



UNITED STATES MARINE CORPS

HEADQUARTERS MARINE CORPS AIR STATION MIRAMAR
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StaO 11140.1A
Safety

30 MAY 2001

STATION ORDER 11140.1A

From: Commanding General
To: Distribution List

Subj: INSPECTION AND TESTING OF LIGHTNING PROTECTION AND
GROUNDING SYSTEMS FOR AMMUNITION AND EXPLOSIVES STORAGE
FACILITIES/OPERATING AREAS

Ref: (a) NAVSEA OP-5, Vol. 1, 6th Rev. (NOTAL)
(b) MIL-HDBK 1004/6 (NOTAL)
(c) NFPA-780 (NOTAL)
(d) MEGGER DET5/4R Earth Tester Instruction Manual (NOTAL)
(e) MIL-HDBK-274 (AS)

Encl: (1) General Information on Grounding Systems
(2) Schedule of Inspections/Tests
(3) Visual Inspection Procedures
(4) Testing Procedures for Above Ground Storage Magazines
(5) Testing Procedures for Earth Covered Storage
Magazines
(6) Testing Procedures for Ready Service Lockers
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(9) Standard Earth Covered Magazine (1 door) Ground
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Points
(12) Standard Earth Covered Magazine (5 door) Ground
Points
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(14) Seat Shop Locations and Ground Points
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Ground Points
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(20) Hangar 4 Ground Points
(21) Hangar 5 Ground Points
(22) Hangar 6 Ground Points
(23) Hangar 0 Parking Apron Ground Points

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- (25) Hangar 2 Parking Apron Ground Points
- (26) Hangar 3 Parking Apron Ground Points
- (27) VAL Line Parking Apron Ground Points
- (28) Hangar 4 Parking Apron Ground Points
- (29) Hangar 5 Parking Apron Ground Points
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- (40) RSL Group 06 Ground Points
- (41) RSL Group 07 Ground Points
- (42) RSL Group 08 Ground Points
- (43) RSL Group 09 Ground Points
- (44) RSL Group 10 Ground Points
- (45) RSL 9220 Ground Points
- (46) RSL 7550 01 Ground Points
- (47) Test Results Record Form

1. Purpose. To establish requirements, responsibilities, and test procedures for the inspection, testing, maintenance, and repairs of the lightning protection and grounding systems related to potential explosive sites (PES) aboard Marine Corps Air Station Miramar (MCAS). This program is established as required by reference (a) and adheres to the guidelines of references (b) through (e). The enclosures contain the specific procedures and requirements for performing visual inspections and testing of the lightning protection and grounding systems.

2. Cancellation. StaO 11140.1.

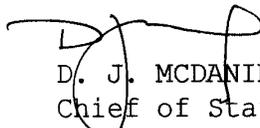
3. Scope. This Order provides procedures for visual inspections and electrical testing of grounding systems to include primary and secondary ground girdles, ordnance grounds, structural (lightning protection system) grounds, static grounds, stationary ground cables and reels, and flight line grounding requirements. Visual inspections and electrical testing will be per this instruction and the references.

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4. Recommendation. Recommendations to increase the effectiveness of this Order are invited and should be submitted to the Safety Department (Attn: Explosive Safety Officer).

5. Action. Department and Division Heads will ensure strict compliance with the guidelines and procedures outlined in this Order. Additionally, due to the significant revisions of this Order, it should be reviewed in its entirety.

6. Certification. Reviewed and approved this date.


D. J. MCDANIEL
Chief of Staff

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GENERAL INFORMATION ON GROUNDING SYSTEMS

1. GENERAL. The grounding system test plan has been developed to ensure that lightning protection and grounding systems integral to explosives safety, in regards to ammunition and explosives operating facilities/areas, are systematically tested, inspected and repaired as necessary. Proper maintenance is critical for the efficient operation of lightning protection/grounding system components.

2. TESTING INTERVALS

a. Resistance-to-earth testing of the lightning protection, selected external secondary ground system components, and each side of gate fences will occur every 24 months. Bonding measurements shall be made between lightning protection down conductors and test rods as well as lightning protection and secondary ground system earth resistance test points. Bonding measurements will also be made every 24 months between the secondary ground system earth resistance test points and:

(1) selected structural steel in the frame of the structure;

(2) the electrical service grounding point (where applicable);

(3) selected static grounding system grounding points;

(4) instrumentation and ordnance grounds; and

(5) any machinery and large structural items.

Additionally, when an existing ground system is modified or added to which disturbs more than half of the total ground system, a monthly test must be conducted for the first year and every 24 months thereafter.

b. Resistance-to-earth testing shall be conducted every 24 months in the case of aircraft static grounds.

c. A schedule of these inspections can be found in enclosure (2).

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d. A visual inspection of lightning protection/grounding system components shall be conducted every 6 months. Procedures for this inspection are contained in enclosure (3).

e. The lightning protection/grounding system of newly constructed ordnance facilities/areas shall be tested on a monthly basis for one year and every 24 months thereafter.

3. TEST CRITERIA. Table 1-1 provides criteria for the following tests and shall be less than the maximum value given.

Test	Value	Reference
Primary and secondary grounding grid earth resistance	25 ohms	OP 5, 5-4.1 6-8.3.4 5-5.1
Bonding resistance	1 ohm	OP 5, 6-8.2.3
Structural Components	1 ohm	OP 5, 5-5.5
Gates and fences	Note (1)	OP 5, 6-6.2.3
Aircraft static ground	10,000 ohms	MIL-HDBK-274 (AS)

Table 1-1 Maximum Resistance Values

Note: Maximum resistance to ground is less than 25 ohms; maximum bonding resistance to secondary ground girdle is less than 1 ohm.

4. REVIEW OF TEST DATA. A review of the test data must be performed to ensure the maximum and minimum requirements are being met per enclosures (4) through (8). A large variation of difference in resistance readings between data points may indicate a potential problem within the system, although the readings fall within accepted parameters. Any large variation discovered during testing shall be justified during the analysis phase of the test procedure. In addition, the comments section should be reviewed to ensure that nothing was found which should be analyzed in more detail or which should be repaired even though it may be sufficient to meet the requirements at the time of the inspection/test.

5. TRAINING. Those personnel involved in the inspection/testing of lightning protection/grounding systems shall be qualified per reference (a), paragraph 6-8.1.11. The explosive safety officer

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will receive the formal training specified in reference (a), table D-1. The explosive safety officer can provide informal and on-the-job training for other personnel involved in inspection/testing provided the explosive safety officer has received the formal training mentioned above.

6. ELECTRICAL TESTING

a. Three-Point Fall-of-Potential Test Method

(1) The three-point fall-of-potential test method is the only acceptable test method for measuring resistance-to-earth of grounding systems in Naval ordnance facilities. However, if it is not practical to employ the three terminal method, the two-terminal method may be employed providing the Naval Ordnance Safety and Security Activity (NOSSA) (N71) approves the test procedure. Justification must be provided stating why the three-point fall-of-potential method cannot be used.

(2) Figure 1-1 demonstrates how a four-terminal earth resistance tester is to be configured when used in performing such a test.

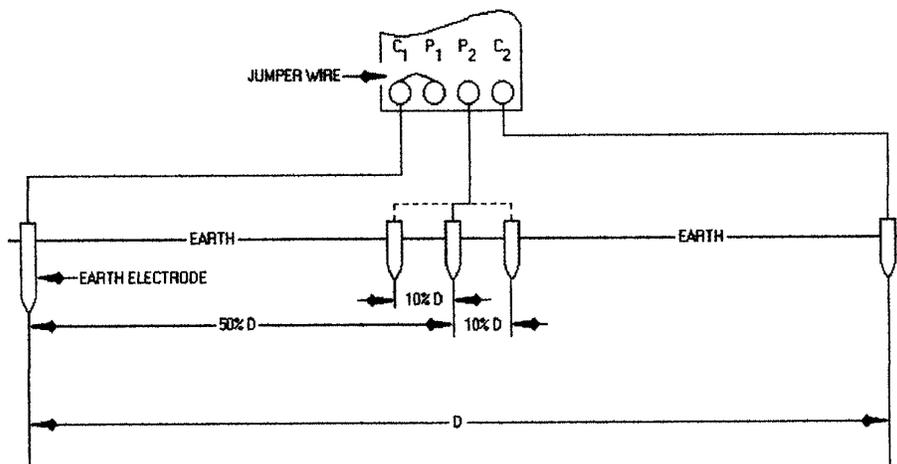


Figure 1-1. Four Terminal Tester Setup

(3) For the most accurate resistance measurements, electrode C₂ (see figure 1-1) should be placed as far from the earth electrode under test as practical. Table 1-2 provides recommended spacing for electrodes P₂ and C₂ (see figure 1-1) for small to medium sized ground systems. For larger ground systems, a general rule of thumb is to use a distance 5 times the diagonal distance of the ground system.

