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NTQ PROCEDURE
FOR
PHASE V SHIELDING INTEGRITY (SIC) TESTS
AT E-MAD FACILITY

NTQ-I-0282

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FINAL ISSUE
September 7, 1967

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Attached is the final issue of NTO-I-0282, "NTO Procedure for Phase V Shielding Integrity Check (SIC) Tests at E-MAD Facility," for your information and records.

Additional copies may be obtained from NTO Documentation and Reporting.

W. D. Wayne, Manager
NERVA Test Operations

Enclosure

ABSTRACT

This document contains the descriptive material and detailed procedures to be used in conjunction with Report No. NTO-I-0015 (Revision C), Procedure No. NTO-I-0033, Procedure No. NTO-I-0026 and Procedure No. NTO-I-0024 (NTP Procedure reports for Phase I, II, III and IV, respectively, Shielding Integrity Check (SIC) Tests for the E-MAD Facility) as required for the performance of the Phase V portion of the Shielding Integrity Check (SIC) Tests at the E-MAD Building. This phase of the test will be performed by NERVA Test Operations under Contract SNP-1.

The following shielding surfaces will be tested for shielding integrity so that corrections of violations can be effected and/or procedures can be adapted to insure personnel safety:

1. Surfaces common to the Core Disassembly and Examination Cell and the galleries, and the Core Disassembly and Examination Cell ceiling.
2. Main Disassembly Bay View Window W-14, blocked window opening W-1, and Disassembly Bay Crane Maintenance Balcony wall cracks created or enlarged by NTS events.
3. The Plug Door Transfer Systems on doors of Cells 165 and 166.
4. The portable personnel shield.
5. Postmortem Cell shielded equipment enclosures - microhardness tester and remote metallograph.

1.0 INTRODUCTION AND SCOPE

This procedure describes the Phase V portion of the Shielding Integrity Check (SIC) Tests to be performed at the E-MAD Building. This test will determine the quality of shielding integrity of the shielding surfaces in the following five (5) systems or areas:

- a. The Core Disassembly and Examination Cell walls and ceiling common to the galleries and exterior roof (136' level). The CDAE East wall, South wall common to Postmortem Cell 160 and ceiling common to the Crane Maintenance Balcony does not require testing as they were tested as part of Phase III, Phase II and Phase I SIC Tests respectively.
- b. The Main Disassembly Bay wall separations or cracks caused or enlarged by events at the Nevada Test Site, shielding window installation at the W-14 location and the blocked window opening at the W-1 location.
- c. The plug door transfer system on door of Cells 165 and 166.
- d. The portable personnel shield.
- e. The microhardness tester shielded enclosure and the metallo-graph shielded enclosure adjacent to Postmortem Cell 165.

The shielding on these systems and rooms contain openings for equipment such as periscopes, material transfer systems, master slave manipulators, camera optical systems and other pieces of remote operating equipment. All of these openings will contain equipment or be adequately plugged at the time of testing. The Cyclops 1300 Curie Cobalt-60 (⁶⁰Co) source, supported by the remote cranes, will be utilized for the Core Disassembly and

Examination Cell and the Main Disassembly Bay SIC Test. The Cyclops 1300 Curie ^{60}Co source, supported on the one-ton electric fork-truck, will be used on the Plug Door Transfer System SIC Tests. A three (3) Curie ^{60}Co source will be used on the portable personnel shield, the microhardness tester enclosure and the metallograph enclosure SIC Tests.

The work for each of the five (5) tests will be done in three steps, namely:

- a. The gridding of the walls, ceiling and/or equipment.
- b. Scanning of the walls, ceiling and/or equipment.
- c. The evaluation of results followed by correction of violations as needed.

2.0 PERSONNEL ASSIGNMENTS AND RESPONSIBILITIES

The Shielding Integrity Check will be performed under the direction of the Manager of MAD Operations. Personnel assignments for this test are shown in Figure 1. The personnel requirements as listed are minimal for single shift operation and do not include contingency personnel that might be required under conditions of emergency, malfunctions, or major off-shift maintenance problems. The associated prime responsibilities are designated as follows:

2.1 TEST DIRECTION

The Test Director has the management responsibility for the effective direction of the SIC Test Program.

2.2 ALTERNATE TEST DIRECTION

The Alternate Test Director will assume the responsibility assigned to the Test Director in the absence of the Test Director or as assigned by the Test Director.

2.3 HEALTH AND SAFETY

The representative from the NTO Health and Safety Department will ensure that adequate Rad-Safe monitoring is performed, that adequate records, calibrations, and radiation data are collected, and will assist in the interpretation and evaluation of the test data.

2.4 E-MAD STAFF

The staff personnel will assist the Test Director in technical direction and implementation of the SIC Program. Each of the staff personnel will be cognizant of and responsible to the Test Director for a specific technical requirement such as HVAC, communications, remote handling, and documentation.

2.5 FACILITY OPERATIONS

Personnel of Facility Operations will assist the Test Director in coordinating and utilizing the facility services and equipment and will report directly to the Test Director in this assignment.

2.6 TEST TECHNICIANS

The test technicians will operate the forklift, remote cranes, master slave manipulators and render additional assistance as needed to effect proper placement of the source and support the monitoring activity. The technicians will report to supervisors assigned by the Test Director.

3.0 EQUIPMENT AND FACILITY REQUIREMENTS

- 3.1 The tests of the Core Disassembly and Examination (CDAE) Cell (Room 127) walls and ceiling will require the exclusive use of the CDAE Cell (Room 127), Hot Hold and Transfer Tunnel (HHTT, Room 228), Crane Maintenance Balcony (Room 306), Operating Galleries 119, 123, 207, 301, 174 and 175, Postmortem Cell 160, Master Control Room (211), and the Amplifier Area (Room 126). In addition, the equipment described in Section 6 of the procedure will be required. This includes the CDAE Cell remote crane, Cyclops ⁶⁰Co source assembly and crane lifting fixture, material for plugging wall openings and one RAMS unit.
- 3.2 The test of the Main Disassembly Bay (Room 122), Shielding Window W-14, blocked window opening W-1, and Nevada Test Site Event created wall separations and cracks will require the exclusive use of the Main Disassembly Bay (Room 122), Operating Galleries 207, 123 and 301, Crane Maintenance Balcony 306 and roof area adjoining the Disassembly Bay wall above the 136-foot reference elevation. In addition, the equipment described in Section 6 of the procedure will be required. This includes the Cyclops ⁶⁰Co source assembly and crane lifting fixtures, one RAMS unit and the V-1 Remote Crane.
- 3.3 The test of the plug door transfer system will require the exclusive use of Postmortem Cells 165 and 166 and the cell service area. In addition, the equipment described in Section 6 of the procedure will be required. This includes the one-ton electric forklift and Cyclops ⁶⁰Co source assembly and forklift adapter.

