOCK DISK SHAFT
- 54 STOP RING
- 55 COMPRESSION SPRING
- 56 LOWER INTERLOCK DISK
- 57 GEAR BACKLASH ADJ.
- 58 MITER GEAR SET
- 59 LOWER INTERLOCK DISK SHAFT



INTERLOCK DISENGAGED

fig. 2

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THE DOCUMENTS

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