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(4) Specific test procedures for resistance-to-earth measurements are outlined in enclosures (4) through (8).

Maximum Dimension, (Feet)	Distance to P2, (Feet)	Distance to C2, (Feet)
2	40	70
4	60	100
6	80	125
8	90	140
10	100	160
12	105	170
14	120	190
16	125	200
18	130	210
20	140	220
40	200	320
60	240	390
80	280	450
100	310	500
120	340	550
140	365	590
160	400	640
180	420	680
200	440	710

Table 1-2. Guide to Approximate Location of Reference Probes

b. Point-to-Point Bonding Testing

(1) Bonding resistance testing is the most important quality control technique that can be used to quantify the effectiveness of lightning protection systems. The test is a simple point-to-point resistance measurement.

(2) The maximum bonding resistance shall be less than one ohm. Therefore, test points should be properly prepared/cleaned. When long leads are used, the lead resistance must be taken into account and the difference subtracted from the resistance measurement.

(3) Specific test procedures for point-to-point bonding are outlined in enclosures (4) through (8).

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7. VISUAL INSPECTION

a. Visual inspections are a useful tool in detecting obvious problems that may interfere with the efficient operation of a ground system. Broken or missing components, corrosion, frayed bonding straps, painted cables or connectors, or any condition that may impede current flow are the subject of such inspections. Transient suppression hardware shall also be inspected during the visual inspection.

b. Qualified inspectors shall conduct visual inspections every 6 months on all storage/operating facilities/areas to include parking aprons.

c. Procedures for conducting visual inspections are outlined in enclosure (3). Additionally, any area where there is a significant amount of paint or corrosion at the contact point, an electrical test must be performed. Anywhere non-translucent insulated cable is used, an electrical test must be performed if there exists the possibility that the cable may be broken. Any area where major modifications have been made to a facility since the last visual inspection should be examined in detail.

d. Time will be allocated for routine/minor maintenance, corrosion control/treatment, and other necessary actions during the visual inspection.

8. TOOLS AND TEST EQUIPMENT

a. Only instruments specifically designed for earth ground system testing shall be used to measure the earth system resistance. Instruments that use high test voltages such as meggers shall be used inside a room only if the room is free of exposed explosives and no exposed electro-explosive devices (EED) are present.

b. The following equipment recommendations are provided:

(1) MEGGER DET5/4R Digital Earth Tester;

(2) test leads;

(3) reference electrodes (1/2" x 18" copper or steel, galvanized or stainless);

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(4) general hand tools; and

(5) wire brush, sandpaper, electrician's knife and a file.

9. PROTECTIVE EQUIPMENT. The following protective equipment is required for inspection team personnel:

- a. safety glasses;
- b. safety shoes (non-conducting).

10. HAZARD DESCRIPTION

a. Test leads should be handled with caution. A shock hazard may exist if test voltage is applied prior to proper connection.

b. Bonds between ordnance items and static or ordnance grounding systems shall be disconnected prior to conducting the electrical testing described in enclosures (4) through (8) to eliminate any possibility of current flow through the ordnance items.

c. The test equipment shall not be located in any area where there may be explosive dusts, flammable vapors, exposed electro-explosive devices (EED) or combustible vapors.

11. RESPONSIBILITIES

a. Explosive Safety Office. The following responsibilities are assigned to the MCAS Miramar Explosive Safety Officer or a designated representative.

(1) Have cognizance over, maintain and update MCAS Miramar's Grounding System Test Plan for areas where ammunition and explosives operations are conducted as defined in enclosure (2).

(2) Submit to the Assistant Chief of Staff (AC/S) G-4 Installations and Logistics (I&L) Department, Public Works Division (PWD), work requests for semi-annual, annual and periodic recurring work orders based on the schedule provided in enclosure (2).

(3) Supervise the inspection/testing of ground systems utilizing the procedures outlined in enclosures (3) through (8) and ensure that all inspectors/testers carry out their responsibilities as defined by this Order.

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(4) Make liaison with the Public Works Officer and the Ordnance Officer in order to arrange for inspection/testing of ordnance facilities/areas as scheduled in enclosure (2).

(5) Provide the team members with a facility data package containing floor diagrams, test record forms, historical data and other pertinent information on the facility being inspected.

(6) Ensure grounding/bonding straps are disconnected prior to and reconnected after test.

(7) Submit to PWD a work request on discrepancies found during inspection/testing that are unable to be corrected immediately. Follow up on these requests to ensure the work has been accomplished.

(8) For ordnance and static grounds that require a work order to correct, ensure they are marked or labeled "do not use" as appropriate until discrepancy is corrected.

(9) Establish and maintain a historical record of inspection/testing results in the facility data package for the lifetime of the facility.

b. Assistant Chief of Staff (AC/S), G-4 (I&L). The following responsibilities are assigned to the AC/S G-4 I&L for Public Works and Ordnance Division functions.

(1) Execute Public Works functions required by the provisions set forth in this Order and requirements of the references and other applicable references concerning lightning protection/grounding systems, through the Public Works Division.

(a) Inform the Explosive Safety Officer of any planning, construction and modification of ordnance facilities or explosive safety areas affecting lightning protection/grounding systems.

(b) In response to work requests from the Explosive Safety Officer, issue recurring work orders for the inspection and testing of ordnance facilities and ordnance operating areas as scheduled in enclosure (2).

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(c) Ensure that qualified technicians conduct inspections and tests and that inspections/tests are conducted in accordance with this order and other applicable references concerning lightning protection/grounding systems.

(d) Ensure that contract personnel performing inspections/tests receive the Electrical Explosive Safety for Naval Facilities training per Table D-1, appendix D of reference (a).

(e) Ensure that test equipment calibration date is current.

(f) Ensure grounding/bonding straps are disconnected prior to and reconnected after test.

(g) Conduct, record results, and analyze data taken from the inspection/testing of ordnance facilities and ordnance operating areas adhering to those procedures defined in enclosures (3) through (8). Forward a copy of completed reports to the Explosive Safety Office within five working days of the date of the inspection.

(2) Execute Ordnance functions required by the provisions set forth in this Order and requirements of the references and other applicable references concerning lightning protection/grounding systems, through the Ordnance Section, Aviation Supply Branch, AC/S, G-4 I&L.

(a) Provide an aviation ordnance technician to assist during inspection/testing. The individual will become familiar with the requirements of this Order as well as reference (a) concerning lightning protection/grounding systems.

(b) Ensure the facility being inspected (East Miramar ammunition storage area) is available for inspection.

(c) Ensure that the facility is free of any exposed explosives, explosive dusts, or exposed electro-explosive devices (EED).

(d) Remove any sources of flammable or combustible vapors. Brief the electrical test personnel on the location and type of hazardous material located in the facility.

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(e) Rearrange any ammunition and explosives that may be necessary to perform the inspection/test.

(f) Conduct visual inspections during the course of daily operations. Submit to PWD any work requests necessary to correct discrepancies. Forward a copy of request to the Explosive Safety Office.

(g) Ensure grounding/bonding straps are disconnected prior to and reconnected after test.

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SCHEDULE OF INSPECTIONS/TESTS

EAST MIRAMAR

LOCATION	ODD												EVEN											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
22103						*						*							X					*
22104	*						*						*							X				
22105		*						*						*							X			
22106			*					*							*						X			
22237		X						*						*							*			
22238			X						*						*							*		
22239				X						*						X			*				*	
22240					X						*						X		*				*	
22241						X						*						X		*			*	
22242	*						X						*							X				*
22243		*						X						*							X			*
22244			*						X						*						X			*
22245				*						X						*					X			*
22246					*						X						*				X			*
22247						*						X						*			X			*
22248	*						*						*						X		*			*
22249		*						*						*						X		*		*
GATES/SIGNS				*					X							*					X			*
EOD INERT FAC	X					*							X					*			X			*
SHERIFF RSL		*						X						*					X		*			*

Note: * Denotes visual inspection due.
 X Denotes visual inspection/test due.

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WEST MIRAMAR HANGERS

LOCATION	ODD												EVEN											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
HNGR 0						*					X						*						*	
HNGR 1			*					*						*						X				
HNGR 2			*					X						*						*				
HNGR 3			X					*						*						*				
HNGR 4		X					*						*							*				
HNGR 5	X					*					*									*				
HNGR 6						X					*							*					*	
HNGR 1 S108					*					*					*							X		
HNGR 1					*					*							*						X	
HNGR 1 C137	*					*					*								X					
HNGR 1 C150					*					*							X						*	
HNGR 1 N118				*						*					X								*	
HNGR 2 1004			*					*						*						X				
HNGR 2 1027				*					*		*				*							X		
HNGR 2 1065					*					*					*								X	
HNGR 2 1095			*					*			*			*						X				
HNGR 3 A117	*					*					*		*						X					

WEST MIRAMAR FLIGHTLINE

LOCATION	ODD												EVEN											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
HNGR 0 APRON				*					*						X					*				
HNGR 1 APRON	*					X					*								*					
HNGR 2 APRON				*					X						*							*		
HNGR 3 APRON			*					*						X						*				
VAL APRON				X				*			*			*						*				
HNGR 4 APRON		*				X					*		*						*					
HNGR 5 APRON	*					X					*							*						
HNGR 6 APRON					X				*		*				*								*	
CALA PRI	*					*					X		X					*						
CALA SEC				*										X						*				
ARMING AREA			*					X			*		*						*					

Note: * Denotes visual inspection due.
 X Denotes visual inspection/test due.