- 3.4 The test of the portable personnel shield will require the exclusive use of the Main Disassembly Bay (Room 122). In addition, the equipment described in Section 6 of the procedure will be required. This includes a three Curie ^{60}Co source and one pair of extended-reach master slave manipulators.
- 3.5 The test of the Microhardness Tester and the Remote Metallograph shielding enclosures will require the exclusive use of Postmortem Cell 165 and Operating Gallery 175 during the test period. In addition, the equipment listed in Section 6 of the procedure will be required. This includes a three Curie ^{60}Co source, one pair of extended-reach master slave manipulators and transfer systems for both Metallograph and Microhardness Tester enclosures.
- 4.0 RADIATION SAFETY

Since the 1300 Curie Cyclops ^{60}Co source will never be out of its collimating container, which has remote exposure control, and the three Curie ^{60}Co source will be removed from its container only in areas with proven shielding integrity and by utilizing master slave manipulators, no significant radiation exposures are anticipated. However, every possible precautionary measure will be taken to insure that radiation exposures are kept to a minimum. This will be accomplished using the following techniques:
- 4.1 Film badges and self-reading pocket dosimeters will be worn by all persons working the test area.
- 4.2 All areas having shielding violations which permit radiation in excess of 10 mR/hr will be appropriately marked and/or barricaded.

- 4.3 All radiation detection equipment will be in operation and calibrated prior to each day's operation. An ionization chamber with a remote readout will be positioned in the barricaded control area.
- 4.4 All personnel in the area will be accounted for prior to each activity. Specific safety procedures applicable to the SIC Test are contained in the document contained in Appendix A, "E-MAD Safety Standard No. 1, Revision B, Use of High Level Sources."

5.0 BUILDING ACCESS

5.1 ACCESS AUTHORIZATION

Access to the Main Disassembly Bay, Crane Maintenance Balcony, Core Disassembly and Examination Cell, Postmortem Cells and adjacent areas will be restricted as required by the test to be performed. Restricted areas for each test are shown in Figures 2, 3, 4, 5, 6 and 7. The designated areas will be controlled by the Test Director as advised by NTO Health and Safety. Those authorizing access to the restricted area will be the Manager, NTO MAD Operations; Test Director; NTO Health and Safety Representative to E-MAD, or their designated alternates. Any interface problems with construction will be coordinated by the Test Director.

5.2 ACCESS CONTROL

5.2.1 Core Disassembly and Examination Cell SIC Test

Test participants only will enter the test area as shown in Figures 2, 3 and 4 during the time of scheduled test activities. The following areas will be swept of all non-participating personnel by Rad-Safe monitors before test:

- a. West Gallery - First Floor (Rooms 123, 126 and 174), that portion of Room 123, including Room 126, the amplifier area, south of the east/west barricade between the west gallery wall and the south wall of the Main Disassembly Bay (Room 122), and that portion of Room 174 north of the east/west barricade between the west gallery wall and Postmortem Cell 162. (See Figure 2)
- b. West and south gallery Second Floor (Rooms 207), that portion of Room 207 south of the east/west barricade between the west gallery wall and north wall of the MCR (Room 22) including the MCR, Room 211, and that portion of Room 207 west of the north-south barricade between the south gallery wall and center of Hot Hold and Transfer Tunnel wall. (See Figure 3)
- c. The entire Third Floor of the Building (Rooms 301, 305, 308 and 306) will be restricted. (See Figure 4)
- d. Core Disassembly and Examination Cell (Room 127)
- e. Hot Hold and Transfer Tunnel (Room 128)
- f. Postmortem Cell 160.
- g. Access may be made into the areas containing the source (shutter closed) by test participants preceded by a Rad-Safe monitor when the Cyclops ⁶⁰Co shutter control key is in the possession of a member of the entry team.

5.2.2 Main Disassembly Bay - Shielding Window W-14, Blocked Window Opening W-1 and Wall Crack SIC Test

Test participants only will enter the test area shown in Figures 5 and 6 during the time of scheduled test activities. The following

areas will be swept of all non-participating personnel by Rad Safe monitors before the test:

- a. West Gallery - First Floor (Room 123), that portion of Room 123 north of the east/west gallery wall and window location W-2, and all of Stairwell No. 5. (See Figure 5)
- b. West Gallery - Second Floor (Room 207), that portion of Room 207 between the east/west barricade established at the north wall of the MCR Room and the north gallery wall. (See Figure 8)
- c. The entire Third Floor area of the building will be restricted, Rooms 301, 305, 307 and 308.
- d. Main Disassembly Bay (Room 122).
- e. Crane Maintenance Balcony (Room 306).
- f. Access may be made into the areas containing the source (shutter closed) by test participants preceded by a Rad-Safe monitor when the Cyclops ^{60}Co shutter control key is in the possession of a member of the entry team.

5.2.3 Plug Door Transfer System SIC Test

Test participants only will enter the test area as shown in Figure 7 during the time of scheduled test activities. The following areas will be swept of all non-participating personnel by Rad-Safe monitors before Test:

- a. All Postmortem Cells (Rooms 160 through 171).
- b. Cell Service Areas and airlock (Rooms 173 and 176).
- c. Access may be made into the area containing the source (shutter

closed) by test participants preceded by a Rad-Safe monitor when the Cyclops ^{60}Co shutter control key is in the possession of a member of the entry team.

5.2.4 Personnel Shield SIC Test

Test participants only will enter the test area as shown in Figure 5 during the time of scheduled test activities. The following areas will be swept of all non-participating personnel by Rad-Safe monitors before test:

- a. Main Disassembly Bay (Room 122)
- b. Crane Maintenance Balcony (Room 306)
- c. Access may be made into the area containing the source by test participants preceded by a Rad-Safe monitor when the three Curie ^{60}Co source capsule is in its container and the container is closed.

5.2.5 Postmortem Cell Shielded Equipment Enclosures - Microhardness Tester and Metallograph Test

Test participants only will enter the test area as shown in Figure 7 during the time of scheduled test activities. The following areas will be swept of all non-participating personnel by Rad-Safe monitors before test:

- a. West Gallery - First Floor (Room 175), that portion of Room 175 south of the east/west barricade established between the west gallery wall and Postmortem Cell 164. (See Figure 7)
- b. Postmortem Cell 165.
- c. Access may be made into the area containing the source by test participants preceded by a Rad-Safe monitor when the three Curie ^{60}Co source capsule is in its container with the container closed.

5.3 DOOR CONTROL

5.3.1 Core Disassembly and Examination Cell SIC Test

The following doors adjoining the controlled areas will be secured in the positions indicated.