ENCLOSURE (2)

WEST MIRAMAR RSL'S

LOCATION	ODD												EVEN											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RSL Group 01		x						*						*						*				
RSL Group 02			x						*						*						*			
RSL Group 03				x						*						*						*		
RSL Group 04	x						*						*							*				
RSL Group 05					x					*						*						*		
RSL Group 06				*						x						*						*		
RSL Group 07					*						x					*						*		
RSL Group 08						*						x							*				*	
RSL Group 09	*						*						x						*					
RSL Group 10		*						*						x						*				
RSL 9220			*						*						x						*			
RSL 7550		*						*						*						x				
RSM 9605			*					*						*							x			

Note: * Denotes visual inspection due.
 X Denotes visual inspection/test due.

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VISUAL INSPECTION PROCEDURES

1. GENERAL. The visual inspection will be conducted every six months. The following procedures will be followed.

2. INSPECTION. Inspect as follows:

STEP 1 - Ensure any large metal objects within the primary grid, or inside of the lightning masts, are connected to the primary ground girdle or bonded to structural steel.

STEP 2 - Inspect cables connected to lightning masts to ensure they are in good condition and are at least AWG #1/0 or larger, made of bare copper wire, are attached to the mast, have no sharp bends in wire, and have no more than 1/3 of the strands broken. Repair, replace, or install new cables as needed.

STEP 3 - On lightning-protected buildings, inspect to see there are no trees in the protected area.

STEP 4 - Randomly inspect grounding systems connections to see that they are secure and free from paint, corrosion, or foreign materials which may impair ground system efficiency. Make repairs as necessary. Inspect both inside and outside of building.

STEP 5 - Check to see that metal masses (400 square inches or larger) are connected to the secondary ground girdle. Examples of masses are metal siding doors, shutters, and trusses. Repair or add bonding as needed.

STEP 6 - Check ordnance ground buses, static ground buses, and instrumentation ground buses for clear identification of each, and make sure connections are secure (via pull test) and connection points are free from paint, corrosion, or foreign material that may impair the efficiency of the system. Repair if needed.

STEP 7 - Check to see utilities coming into the buildings are buried the last 50 feet.

STEP 8 - Check to ensure 120 volt single phase receptacles installed outdoors or in wet locations are ground fault circuit interrupters. Repair if needed.

ENCLOSURE (3)

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STEP 9 - Ensure metallic conductors, including intrusion detection lines, water, electrical, steam, air conditioning lines, etc., are run underground the last 50 feet to the building.

STEP 10 - Ensure fences are bonded to lightning protection system if they come within 50 feet of the structure being grounded. Ensure fences that run parallel with high-tension lines directly overhead (within 50' is considered overhead) are grounded every 150'. Ensure fences are grounded at places where personnel may routinely touch the fence and areas where structure and materials are located within 6 feet of the fence.

STEP 11 - Review previous test records to ensure fences are bonded from gate post to gate post, gate post to gate, and gate post to secondary ground girdle, if within zone of protection. If outside zone of protection, ensure ground rods are driven on each side of gate post in place of connecting to secondary girdle.

STEP 12 - Inspect parking apron ground point receptacles/padeyes for dirt and corrosion. Ensure ground rods have ball studs in place.

3. SUMMARY. File the inspection results for use during the next six-month inspection. Initiate a work request to correct any discrepancies that are not immediately repairable.

Inspector/Date:	ESO Validation/Date:
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Facility Inspected: _____

Comments: _____

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TESTING PROCEDURES FOR ABOVE GROUND STORAGE MAGAZINES

1. GENERAL. An above ground storage magazine is typically comprised of a primary lightning protection system and a secondary ground girdle. It is tested every 24 months. These grounding/lightning protection systems serve to protect personnel and equipment from the potential of lightning strikes and the build-up and uncontrolled discharge of static electrical charges.

WARNING

DISCONNECT ORDNANCE FROM STATIC AND ORDNANCE GROUNDS DURING TEST

WARNING

**INSTRUCTIONS FOR USE OF COMMUNICATION EQUIPMENT IN ORDNANCE AREAS
SHALL BE STRICTLY ADHERED TO AT ALL TIMES**

2. TESTING. Test as follows:

STEP 1 - Ensure the MEGGER DET5/4R Digital Earth tester is calibrated and its equipment is present. Follow the appropriate diagrams (enclosures (9) through (47)) for the test points to be tested.

STEP 2 - Locate the wire that bonds the lightning masts together around the building to be tested (primary girdle). Test reference point (TRP) connection is located in the test well or next to mast.

STEP 3 - Clean a connection point on the wire cable or grounding rod. This is where the earth tester will be connected for the earth test (less than 25 ohms is required). This cleaned area on the wire cable (or rod) now is called your TRP. Continuity readings will be taken from this point (after the earth ground test). Disconnect cables from rod.

STEP 4 - Test the TRP (less than 25 ohms is required), record the reading and date on the appropriate form (enclosures (9) through (47)), and reconnect cables.

STEP 5 - Using a zeroed digital resistance meter with long leads, check for continuity from the TRP to the first lightning mast, from the second mast to the third and so on. A high reading will indicate a break in the wire cable you are reading back through the system. No reading will indicate there is more than one break in the cable linking the mast together.

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STEP 6 - If the continuity readings from mast to mast are good (less than 1 ohm), record and go to the next step. If breaks were detected, disconnect the wire cable from the mast and run a new continuous cable from mast to mast.

STEP 7 - MAST INSPECTION. The lightning mast shall not be closer than 6 feet to the structure and no further away than 25 feet. EXAMPLE: Mast 40 feet high 20 feet from the structure (1/2 the height of the mast). EXAMPLE: Mast 60 feet high 25 feet from the structure. Wood mast's shall be capped at the top and have two down conductors. The mast shall be high enough to protect the structure from a lightning strike.

STEP 8 - Inspection of metallic objects passing through the zone of lightning protection to the building being protected. These objects are usually steam pipes, railroad tracks, etc. These objects shall be bonded prior to entering the lightning protection zone. Bond them to the primary lightning protection wire girdle and make these areas a test point.

Note: Electrical transmission lines and communications lines shall be buried for the last 50 feet prior to entering the structure.

STEP 9 - You have completed the test and inspection on the primary lightning protection system by verifying there is continuity from lightning mast to lightning mast and back to your test reference point. Metallic objects passing through the zone of protection must be connected to the primary lightning protection system. Record readings and date on the appropriate form (enclosures (9) through (47)).

STEP 10 - Locate the ground girdle. According to design, it is three feet from the structure and buried three feet in the ground.

Note: Most of the time the ground cable (girdle) can be located by seeing a cable running out of the ground close to the footer and then running to the structure, or it may be located on the floor inside the structure.

STEP 11 - Identify cables around the structure. Conduct a continuity check from these cables to the primary lightning protection test reference point (less than 1 ohm is required). If no reading can be established, the secondary and primary girdles are not connected together. First, check for grandfather clauses

ENCLOSURE (4)

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(for older systems). If this step is not applicable, submit a work request to effect repairs or initiate corrective actions, whichever is required.

STEP 12 - Zero the digital resistance tester if the leads have been changed. Test continuity from the ground girdle to metallic objects within the primary girdle inside and outside the structure, including windows, doors, conduit, structural overhangs, ladders, etc. Connection shall be less than 1 ohm. Record readings and date on the appropriate form (enclosures (9) through (47)).

3. SUMMARY

a. Ensure readings are recorded on the appropriate forms (enclosures (9) through (47)). Check with previous readings for any variations. This will let you know if there are any possible system integrity problems.

b. File the record for use during the next 24 month test. Initiate a work request to correct any discrepancies not immediately repairable.

Note: Metallic objects (400 square inches or more) within the primary girdle of a protected ordnance structure shall be at the same potential as the lightning protection system.

Note: Grounds are to be connected to the girdle at the lowest point of the system.

ENCLOSURE (4)

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TESTING PROCEDURES FOR EARTH COVERED STORAGE MAGAZINES

1. GENERAL. The concrete construction of an earth covered magazine is reinforced with steel bars. Some earth covered magazines have steel casings inside. These reinforcement bars or cases are connected to or are considered the primary lightning protection and grounding system. This forms an umbrella of protection (FARADAY CAGE) for the ordnance stored inside the structure. This system is tested every 24 months to less than 25 ohms to a test reference point (TRP) earth ground.