- a. Door 122-2 between Main Bay and HHTT (Rooms 122 and 128) closed.
- b. Door 160-2 - Intercell Gate between CDAE and Postmortem Cell 160 closed.
- c. Door 160-1 between Cell 160 and CSA closed.
- d. Door 127-1 between CDAE and HHTT (Rooms 127 and 128) will be open 6 inches to accommodate the source control lines. Test participants will reside East and South of Door 127-1 beyond the barricade 10 mR/hr contour in the HHTT (Room 128) while the shutter is open.
- e. West Gallery Doors - First and Second Floors - 104-1, 123-1, 123-2 and 204-1 shall be secured in the closed position.
- f. The doors on the Third Floor Level No. 302-1 and 307-2 shall be closed and secured to restrict access to Rooms 301, 305, 306 and 308 and adjoining roof areas.

5.3.2 Main Disassembly Bay - Window W-14, Blocked Window Opening W-14 Wall Crack SIC Test

The following doors adjoining the controlled area will be secured in the positions indicated:

- a. Door 122-1 - Main Bay entrance - closed.
- b. Door 122-3 - between Rooms 119 and 122 - closed.
- c. Door 122-2 - between HHTT and Main Bay - closed.
- d. Door 306-1 - between Crane Maintenance Balcony and Room 305 - closed.

- e. West Gallery Doors - First Floor 103-1 and 103-3 - closed.
- f. The doors on the Second and Third Floor Levels will not be secured since barricades will control and restrict passage of personnel into the restricted areas.

5.3.3 Plug Door Transfer System SIC Test

The following doors adjoining the controlled area will be secured in the position indicated:

- a. Door 128-1 between HHTT and CSA - closed.
- b. Postmortem Intercell Gates Nos. 160-2 and 166-2 between CDAE Cell 160 and EDAE Cell 166 - closed.
- c. Plug Doors 165 and 166 - closed.
- d. Door 173-1 between CSA and airlock (Rooms 173 and 176) will be open 12 inches to accommodate the source control lines. Test participants will reside south of Door 173-1 beyond the barricaded 10 mR/hr contour in the airlock (Room 176) while the source shutter is open.

5.3.4 Personnel Shield SIC Test

The following doors adjoining the controlled area will be secured in the position indicated:

- a. Door 122-1 - Main Bay entrance - closed.
- b. Door 122-2 between Main Bay and HHTT (Room 122 and 128) - closed
- c. Door 122-3 and 4 between Change Room and Main Bay (Rooms 119 and 122) shall be open to allow Rad-Safe monitors an entrance and exit route.
- d. Door 306-1 between Crane Maintenance Balcony and Change Room (Rooms 306 and 305) - closed.

5.3.5 Postmortem Cell Shielded Equipment Enclosures SIC Test

The following doors adjoining the controlled area will be secured in the position indicated:

- a. Intercell Gates 164-3 and 165-2 between Cells 164 and 165 - closed.
- b. Plug Door 165-1 between CSA and Cell 165 - closed.
- c. Door 175-1 between Gallery 175 and exterior - closed.

6.0 PROCEDURE

6.1 INDEXING OF AREAS

- 6.1.1 The CDAY Cell north, south and east walls and ceiling on both faces will be gridded in three-foot squares as shown in Figures 7, 8, 9, 10 and 11. The same equipment detailed in Section V of the NTO Procedure Report for Phase I SIC Test (NTO-I-0015) will be used.
- 6.1.2 The Main Disassembly Bay Window W-14, block window opening W-1 and wall cracks will be gridded both faces in three-foot squares as shown in Figures 12 and 13. The same equipment detailed in Section V of the NTO Procedure Report for Phase I SIC Test (NTO-I-0015) will be used.
- 6.1.3 The two (2) Plug Door Transfer Systems will be gridded on both faces as shown in Figure 14. The same equipment detailed in Section V of the NTO Procedure Report for Phase I SIC Test (NTO-I-0015) will be used.
- 6.1.4 The Personnel Shield will be checked with a Rad Safe monitor on the inside and a 3 Curie ⁶⁰Co source located 2 meters from the shield.

Readings will be taken at 5 points on the window and 3 points on each side as outlined in Figure 15.

- 6.1.5 The Microhardness Tester enclosure and Metallograph enclosure SIC Tests do not require gridding since the source location is fixed in each enclosure. Figures 16 and 17 show the approximate locations for monitoring of shielding integrity.

6.2 EQUIPMENT AND AREA READINESS

Before the scanning portion of any of the five SIC tests begins, it will be necessary to check the status of the following for the specific test to be performed:

6.2.1 Equipment and Materials - CDAE SIC Test

The source handling fixture is a counter-balanced horizontal beam, attached to the crane hook near its center and supporting the Cyclops ⁶⁰Co source, head, yoke and upper arm at one end. At the opposite end is a counter-balancing basket containing lead brick.

- a. The handling fixture with source in place shall be attached to the CDAE crane hook.
- b. The fixture shall be counter-balanced to within a plus or minus 5° of level, when supported by the crane hook.

6.2.1.2 CDAE Crane

The crane shall be fully operational, acceptance test completed to NTO requirements, and turned over to NTO. The hook and hoist assembly shall be certified in accordance with NTO Procedure, NTO-A-0022, Section VI-6, and E-MAD Procedure, NTO-SOP-0036.

6.2.1.3 Doors

- a. Door 122-2, between HHTT and Main Disassembly Bay, is closed and operable.
- b. Door 127-1, between CDAE and HHTT is operable.
- c. Doors 160-1, between CSA and Cell 160, is closed and electrical power secured.
- d. Transfer plugs between Crane Maintenance Balcony and CDAE are in place.
- e. Intercell Gates 160-2 and 3, between Cell 160 and CDAE and Cell 160 and Cell 161 are closed and mechanically secured.

6.2.1.4 Communications

The E-MAD Intercom System will be used with backup of three portable transceivers on Net 21.

6.2.1.5 Closed Circuit TV System

One closed circuit TV system shall be set up in the CDAE for this operation. The TV camera will be tripod-mounted with bail pickup for the rectilinear manipulator to position as required. The TV monitor will be located in the gallery as needed at Windows S-3, W-8 and N-2.

- 6.2.1.6 Prior to tests, all areas will be surveyed for openings, appropriate shielding plugs or control areas.

- 6.2.1.7 The following openings will be plugged either with lead bricks, concrete plugs, designated equipment or the adjacent gallery areas will be controlled by Rad-Safe monitors as required:

- a. Ten 10-inch diameter openings - two over each First Floor window location for master slave manipulators.
- b. Seven 10-inch diameter openings - five First Floor and two Second Floor for periscopes.
- c. One 10-inch diameter opening - First Floor for gamma scanning.
- d. One 6 x 10 inch opening - Ceiling for FEPS Optical System.

6.2.1.8 Other

Materials and equipment described in Procedure Report, NTO-I-0015, and Procedure, NTO-I-0026, are currently available at NRDS, and any additional items required to implement and complete the test will be provided as needed.

6.2.2 Equipment and Materials - Window W-14, Blocked Opening V-1, and Main Disassembly Bay Crane Maintenance Balcony Wall Crack SIC Test

6.2.2.1 Source and Crane Handling Fixture - Figure 18

The source and handling fixture are the same as listed in Section 6.2.1.1. The source will be supported by the 40-ton hook of the V-1 crane for this test.