WARNING

DISCONNECT ORDNANCE FROM STATIC AND ORDNANCE GROUNDS DURING TEST

WARNING

INSTRUCTIONS FOR USE OF COMMUNICATION EQUIPMENT IN ORDNANCE AREAS
SHALL BE STRICTLY ADHERED TO AT ALL TIMES

2. TESTING. Test as follows:

STEP 1 - Ensure the MEGGER DET5/4R Digital Earth Tester is calibrated and its equipment is present. Follow the appropriate diagrams (enclosures (9) through (47)) for the test points to be tested.

STEP 2 - Locate the ground girdle (if applicable) for the structure. According to design, it is three feet from the structure and buried three feet in the ground (located in test well or under white PVC cap by bulkhead wall).

Note: Usually, if there is a ground girdle cable it will extend out of the ground close to the headwall and continue into the structure. Sometimes the ground cable will extend out of the floor inside the building.

STEP 3 - Clean a connection point on the ground girdle, wire, cable, rod or some point on structural steel. This is where the earth tester will be connected for the earth test (less than 25 ohms is required). This cleaned area is called your test reference point (TRP). Continuity readings will be taken from this point after the earth ground test. Disconnect cables from ground rod (when used).

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STEP 4 - Test the ground girdle, record the reading and date on the appropriate forms (enclosures (9) through (47)) and reconnect cables.

STEP 5 - Zero a digital resistance tester if the leads have been changed. Test continuity from the TRP to metallic objects of or around the structure, including doors, conduit, structural overhangs over doors, metal ventilators, security grates under the ventilator inside, railroad tracks, etc. Connections to the ground girdle shall be less than 1 ohm. Record the continuity readings on the appropriate forms (enclosures (9) through (47)).

STEP 6 - Check inside the earth covered magazine for a ground system. Test to less than 1 ohm continuity to the ground girdle. Record readings on the appropriate forms (enclosures (9) through (47)).

STEP 7 - Inspect to ensure that the ventilator and security grate is not bonded from the ventilator down to a ground inside the magazine. It shall be bonded from the top and outside to the ground girdle.

3. SUMMARY

a. Ensure readings are recorded on the appropriate forms (enclosures (9) through (47)). Check with previous readings for any variations. This will let you know if there are any possible system integrity problems.

b. File the record for use during the next 24 month test. Initiate a work request to correct any discrepancies not immediately repairable.

ENCLOSURE (5)

TESTING PROCEDURES FOR READY SERVICE LOCKERS

1. GENERAL. The above ground ammunition storage lockers are metal safe-like containers used to temporarily store munitions prior to use. They are portable and mounted on metal skids and tested every 24 months.

WARNING

DISCONNECT ORDNANCE FROM STATIC AND ORDNANCE GROUNDS DURING TEST

WARNING

**INSTRUCTIONS FOR USE OF COMMUNICATION EQUIPMENT IN ORDNANCE AREAS
SHALL BE STRICTLY ADHERED TO AT ALL TIMES**

2. TESTING. Test as follows:

STEP 1 - Ensure the MEGGER DET5/4R Digital Earth Tester is calibrated and its equipment is present. Follow the appropriate diagrams (enclosures (9) through (47)) for the test points to be tested.

Note: A record sheet to record readings and floor/area diagram is provided with this Order.

STEP 2 - Locate the ground rods for the container. According to design, it is no more than three feet from the container on opposite corners.

STEP 3 - Clean a connection point on the ground rod and connects to the down strap. This is where the earth tester will be connected for the earth test (less than 25 ohms is required). This cleaned area on the rod is called your test reference point (TRP). Continuity readings will be taken from this point after the earth ground test. Disconnect cables.

STEP 4 - Test the ground rods, record the readings and date on the appropriate forms (enclosures (9) through (47)) and reconnect cables.

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STEP 5 - Zero the digital resistor tester. You can now check the test points as identified on the diagram for that container (less than 1 ohm resistance to the TRP is required). Record the readings and date on the appropriate forms (enclosures (9) through (47)) and reconnect cables.

3. SUMMARY

a. Ensure readings are recorded on the appropriate forms (enclosures (9) through (47)). Check with previous readings for any variations. This will let you know if there are any possible system integrity problems.

b. File the record for use during the next 24 month test. Initiate a work request to correct any discrepancies that are not immediately repairable.

ENCLOSURE (6)

TESTING PROCEDURES FOR ORDNANCE HANDLING BUILDINGS AND PADS

1. GENERAL. An operating building's grounding system is typically comprised of a primary lightning protection system and a secondary ground girdle. These buildings typically have ordnance grounds installed inside, which is an isolated grounding system design for the assembly/disassembly of ordnance and tested every 24 months.

WARNING

DISCONNECT ORDNANCE FROM STATIC AND ORDNANCE GROUNDS DURING TEST

WARNING

**INSTRUCTIONS FOR USE OF COMMUNICATION EQUIPMENT IN ORDNANCE AREAS
SHALL BE STRICTLY ADHERED TO AT ALL TIMES**

2. TESTING. Test as follows:

STEP 1 - Ensure the MEGGER DET5/4R Digital Earth Tester is calibrated and its equipment is present. Follow the appropriate diagrams (enclosures (9) through (47)) for the test points to be tested.

STEP 2 - Locate the wire that bonds the lightning masts together around the building to be tested (primary girdle). The test reference point (TRP) connection is located in the test well or next to the mast.

STEP 3 - Clean a connection point on the wire cable or grounding rod. This is where the earth tester will be connected for the earth test (less than 25 ohms is required). This cleaned area on the wire cable (or rod) is your TRP. Continuity readings will be taken from this point (after the earth ground test). Disconnect cables from rod.

STEP 4 - Test the primary system. Also test any ordnance grounding system, as both have the same result requirements (less than 25 ohms). Record the test readings and date on the appropriate forms (enclosures (9) through (47)) and reconnect cables.

STEP 5 - Using a zeroed digital resistance meter with long leads, check for continuity from the TRP to the first lightning mast, from the second mast to the third and so on. A high reading

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will indicate a break in the wire cable you are reading back through the system. No reading will indicate there is more than one break in the cable linking the mast together.

STEP 6 - If the continuity readings from mast to mast are good (less than 1 ohm), record and go to the next step. If breaks were detected, disconnect the wire cable from the mast and run a new cable continuously from mast to mast. Turn in a discrepancy report and corrective actions.

STEP 7 - MAST INSPECTION. The lightning mast shall not be closer than 6 feet to the structure and no further away than 25 feet. EXAMPLE: Mast 40 feet high 20 feet from the structure 1/2 the height of the mast. EXAMPLE: Mast 60 feet high 25 feet from the structure, wood masts shall be capped at the top and have two down conductors. The mast shall be high enough to protect the structure from a lightning strike.

STEP 8 - Inspect metallic objects passing through the zone of lightning protection to the building being protected. These objects are usually steam pipes, railroad tracks, etc. These objects shall be bonded prior to entering the lightning protection zone. Bond them to the primary lightning protection girdle and make these areas a test point.

Note: Electrical transmission lines and communications lines shall be buried for the last 50 feet prior to entering the structure.

STEP 9 - You have completed the test and inspection on the primary lightning protection system by verifying there is continuity from lightning mast to lightning mast and back to your test reference point. Metallic objects (400 square inches or more) within or passing through the zone of protection must be connected to the primary lightning protection system. Record test readings and date on appropriate forms (enclosures (9) through (47)) and reconnect cables.

STEP 10 - Locate the ground girdle. According to design, it is three feet from the structure and buried three feet in the ground.

Note: Most of the time the ground girdle cable can be located by seeing a cable running out of the ground close to the footer and then running to structural steel. The ground cable may be located on the floor inside the building.

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STEP 11 - Identify cables around the structure. Conduct a continuity check from these cables to the primary lightning protection test reference point (less than 1 ohm is required). If no reading can be established, the secondary and primary girdles are not connected together. First, check for grandfather clauses (for older systems). If this step is not applicable, submit a work request to effect repairs or initiate corrective actions, whichever is required.

STEP 12 - Zero the digital resistance tester if the leads have been changed. Test continuity from the ground girdle to metallic objects within the primary grid (i.e., anything inside or outside the structure 400 square inches or more), including windows, doors, conduit, structural overhangs, ladders, etc. Connection shall be less than 1 ohm. Record the test readings on the appropriate forms (enclosures (9) through (47)) and reconnect cables.

Note: Metallic objects (400 square inches or more) within the primary girdle of an ordnance operating building shall be at the same potential as the lightning protection system.

Note: Grounds are connected to the lowest point near the ground girdle. Higher connections are considered to be connected to the down trap of the system.