6.2.2.2 Crane

The V-1 Crane will be operable and the 40-ton hook and hoist assembly shall have current certifications in accordance with Procedure, NTO-I-0022, Section VI-6, and E-MAD Procedure, NTO-SOP-0036.

6.2.2.3 Doors

- a. Door 122-1, between exterior and Main Disassembly Bay is closed and electrical power secured.

- b. Door 122-2 between HHTT and Main Disassembly Bay is closed and electrical power secured.
- c. Door 122-3 between Main Disassembly Bay and Hot Change Room 120 is open approximately six inches to accommodate the source control lines while the source is in the Main Disassembly Bay. When the source is in the Crane Maintenance Balcony, Door 122-3 will be closed and electrical power secured.
- d. Door 306-1 between Crane Maintenance Balcony and Hot Change Room 305 is closed and electrical power secured during the time the source is in the Main Disassembly Bay. When the source is in the Crane Maintenance Balcony, Door 306-1 will be open approximately six inches to accommodate the source control lines.

6.2.2.4 Communications

The E-MAD Intercom System will be used with backup of three portable transceivers on Net 21.

6.2.2.5 Closed Circuit TV System

One closed circuit TV system will be set up in the Main Disassembly Bay. The TV camera will be tripod-mounted with ball pickup for the 10-ton crane hook to position as required. Sufficient cable will be attached to the camera to allow positioning in either the Main Disassembly Bay or the Crane Maintenance Balcony.

The TV monitor will be located in the gallery as needed at windows E-1, E-10, W-12 and Window S-10 when the source is in the Crane Maintenance Balcony.

- 6.2.2.6 Prior to tests, all areas will be surveyed for openings, appropriate shielding plugs or control areas.
- 6.2.2.7 The following openings will be plugged either with lead bricks, concrete plugs, designated equipment or the adjacent gallery areas will be controlled by Rad-Safe monitors as required:
 - a. Twenty-four 10-inch diameter openings - two over each First Floor window location for master slave manipulators.
 - b. Three each 10-inch periscope openings.

6.2.2.8 Other

Materials and equipment described in Procedure Report, NTC-I-0015 and procedure NTC-I-0026, are currently available at NRDS and any additional items required to implement and complete the test will be provided as needed.

6.2.3 Equipment and Materials - Plug Door Transfer System SIC Test

6.2.3.1 One-ton Forklift ⁶⁰Co Source Handling Assembly - (Figure 19)

The Cyclops ⁶⁰Co source will be supported on the one-ton Clark forklift. The source head will be supported by the yoke assembly and the yoke will be attached to the "lazy susan" type double plate bearing. The yoke will be firmly attached to the upper plate and the forks of the forklift will be firmly attached to the lower plate.

This constitutes a thrust bearing so that rotation can be

accomplished around a vertical axis. This fixture permits 300° rotation. The assembly will have the following components:

- a. Cyclops ⁶⁰Co source hand yoke support
- b. "Lazy Susan" adapter
- c. One-ton capacity Clark Electric Forklift

6.2.3.2 Doors

- a. Door 128-1 between HHTT and CSA, is closed and electrical power secured.
- b. Postmortem Intercell Gates No. 160-2 and 166-2, between CDAE and Cell 160 and EDAE and Cell 166 are closed and mechanically secured.
- c. Postmortem Cell Plug Doors No. 165-1 and 166-1 are operable.
- d. Door 173-1 is operable.
- e. Transfer System Doors - two each system - are operable.

6.2.3.3 Communications

The E-IAD Intercom System will be used with backup of three portable transceivers on Net 21.

6.2.4 Equipment and Materials - Personnel Shield SIC Test

6.2.4.1 Source and Handling Assembly - Figure 20

Six $\frac{1}{2}$ Curie ⁶⁰Co sources, currently in use at NTS and NRDS and owned by REECo, will be used for the radiation source. Each source is encapsulated in magnetic stainless shell and is .50" dia. by 1.0" long. Sources will be placed in a 1.75" dia. by 1.25" high container for tests.

- a. Source shipping/storage container will be located at Window E-3 of the Hot Bay (Room 122).

- b. Source handling container will be located on a table at Window E-3 with lid removed.

6.2.4.2 Master Slave Manipulators

One pair of extended-reach master slave manipulators - one Model FX and one Model EX - shall be installed and fully operable at Window E-3 of the Disassembly Bay (Room 122).

6.2.4.3 Personnel Shield

The personnel shield will be positioned nine feet from the Main Disassembly Bay (Room 122) wall and directly in front of Window E-3.

6.2.4.4 Doors

- a. Door 122-1, between outside and Main Disassembly Bay, is closed and electrical power secured.
- b. Door 122-2, between HHTT and Room 122 is closed and electrical power secured.
- c. Door 306-1, between Hot Change Room 305 and Crane Maintenance Balcony is closed and electrical power secured.
- d. Door 122-3, between Hot Change Room 120 and Main Disassembly Bay is closed and operable.

6.2.4.5 Communications

The E-MAD Intercom System will be used with backup of three portable transceivers on Net 21.

6.2.5 Equipment and Materials - Microhardness Tester Enclosures and Metallograph Enclosure SIC Test

6.2.5.1 Source and Handling Assembly - Figure 20

The six $\frac{1}{2}$ Curie ^{60}Co sources and handling container listed in Section 6.2.4.1 will be used.

- a. Source shipping/storage container will be located in Postmortem Cell 165.
- b. Source container will be located on the window table with lid removed.

6.2.5.2 Master Slave Manipulator

One Model FX and one Model EX master slave manipulators will be installed in the cell and fully operable. The remote tongs in each enclosure shall be installed and operable.

6.2.5.3 Transfer Systems

The microhardness tester transfer system and the metallograph transfer system will be operable.

6.2.5.4 Doors

- a. Intercell Gates 164-3 and 165-2, between Cells 164 and 165, are closed and mechanically secured.
- b. Plug Door 165-1, between Cell 165 and CS1, is closed and electrical power secured.

6.2.6 Rad-Safe Equipment - All Five (5) SIC Tests

6.2.6.1 RAMS

One remote area monitoring system will be used in this test as a backup indication of source open and closed positions and for scattering measurements in the hot areas of the test.

6.2.6.2 Protective Clothing

This item will be made available by Rad-Safe, as required.

6.2.6.3 Pocket Dosimeters

Accumulative dosimeters will be issued to test participants at the start of each shift.

6.2.6.4 Film Badges

Film badges will be used throughout the test and be exchanged as deemed necessary by operating conditions.

6.2.6.5 Warning Signs and Barricades

These will be furnished by Rad-Safe as required.

6.2.6.6 Log Book and Data Sheets

Log books and index map data sheets will be distributed to operating and monitoring personnel with complete instructions as to their use and safekeeping.