3. SUMMARY

a. Ensure readings are recorded on the appropriate forms (enclosures (9) through (47)). Check with previous readings for any variations. This will let you know if there are any possible system integrity problems.

b. File the record for use during the next 24 month test. Initiate a work request to correct any discrepancies that are not immediately repairable.

ENCLOSURE (7)

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TESTING PROCEDURES FOR AIRCRAFT STATIC GROUNDS

1. GENERAL. Aircraft static grounds are used to ground aircraft during ordnance evolutions, electrical power supply and refueling operations. The construction, resistance and testing of aircraft static grounds used for all aircraft grounding shall occur every 24 months.

WARNING

DISCONNECT ORDNANCE FROM STATIC AND ORDNANCE GROUNDS DURING TEST

WARNING

**INSTRUCTIONS FOR USE OF COMMUNICATION EQUIPMENT IN ORDNANCE AREAS
SHALL BE STRICTLY ADHERED TO AT ALL TIMES**

2. TESTING. Test as follows:

STEP 1 - Ensure the MEGGER DET5/4R Digital Earth Tester is calibrated and its equipment is present. Follow the appropriate diagrams (enclosures (9) through (47)) for the test points to be tested.

Note: A record sheet to record readings and floor/area diagram is provided with this Order.

STEP 2 - Locate the ground connections on the flight line or in hanger.

STEP 3 - Locate a suitable ground (structural, power, etc.) if it is impractical to utilize the three-point fall-of-potential test method. In this instance, the two-point fall-of-potential test method is authorized. Clean both the ground point and the electrode under test and connect the earth tester. This cleaned point is called your test reference point (TRP). Ensure that nothing but the meter is connected to any point under test. 10,000 ohms is the maximum resistance allowed for aircraft static grounds.

STEP 4 - Test the other ground points, record the test readings and date on the appropriate forms (enclosures (9) through (47)) and reconnect cables. Secure the earth tester in its case.

ENCLOSURE (8)

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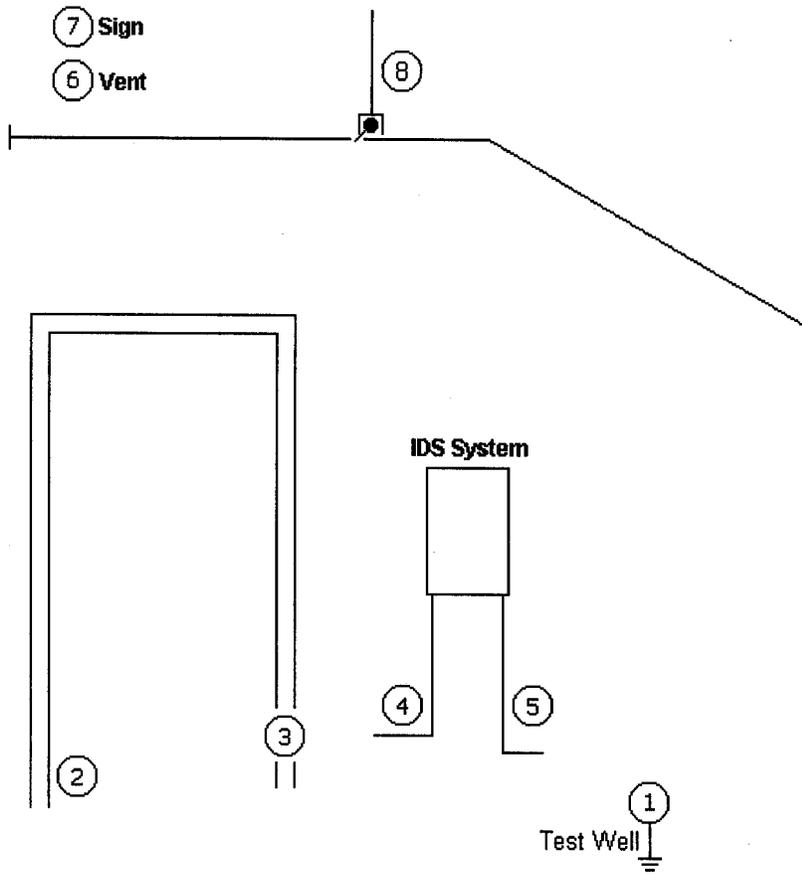
3. SUMMARY

a. Ensure readings are recorded on the appropriate forms (enclosures (9) through (47)). Check with previous readings for any variations. This will let you know if there are any possible system integrity problems.

b. File the record for use during the next 24 month test. Initiate a work request to correct any discrepancies that are not immediately repairable.

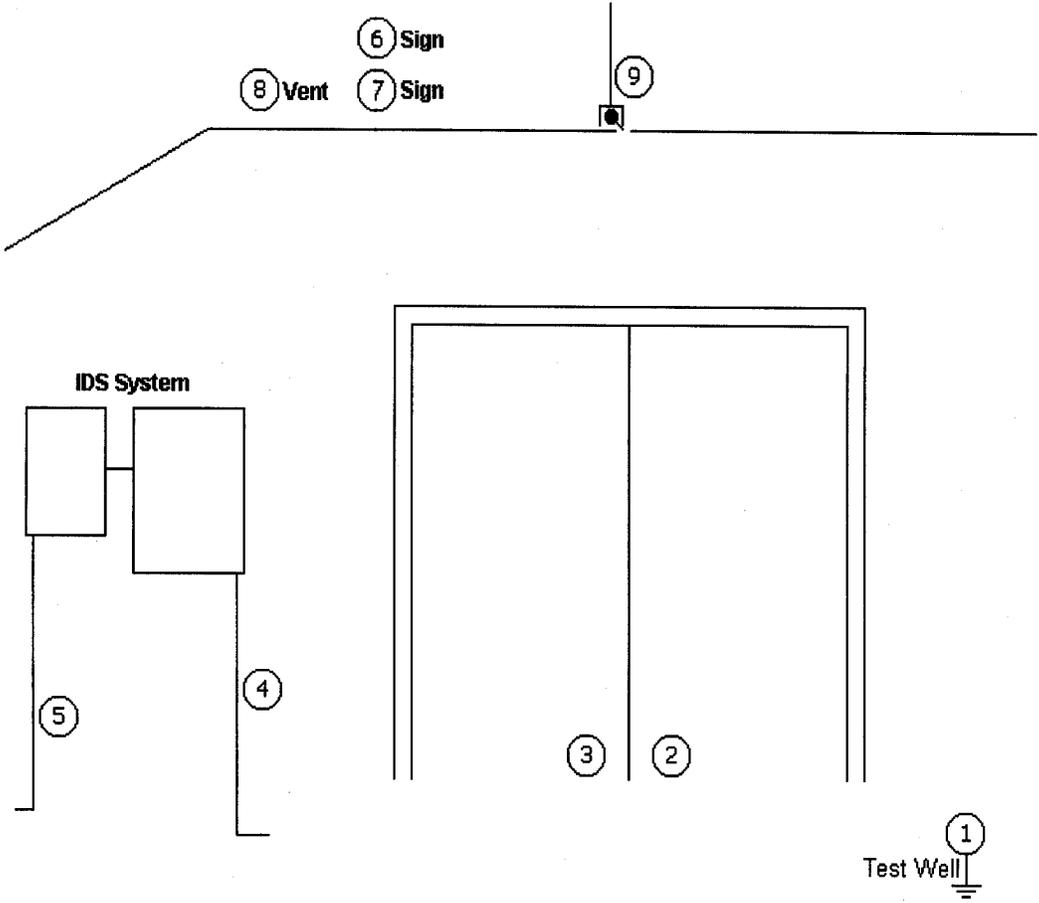
ENCLOSURE (8)