6.3 SCAN OF SHIELDING AREAS

6.3.1 Background Levels

The background radiation levels will be determined in detail before initiation of the Phase V SIC Tests. Radiation levels are determined continuously throughout the tests in the particular area where the test is being conducted.

6.3.2 Barricades

Rad-Safe barricades will be set up at the beginning of each shift, for the specific test to be performed, as shown in Figures 2, 3, 4, 5, 6 and 7.

6.3.3 Scanning the CDAE Cell (Room 127)

- 6.3.3.1 The source handling fixture (Figure 18) will be positioned within two feet of the wall on column one and at the center of Row A (1- $\frac{1}{2}$ ' above the floor). The source handling personnel will evacuate the room. When these personnel report to the source control station and deliver the source control key to the source control operator, the source will be opened.

- 6.3.3.2 Rad-Safe monitors will monitor and record the radiation measurements on the opposite side of the wall from the source.
- 6.3.3.3 When Rad-Safe monitors report that data accumulation is complete, the source will be moved horizontally to Column 2. Direct viewing through shield windows, TV system monitoring and mirrors will be used to provide adequate visual control.
- 6.3.3.4 Steps 6.3.3.2 and 6.3.3.3 are repeated and again the source is moved horizontally to Column 3. This procedure continues until all columns on the row have been completed.
- 6.3.3.5 On completing the row, elevate the source handling fixture to the center of the next horizontal row. Return across wall repeating Steps 6.3.3.2 and 6.3.3.3 until the row is complete.
- 6.3.3.6 Repeat Steps 6.3.3.2 through 6.3.3.5 until the entire wall has been scanned.
- 6.3.3.7 The source is closed and the source control key is handed to the Test Director. A Rad-Safe monitor, followed by the source handling team, enters the CDAE Cell containing the source and the source is positioned to the next wall to be scanned. Steps 6.3.3.1 through 6.3.3.7 are repeated until all walls have been scanned. The CDAE east wall was scanned as part of the Phase III SIC Test and will not require retesting.
- 6.3.3.8 The ceiling and roof scanning is performed using the source handling fixture with the source window pointing upward. The source is raised to the maximum elevation of the CDAE crane hook and positioned at the center of Column 1, Row A, as shown in Figure 11. When the Rad-Safe monitors report that data accumulation is complete, the source will be moved west to the next row.

6.3.3.9 When every row along a column has been completed, the source is moved north to the next column and Step 6.3.3.8 repeated. This procedure continues until the entire ceiling area has been scanned.

6.3.3.10 During the integrity testing of the CDAE area, when the source is not in use, it will be stored in the CDAE (Room 127).

The following procedure will be employed in transferring the source handling fixture from the crane hook to the designated storage area.

- a. The hand wheel key switch located in the source head is to be locked.
- b. Following the locking of the hand wheel, the power console key control switch is locked and then electrically disconnected.
- c. The source handling fixture is to be lowered to the floor and placed on a suitable support. The crane hook is then detached from the lifting bail.
- d. Rad-Safe barricades will be placed around the source.
- e. Appropriate identification is to be provided identifying the presence of a radiological source.
- f. The keys to the hand wheel and the power console are to be retained by the Test Director and suitably safeguarded until further use of the source is required.

6.3.4 Scanning Main Disassembly Bay (Room 122) - Window 14, Blocked Window Opening W-1, and Selected Wall Joints/Cracks

6.3.4.1 The source handling fixture (Figure 18) will be positioned within two feet of Window W-14 on Column Line #1 and Row A (Figure 12).

The source handling personnel will evacuate the room. When these personnel report to the source control station and deliver the source control key to the source control operator, the source will be opened.

- 6.3.4.2 Rad-Safe monitors will monitor and record the radiation measurements on the opposite side of the wall from the source.
- 6.3.4.3 When the Rad-Safe monitors report that the data accumulation is complete, the source will be moved horizontally to Column 2.
- 6.3.4.4 Steps 6.3.4.2 and 6.3.4.3 are repeated and again the source is moved horizontally to Column 3. This completes Row A.
- 6.3.4.5 On completing the row the source is lowered to the next row and returned across the window repeating Steps 6.3.4.2 thru 6.3.4.4.
- 6.3.4.6 Steps 6.3.4.2 through 6.3.4.5 are repeated until the entire window has been scanned.
- 6.3.4.7 When the scanning of Window W-14 has been completed, the source is closed and the source control key transferred to the Test Director. A Rad-Safe monitor followed by the source handling team will enter the Hot Bay, containing the source and position the source within two feet of Blocked Window Opening W-1 on Column Line #1, Row A (Figure 12).
- 6.3.4.8 The source handling personnel will evacuate the room. When these personnel report to the source control station and deliver the source control key to the source control operator, the source will be opened.
- 6.3.4.9 Steps 6.3.4.2 through 6.3.4.5 will be repeated until scanning of Blocked Window Opening W-1 has been completed.

- 6.3.4.10 When the scanning of Blocked Window Opening W-1 has been completed, the source is closed and the source control key transferred to the Test Director. A Rad-Safe monitor followed by the source handling team will enter the Hot Bay, containing the source, and position the source within two feet of the wall and centered on the wall construction joint between window W-2 and W-3 (Figure 13).
- 6.3.4.11 The source handling personnel will evacuate the room. When these personnel report to the source control station and deliver the source control key to the source control operator, the source will be opened.
- 6.3.4.12 Rad-Safe monitors will monitor and record the radiation measurements on the opposite side of the wall from the source.
- 6.3.4.13 When the Rad-Safe monitors report that the data accumulation is complete, the source will be moved along the seam or crack to the next column line.
- 6.3.4.14 Steps 6.3.4.8 and 6.3.4.9 will be repeated until the complete length or height of the seam or crack has been scanned.
- 6.3.4.15 When the scanning of the crack or seam has been completed, the source is closed and the key delivered to the Test Director. A Rad-Safe monitor, followed by the source handling team, enters the room containing the source and the source is positioned at the next seam or crack to be retested as shown on Figures 12 and 13A.
- 6.3.4.16 Steps 6.3.4.7 through 6.3.4.11 are repeated until all areas to be retested have been completed.

6.3.4.17 Storage of the Source in the Hot Bay

When the source is not in use, it will be stored in an appropriate area of the Hot Bay or Crane Maintenance Balcony.

The following procedure will be employed when transferring the source handling fixture from the crane hook to the designated storage area:

- a. The handwheel key switch located in the source head is to be locked.
- b. Following locking of the handwheel, the power console key control switch is locked and then electrically disconnected.
- c. The source handling fixture is to be lowered to the floor and positioned on a suitable support. The crane hook is detached from the lifting bail.
- d. Rad-Safe barricades will be placed around the source.
- e. Appropriate identification is to be provided identifying the presence of a radiological source.
- f. The keys to the handwheel and the power console are to be retained by the Test Director and suitably safeguarded until further use of the source is required.