STANDARD EARTH COVERED MAGAZINE (1 DOOR)
GROUND POINTS



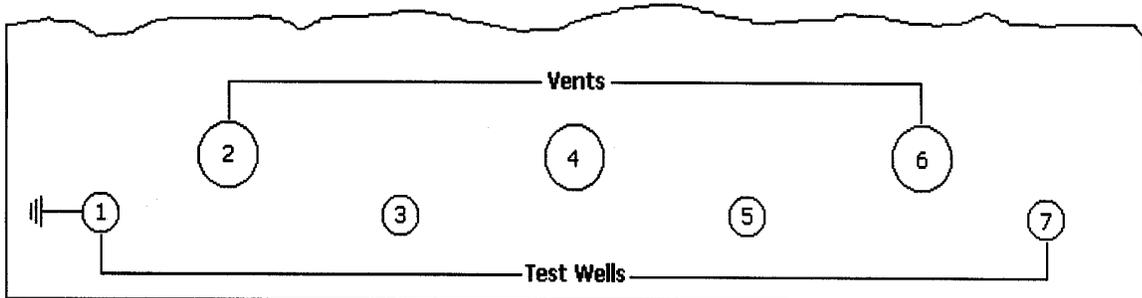
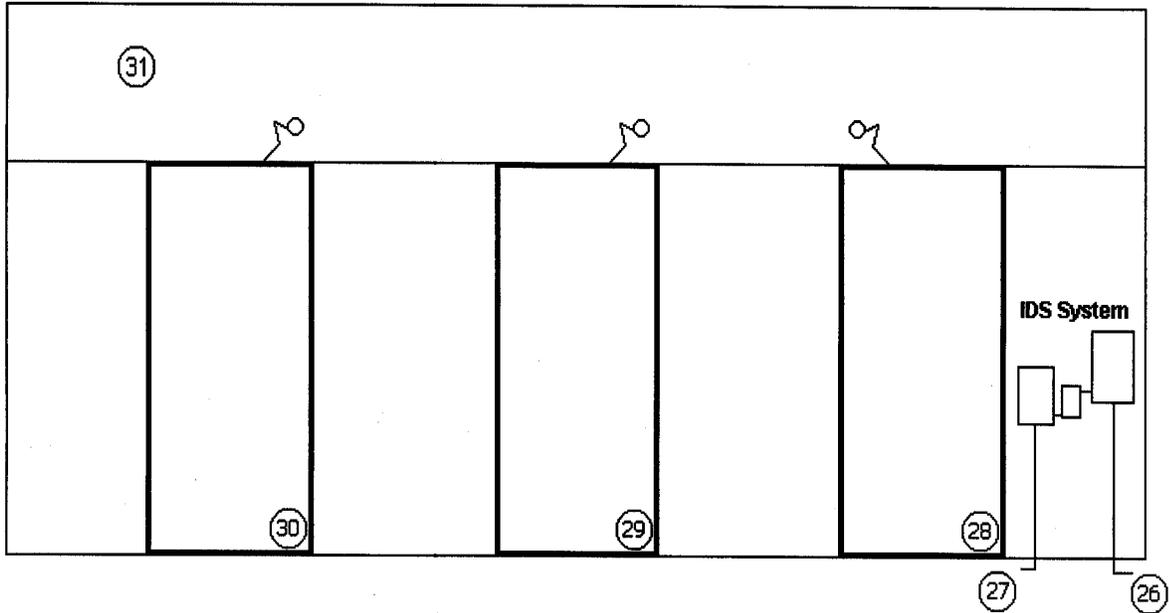
ENCLOSURE (9)

STANDARD EARTH COVERED MAGAZINE (2 DOOR)
GROUND POINTS



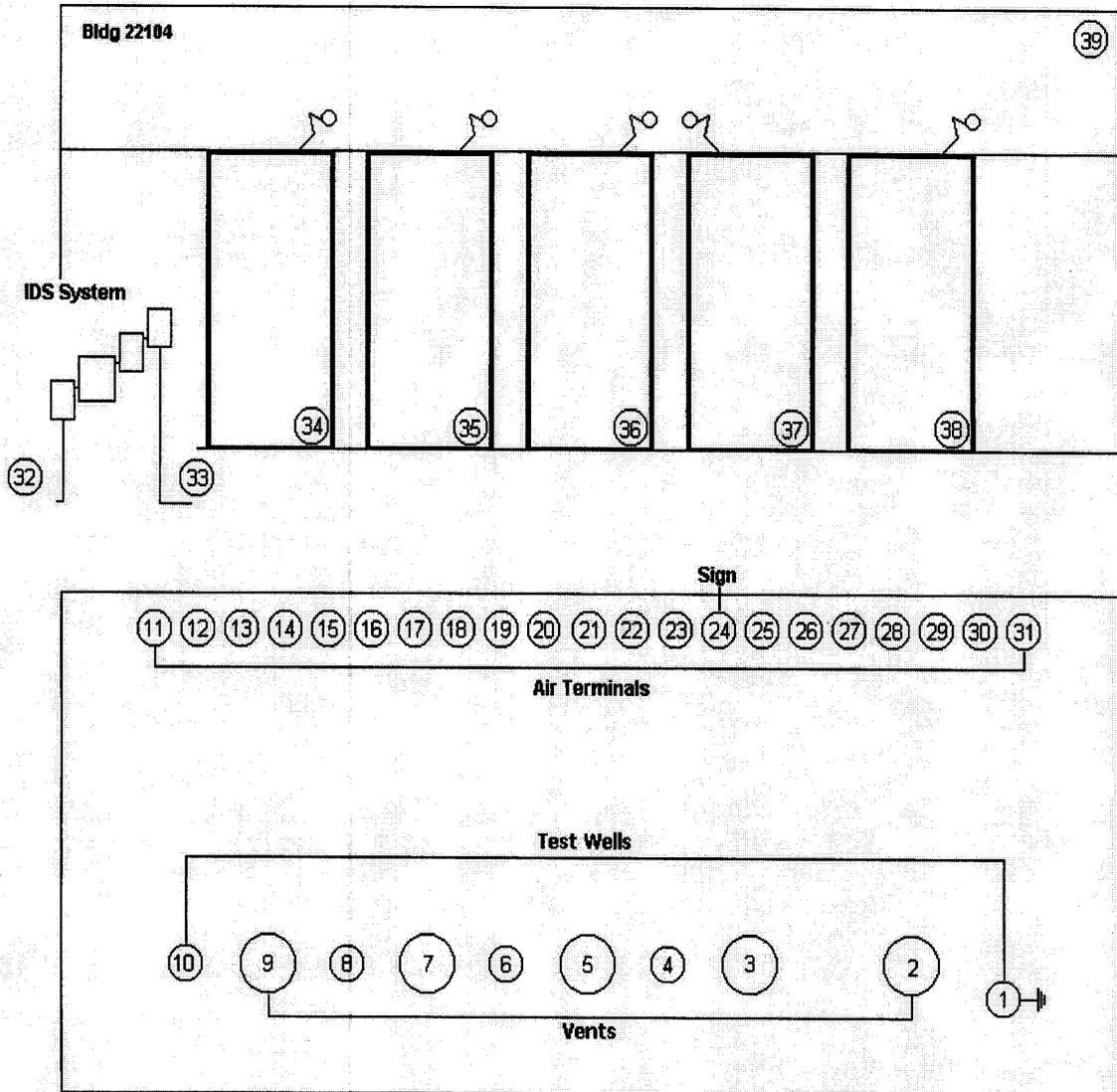
ENCLOSURE (10)

STANDARD EARTH COVERED MAGAZINE (3 DOOR)
GROUND POINTS

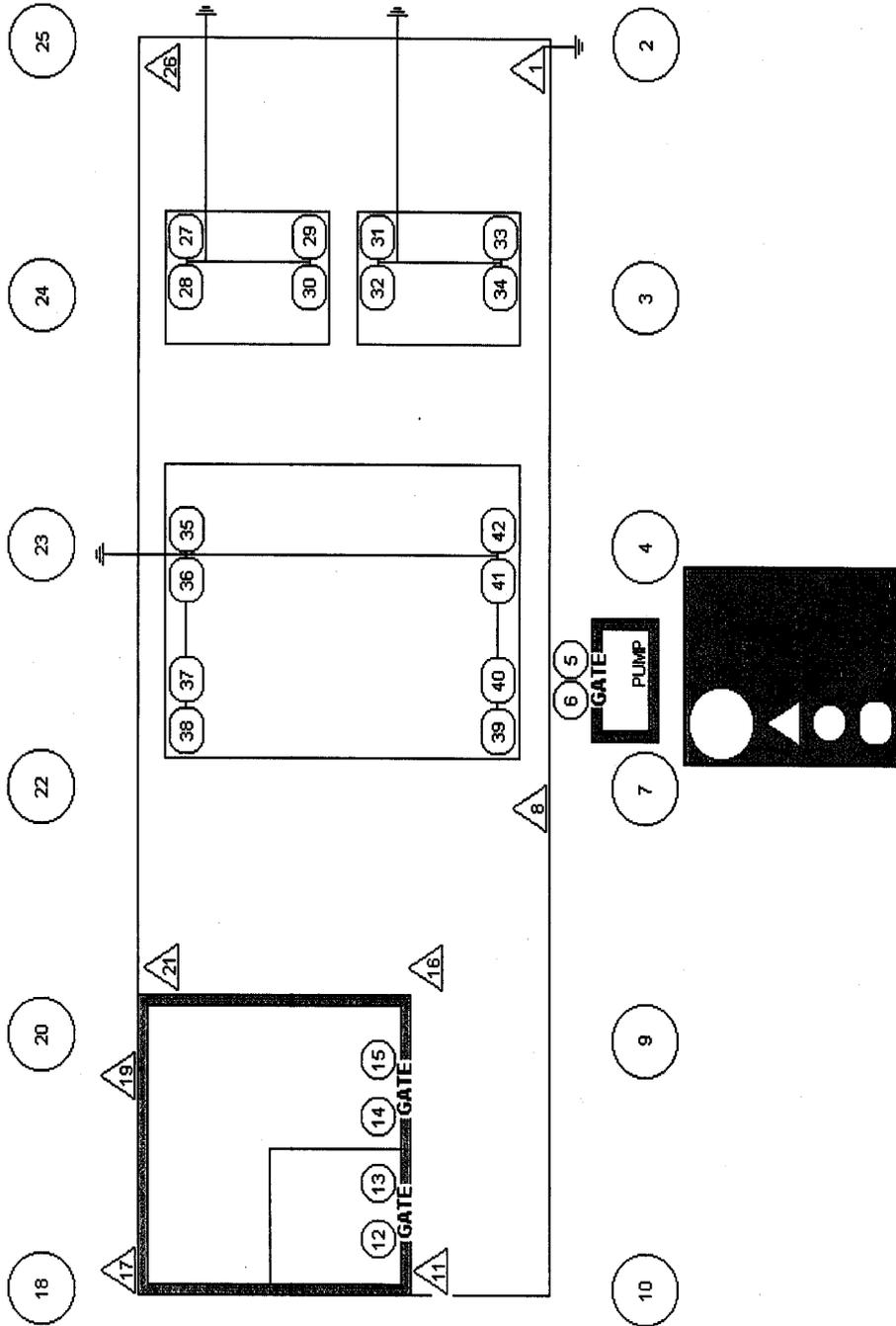


ENCLOSURE (11)