6.3.5 Scanning the Plug Door Transfer System (Doors 165 and 166)

- 6.3.5.1 Two (2) Rad-Safe monitors will be stationed in Cell 165, with radiation measuring instruments and intercom headset for communications, and Door 165 will be closed. The source will be positioned, using the electric fork truck, within two

feet of the transfer system door and at the door center.

- 6.3.5.2 The source handling team will evacuate the Cell Service Area. When these personnel report to the source control station and deliver the source control key to the source control operator, the source will be opened.
- 6.3.5.3 Rad-Safe monitors will monitor and record the radiation measurements on the opposite side of the door from the source.
- 6.3.5.4 When the Rad-Safe monitors report that the data accumulation is complete, the source will be closed and the source control key delivered to the Test Director. A Rad-Safe monitor, followed by the source handling team, will enter the CSA containing the source and the source will be positioned at the top center of the transfer door.
- 6.3.5.5 Steps 6.3.5.2 thru 6.3.5.4 are repeated and the source is positioned at the left center of the transfer door.
- 6.3.5.6 Steps 6.3.5.2 thru 6.3.5.4 are repeated until all five locations shown on Figure 14 have been scanned. The transfer door will be checked at each location with the following combination of door attitudes:
 - a. Both doors closed.
 - b. Cell side door closed; CSA side door open.
 - c. Cell side door open; CSA side door closed.
- 6.3.5.7 When scanning of the transfer system doors in Plug Door 165 have been completed, the source will be closed and the source control key handed to the Test Director. Steps 6.3.5.1 through 6.3.5.7 will be repeated for Plug Door 166 transfer system doors.

6.3.5.8 Source Storage

During the time the source is not in use, it will be stored in one of the Postmortem Cells, the Cell Service Area (CSA) or in the Engine Disassembly and Examination Cell (CDAE). The following procedure will be employed in transferring the source from its fixed mounted position on the forklift to the designated storage areas:

- a. The handwheel key switch located in the source head is to be locked.
- b. Following the locking of the handwheel, the power console key control switch is locked and electrically disconnected.
- c. The source, including the attached "Lazy Susan" fixture is to be lowered to the floor by the forklift and detached from the forklift.
- d. Rad-Safe barricades will be positioned around the source.
- e. Appropriate identification is to be provided identifying the presence of a radiological source.
- f. The keys to the handwheel and the power console are to be retained by the Test Director and suitably safeguarded until further use of the source is required.

6.3.6 Scanning the Personnel Shield

- 6.3.6.1 The personnel shield will be scanned using six $\frac{1}{2}$ Curie ^{60}Co sources. The container holding all six sources will be positioned in the Main Disassembly Bay at Window E-3. The sources will be removed from the container and placed in the

source holder, as shown in Figure 20. The source holder will be placed in a lead cave, built of lead bricks.

- 6.3.6.2 When the source holder, containing the six $\frac{1}{2}$ Curie ^{60}Co sources, is positioned in the lead cave, a Rad-Safe monitor will enter the Hot Disassembly Bay and take a position in the personnel shield, located directly in front and nine feet from the face of Window E-3. The monitor shall be equipped with radiation monitoring instruments and an inter-com headset.
- 6.3.6.3 The Rad-Safe monitor will notify the Test Director when in position in the shield. The Test Director will instruct the source operator to remove the source holder from the lead cave and position it seven feet from the shield at the bottom edge of the window.
- 6.3.6.4 The Rad-Safe monitor will monitor and record the radiation measurements on the opposite side of the shield from the source.
- 6.3.6.5 When the Rad-Safe monitor reports that the data accumulation is complete, the source will be raised to center of window.
- 6.3.6.6 Steps 6.3.6.3 thru 6.3.6.5 will be repeated until the source has been located and radiation readings taken at all positions shown in Figure 15.
- 6.3.6.7 When the Rad-Safe monitor reports that the final data accumulation is complete, the source operator will return the source holder to the lead cave and secure the master slave manipulators. The Rad-Safe monitor will be notified when the

source is positioned in the lead cave and will then leave the personnel shield and exit the Disassembly Bay.

6.3.6.8 When the Test Director is notified that the Rad-Safe monitor has evacuated the Disassembly Bay and the exit door is closed and electrical power secured, the source handler will be instructed to store the sources.

6.3.6.9 Source Storage

During the time they are not in use, the six $\frac{1}{2}$ Curie sources will be kept in the shipping container and stored in one of the Postmortem Cells or the Engine Disassembly and Examination Cell (EDAE). The following procedure will be employed in transferring the sources from the source holder to the shipping container and the container to the designated storage area:

- a. Using the master slave manipulators, remove the sources, one at a time, and transfer them to the shipping container.
- b. When all six sources have been transferred to the shipping container, place the lid on the container with the master slave manipulators.
- c. A Rad-Safe monitor, followed by the source handling team, enters the Disassembly Bay and secures the container lid. The source container is then transferred to the designated storage area, using the electric forklift.
- d. Rad-Safe barricades will be positioned around the source.
- e. Appropriate identification is to be provided identifying the presence of a radiological source.

- 6.3.7 Scanning the Metallograph Enclosure & Microhardness Tester Enclosure
- 6.3.7.1 The source container, holding six $\frac{1}{2}$ Curie ^{60}Co sources and source holder, will be placed in Cell 165 with the bolts securing the lid removed. The Plug Door 165 to the cell will then be closed and electrical power secured.
- 6.3.7.2 When the Test Director is notified that the cell has been secured, the source operator will be instructed to remove the container lid and place the six sources in the source holder, using the master slave manipulators.
- 6.3.7.3 Place the source holder on the carriage of the Metallograph Transfer System.
- 6.3.7.4 Trace the carriage with the source in the metallograph.
- 6.3.7.5 Rad-Safe monitors will monitor and record the radiation measurements as per data sheet (Figure 17A). The in-transit measurements will be taken when the source is at the shielding wall/instrument enclosure interface.
- 6.3.7.6 When Rad-Safe monitors report that the data accumulation is complete, the source will be returned to Cell 165, using the Metallograph Transfer System, and will be placed on the carriage of the Microhardness Tester.
- 6.3.7.7 Steps 6.3.7.3 thru 6.3.7.4 will be repeated. Rad-Safe monitors will monitor and record the radiation measurements as listed on the data sheet (Figure 16A).
- 6.3.7.8 When the Rad-Safe monitors report that the data accumulation is complete, the source holder will be returned to Cell 165.

6.3.7.9 During the time not in use, the six individual $\frac{1}{2}$ Curie sources will be kept in the shipping container and stored in one of the Postmortem Cells or the Engine Disassembly and Examination Cell (EDAE). The following procedure will be followed in transferring the sources to the designated storage area:

- a. Using the master slave manipulators, transfer the six sources from the source holder to the shipping container.
- b. When the transfer of all six sources has been completed, the lid to the container will be installed.
- c. A Rad-Safe monitor followed by the source handling team will enter Cell 165 and secure the lid. The source container is then transferred to the designated storage area using the electric forklift.
- d. Rad-Safe barricades will be positioned around the source container.
- e. Appropriate identification is to be provided identifying the presence of a radiological source.