STANDARD EARTH COVERED MAGAZINE (5 DOOR)
GROUND POINTS

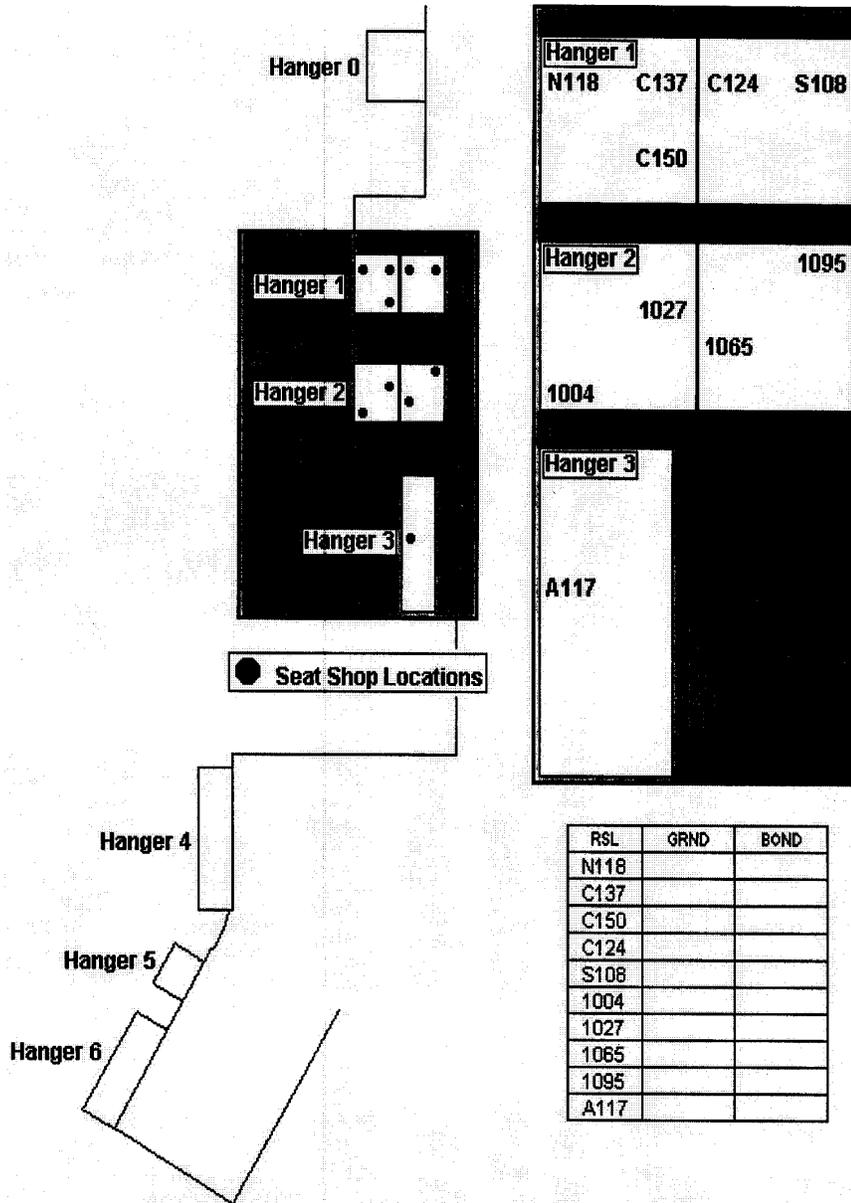


WEAPONS ASSEMBLY AREA GROUND POINTS



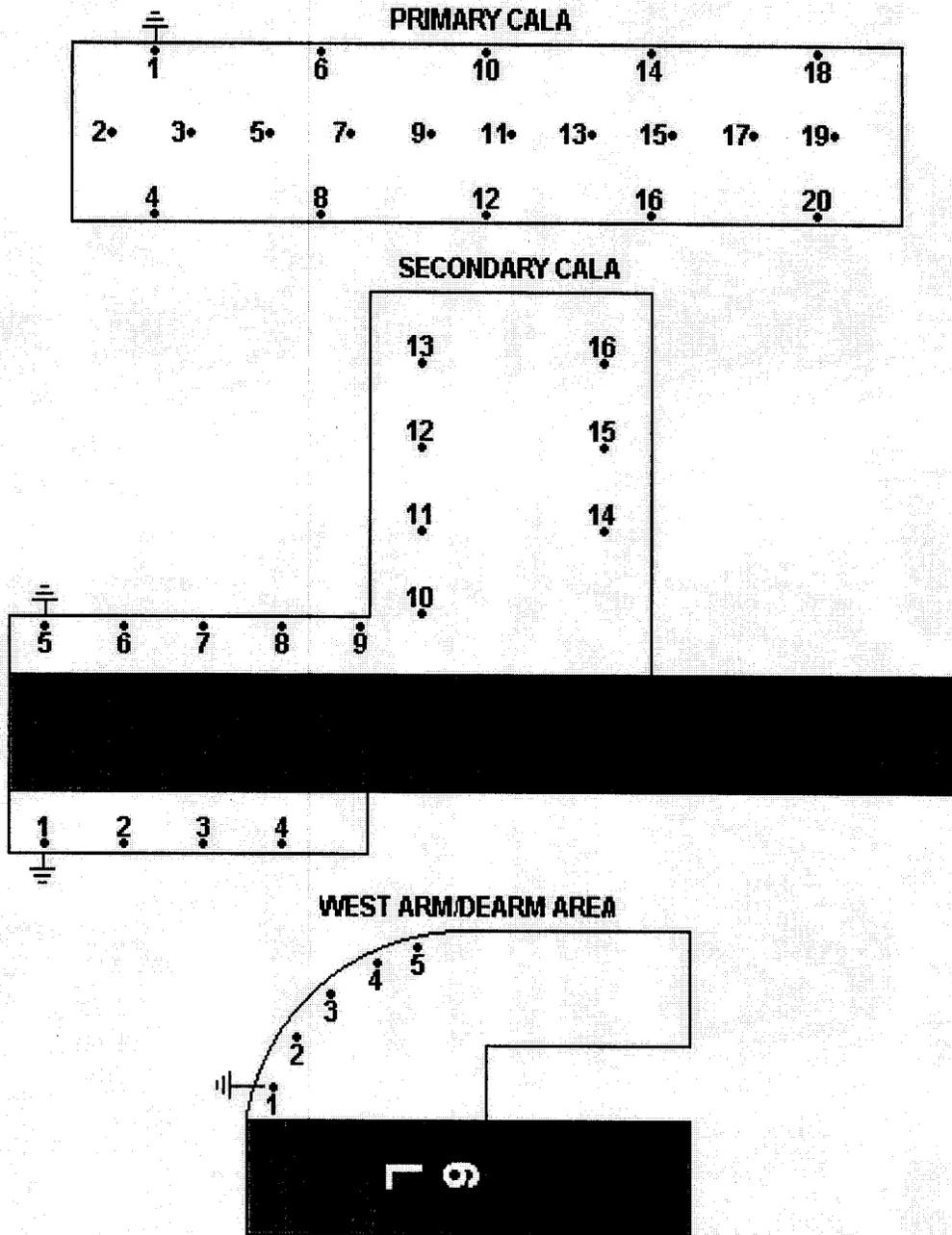
ENCLOSURE (13)