6.4 ANALYSIS OF SIC DATA

The radiation readings obtained from the five individual tests will be reviewed by the Test Evaluations Committee (TEC), composed of NTO representatives from the E-MAD Facility, Health and Safety, and Product Assurance. The Committee will evaluate the data and make recommendations based on the following criteria:

6.4.1 Readings of five times or less the average level observed through walls or shields known to possess adequate shielding integrity with a source in position will not be considered as significant.

6.4.2 A reading of ten times the average level, as defined in 6.4.1, indicate a 1/10 value layer void or defect in the shielding.

6.5 CORRECTION OF DEFECTS

Only those defects will be corrected that have been judged significant by the Evaluation Committee. These corrections might include such items as additional lead packing around windows, pass-through holes, steel shot fill of concrete voids, etc.

7.0 CONFIRMATION OF ADEQUACY OF CORRECTIONS

Following the correction of any defects, the appropriate source will be used in accordance with the steps of this procedure to confirm the fact that the correction is such that the indicated leakage is consistent with the shielding design, i.e., that readings five times (or less) of the average level expected are not exceeded.

8.0 DOCUMENTATION AND FINAL REPORT

A detailed record will be kept of the operation on the grid map data charts. A log book of the operation will be kept to relate the operation to a time scale. Negative results and incidental activities will be recorded as well as obviously important details at the discretion of the Test Director, NTO Health and Safety

personnel and NTO Operating personnel because these seemingly insignificant items may become important at a later date.

8.1 FINAL REPORT

A final report will be issued at the completion of this phase of the test. The analysis of the test results, the shielding violations disclosed, the actions taken to correct these violations, and the results of the checks of the corrective actions will be included in the report.

8.2 STATUS REPORT

A status report will be issued daily to SIC Test participants and to the Test Evaluation Committee members.

9.0 PROCEDURAL CHANGES

Changes to or deviations from the stated procedure as contained herein may be implemented by agreement of the Test Evaluations Committee members as long as there is no compromise of safety involved.

10.0 REFERENCE DOCUMENTS

- a. NTO Report for Phase I Shielding Integrity Check (SIC Tests for the E-MAD Facility, Report No. NTO-I-0015, Revision C.
- b. NTO Final Report for Phase I Shielding Integrity Check (SIC) Tests for the E-MAD Facility, NTO Report No. R-0038.
- c. NTO Procedure for Phase II and Phase II Addendum Shielding Integrity (SIC) Check Tests for the E-MAD Facility, NTO-I-0033.
- d. NTO Final Report for Phase II and Phase II Addendum Shielding Integrity Check (SIC) Tests for the E-MAD Facility, NTO-R-0062.
- e. NTO Procedure for Phase III Shielding Integrity Check (SIC) Tests for the E-MAD Facility, NTO-I-0026.
- f. NTO Final Report for Phase III and Phase III Addendum Shielding Integrity Check (SIC) Tests for the E-MAD Facility, NTO-R-0039.
- g. NTO Health and Safety Manual, NTO-A-0022, Sections I, II, VI and VII.
- h. NTO Administrative Procedure - E-MAD Lock and Tag Procedure, No. NTO-A-0040, Section 002.

- i. Vitro Engineering Company, E-MAD Facility Specifications Phase II and Drawing No. 1425 H-53, H-54, H-55, A-4, A-6, H-8, A-201.
- j. Lerma Engineering Corp - Microhardness Tester Compartment Drawing No. J-7200.
- k. Amery Corporation - Plug Door Transfer System - Drawing No. AM-2715-3A and Am-2714-1.
- l. Bausch and Lomb, Inc. - Westinghouse Metallograph Installation Drawing No. R-4582-500.
- m. Acceptance Test Specification for P.L. No. 5014, Personnel Shield.
- n. Penberthy Instrument Division - Window Radiation Shielding, Assembly Drawing No. W-622, Sheets 1 thru 8.
- o. Hot Disassembly Bay Crane (V-1) Operating Procedure.
- p. Core Disassembly and Examination Cell Crane Operating Procedure.

APPENDIX A

E-MAD SAFETY STANDARD #1, REVISION B, USE OF HIGH LEVEL SOURCES

(Supersedes E-MAD Safety Standard #1, Revision A, issued 12/10/64)

All use of high level sources at E-MAD, such as the SIC Test, will be conducted in compliance with the following rules:

TEST RESPONSIBILITY

While the test is being conducted, the area and personnel within will be under the direction of the NTO SIC Test Director.

The Test Director will be responsible for the safe conduct of the test and the safety of all personnel. He is assigned the responsibility of the following, when applicable:

- a. Area sweep prior to each day's test period to account for all personnel, and to assure that no unauthorized personnel are in the area.
- b. Locking of all doors which might provide access to the test area during the test.
- c. Controlling the keys of all doors and the cyclops system.
- d. Compliance with the approved safety and operational procedure.
- e. Assuring the establishment and proper implementation of personnel access lists.
- f. Notification of MAD Operations Management in the event of a significant malfunction or emergency:

Call list:	M. J. Neder	878-0217
	D. Newby	878-4404
	or	
	R. B. Edmonson	878-8631

RADIATION SAFETY

Radiation exposures will be kept to a minimum during the test. The following procedures will be in effect:

- a. Film badges and self-reading pocket dosimeters will be worn by all test personnel.
- b. Special radiation surveys will be made as deemed necessary.
- c. The SSC will provide maintenance and calibration of radiological instrumentation for the test.
- d. Radiation signs and/or barricades will be used to delineate radiation exclusion areas when applicable.
- e. Entries into the radiation areas will be made under the direction of the Test Director as advised by the NTO Health and Safety representative.
- f. Radiation exposures, acceptable contamination levels, and atmosphere contamination limits will be kept in compliance with the NTO Health & Safety Manual, NTO-A-0022, Section VII.

GENERAL SAFETY RULES

General safety rules are contained in the NERVA Health and Safety Manual, NTO-A-0022. Specific instructions pertaining to the following are applicable for the SIC Test:

- E-MAD EMERGENCY PLAN - NTO-A-0040 Section 008
- E-MAD LOCK AND TAG PROCEDURE - NTO-A-0040 Section 002, Revision 1
- NTO HEALTH AND SAFETY MANUAL - NTO-A-0022 Sections I, II, VI & VII

EMERGENCY PROCEDURES

NERVA Test Operations Emergency Plan, NTO-A-0040, Section 008, dated March 22, 1967, which covers emergencies such as fire, uncontrolled radiation exposure, unknown or undefined conditions which may pose a threat to life or property, etc., is applicable for the E-MAD Facility.

Should any of these events occur, the SIC Test Director will assure that the following steps are taken:

- a. The source will be secured in the location that it exists.
- b. All entry ways to the Cell Area will be left locked and the keys retained by the Test Director.
- c. Personnel will leave the E-MAD Building by the shortest safe route.
- d. Re-entries will be made in accordance with the specific instructions of the Manager, NERVA Test Operations.

NTO PERSONNEL ASSIGNMENT

FOR SIC TEST

_____ MANAGEMENT DIRECTION

- - - - - ADMIN. DIRECTION & SAFETY SURVEY

(FIGURE 1)

**FIRST FLOOR PLAN E-MAD SHOWING
CONTROLLED AREA FOR CDAE SIC TEST
FIG. 2**

SECOND FLOOR PLAN

ACCESS CONTROL CDAE SIC TEST
FIG. 3

THIRD FLOOR PLAN
CONTROLLED AREA FOR
CDAC SIC TEST

LEGEND
W.L. = WINDOW & LINER
L.B. = LINER & BLOCKING
BQ = BLOCKING ONLY

FIG. 4.

☒ SOURCE CONTROL STATION

FIRST FLOOR E-MAD SHOWING CONTROLLED AREA FOR SIC TEST

PLUG DOOR TRANSFER SYSTEM AND SHIELDED ENCLOSURES

⊗ SOURCE LOCATIONS
FOR S.I.C. TEST

FIG 1

FIG. 8

FIG. 9

CDAC NORTH WALL
GRID MAP

FIG. 10

CDAE CEILING
GRID MAP

FIG 11

REVISION				
SYM	ZONE	DESCRIPTION		DATE
				APPROVED

HOT BAY (RM 122)
 WINDOW W-14 & BLOCKED OPENING
 GRID MAP

LOCATION OF DISASSEMBLY BAY & MAINTENANCE BALCONY SOUTH & WEST WALL CRACK SIC TEST

A LOWER CORNERS WINDOW W-2	I LOWER CORNERS S-4
B VERTICAL CRACK BETWEEN W-2 & W-3	J LOWER CORNERS S-4A
C VERTICAL CRACKS BETWEEN W-3 & W-4	K VERTICAL CRACK SW CORNER RM. 306
D LOWER CORNER W-4	L HORIZONTAL CRACK S-10 WEST RM. 306
E LOWER CORNER W-5	M VERTICAL CRACK BETWEEN S-9 & S-10
F LOWER CORNERS W-12	N VERTICAL CRACK ABOVE S-10
G UPPER CORNER W-13	O HORIZONTAL & VERTICAL CRACK BETWEEN S-8 & S-9
H UPPER & LOWER CORNERS W-15	P HORIZONTAL CRACK S-8 to EAST WALL

FIG. 13

LOCATION of DISASSEMBLY BAY & MAINTENANCE BALCONY
EAST WALL CRACK SIC TEST

- A** VERTICAL CRACK ABOVE WINDOW E-10
- B** VERTICAL CRACK ABOVE WINDOW E-11
- C** LOWER CORNER CRACK WINDOW E-11
- D** LOWER CORNER CRACK WINDOW E-12
- E** HORIZONTAL CRACK WINDOW E-15 TO SWALL

FIG.13A

PLUG DOOR TRANSFER
SYSTEM

FIG. 14

DATA SHEET FOR PART A
PLUG DOOR TRANSFER SYSTEM

Cell 165

Source on CSA Side

1, 2, 3, 4, 5

Source Position*

Both Doors Closed

Cell Side Door Open

CSA Side Door Open

Cell 166 -

Source on CSA Side

1, 2, 3, 4, 5

Source Position*

Both Doors Closed

Cell Side Door Open

CSA Side Door Open

FIGURE 14A

PERSONNEL SHIELD

DATA SHEET

Calculated radiation levels - 3 Ci ^{60}Co source located 2 meters from shield.

Radiation at shield - - 970 mr/hr

Radiation through shield - - 9 mr/hr

<u>Source Location</u>	<u>Readings</u>
Center-Bottom edge of window	_____
Center of window	_____
Center top edge of window	_____
Center right edge of window	_____
Center left edge of window	_____
Left Wall (man inside)	
Top	_____
Center	_____
Bottom	_____
Front Wall	
Top	_____
Center	_____
Bottom	_____
Right Wall	
Top	_____
Center	_____
Bottom	_____
Top Surface	_____

FIGURE 15

FIG. 16

MICROHARDNESS TESTER

DATA SHEET

Calculated radiation levels 3 Ci ^{60}Co source located in transfer carriage 6" from west wall 17" from south wall.

West Wall

1.	Inside surface of shield 6" from source	92 R/hr.
2.	Outside surface through shield 14" from source	100 mr/hr.

South Wall

1.	Inside surface of shield 17" from source	11.4 R/hr
2.	Outside surface through shield 25" from source	32 mr/hr

Radiation Readings

A. During Transfer of Source

West Wall

Top	_____
Center	_____
Bottom	_____

Top Wall

Center	_____
East Edge	_____
West Edge	_____

South Wall

Top	_____
Center	_____
Bottom	_____

FIGURE 16A

MICROHARDNESS TESTER

DATA SHEET

B. With Source in Position

West Wall

Top _____
 Center _____
 Bottom _____

Top Wall

Center _____
 East Edge _____
 West Edge _____

South Wall

Top _____
 Center _____
 Bottom _____

METALLOGRAPH ENCLOSURE
SOURCE LOCATION

METALLOGRAPH
DATA SHEET

Calculated radiation levels with a 3 Ci ^{60}Co source located in the transfer carriage.

West Wall

1.	Inside surface of shield 5" from source	132 R/hr.
2.	Outside surface through shield 13" from source	97 mr/hr.

East Wall

1.	Inside surface of shield 5" from source	132 R/hr.
2.	Outside surface through shield 13" from source	97 mr/hr.

South Wall

1.	Inside surface of shield 7" from source	67 R/hr.
2.	Outside surface through shield 16" from source	79 mr/hr.

Radiation Readings

A. During Transfer of Source

West Wall

Top	
Center	
Bottom	

Top Surface

Center	
East Edge	
West Edge	
South Edge	
North Edge	

East Wall

Top	
Center	
Bottom	

South Wall

Top	
Center	
Bottom	

FIGURE 17A

METALLOGRAPH

DATA SHEET

B. With Source in Position

West Wall

Top _____
 Center _____
 Bottom _____

East Wall

Top _____
 Center _____
 Bottom _____

South Wall

Top _____
 Center _____
 Bottom _____

Top Surface

Center _____
 East Edge _____
 West Edge _____
 South Edge _____
 North Edge _____

FIG. 18

CYCLOPS HANDLING FIXTURE

FIGURE 19

NERVA TEST OPERATIONS
Jackass Flats, Nevada

3 CURIE COBALT 60 SOURCE
HANDLING FIXTURE