SEAT SHOP LOCATIONS AND GROUND POINTS



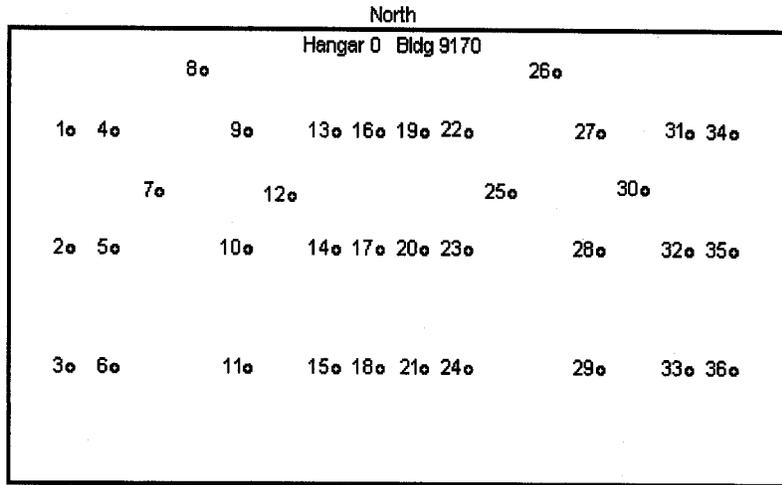
Inspector/Date	ESO Validation/Date
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CALA AND ARMING AREA GROUND POINTS



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HANGER 0 GROUND POINTS



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		10		19		28	
2		11		20		29	
3		12		21		30	
4		13		22		31	
5		14		23		32	
6		15		24		33	
7		16		25		34	
8		17		26		35	
9		18		27		36	

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

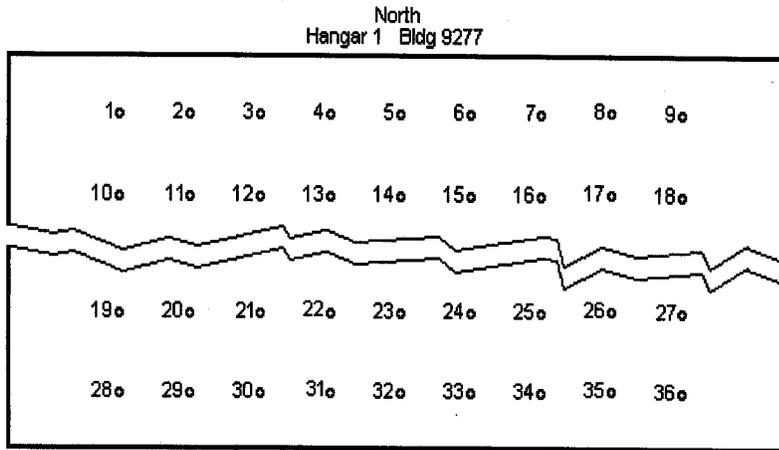
Condition _____

Inspector/Date	ESO Validation/Date
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ENCLOSURE (16)

30 MAY 2001

HANGER 1 GROUND POINTS



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		10		19		28	
2		11		20		29	
3		12		21		30	
4		13		22		31	
5		14		23		32	
6		15		24		33	
7		16		25		34	
8		17		26		35	
9		18		27		36	

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

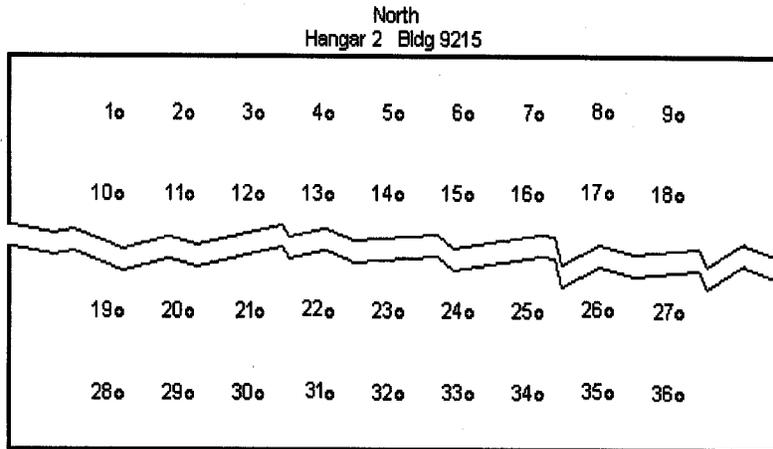
Condition _____

Inspector/Date	ESO Validation/Date
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ENCLOSURE (17)

30 MAY 2001

HANGER 2 GROUND POINTS



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		10		19		28	
2		11		20		29	
3		12		21		30	
4		13		22		31	
5		14		23		32	
6		15		24		33	
7		16		25		34	
8		17		26		35	
9		18		27		36	

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

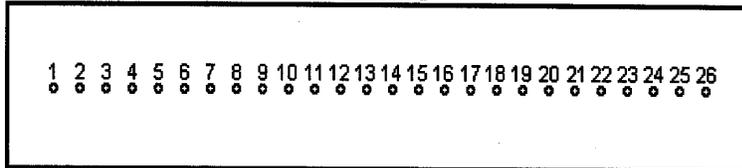
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HANGER 3 GROUND POINTS

North
 Hangar 3 Bldg 9500



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		8		15		22	
2		9		16		23	
3		10		17		24	
4		11		18		25	
5		12		19		26	
6		13		20			
7		14		21			

● Ground Rod

⊕ Padeye

≡ Reference Point

Condition _____

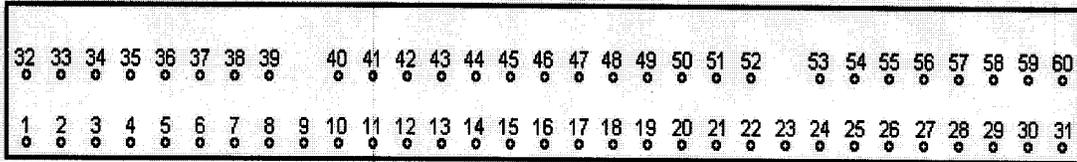
Inspector/Date	ESO Validation/Date
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ENCLOSURE (19)

30 MAY 2001

HANGER 4 GROUND POINTS

North
Hangar 4 Bldg 9470



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		16		31		46	
2		17		32		47	
3		18		33		48	
4		19		34		49	
5		20		35		50	
6		21		36		51	
7		22		37		52	
8		23		38		53	
9		24		39		54	
10		25		40		55	
11		26		41		56	
12		27		42		57	
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14		29		44		59	
15		30		45		60	

● Ground Rod

⊕ Padeye

≡ Reference Point

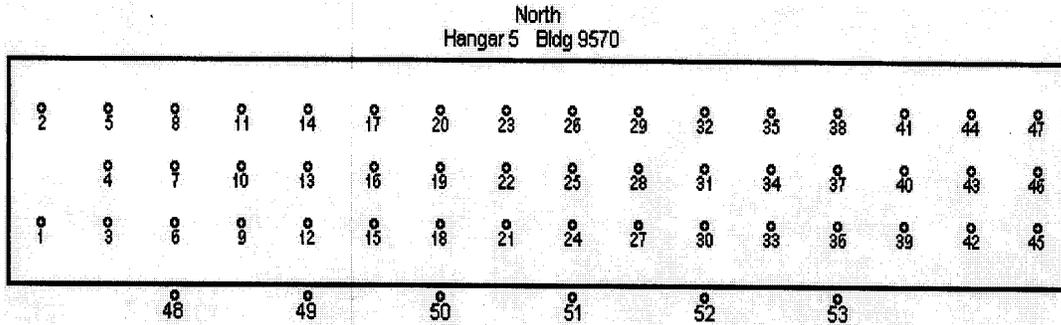
Condition _____

Inspector/Date	ESO Validation/Date
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ENCLOSURE (20)

30 MAY 2001

HANGER 5 GROUND POINTS



Point	Reading	Point	Reading	Point	Reading	Point	Reading
1		15		29		43	
2		16		30		44	
3		17		31		45	
4		18		32		46	
5		19		33		47	
6		20		34		48	
7		21		35		49	
8		22		36		50	
9		23		37		51	
10		24		38		52	
11		25		39		53	
12		26		40			
13		27		41			
14		28		42			

● Ground Rod

⊕ Padeye

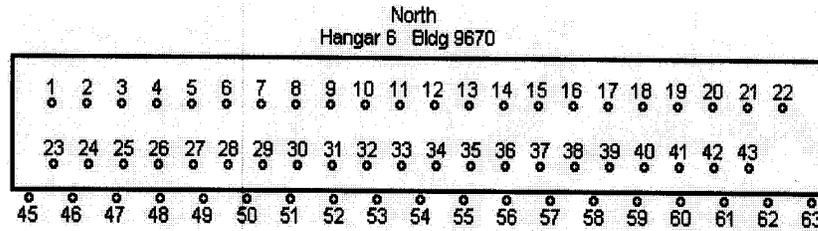
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Condition _____

Inspector/Date	ESO Validation/Date
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ENCLOSURE (21)

HANGER 6 GROUND POINTS



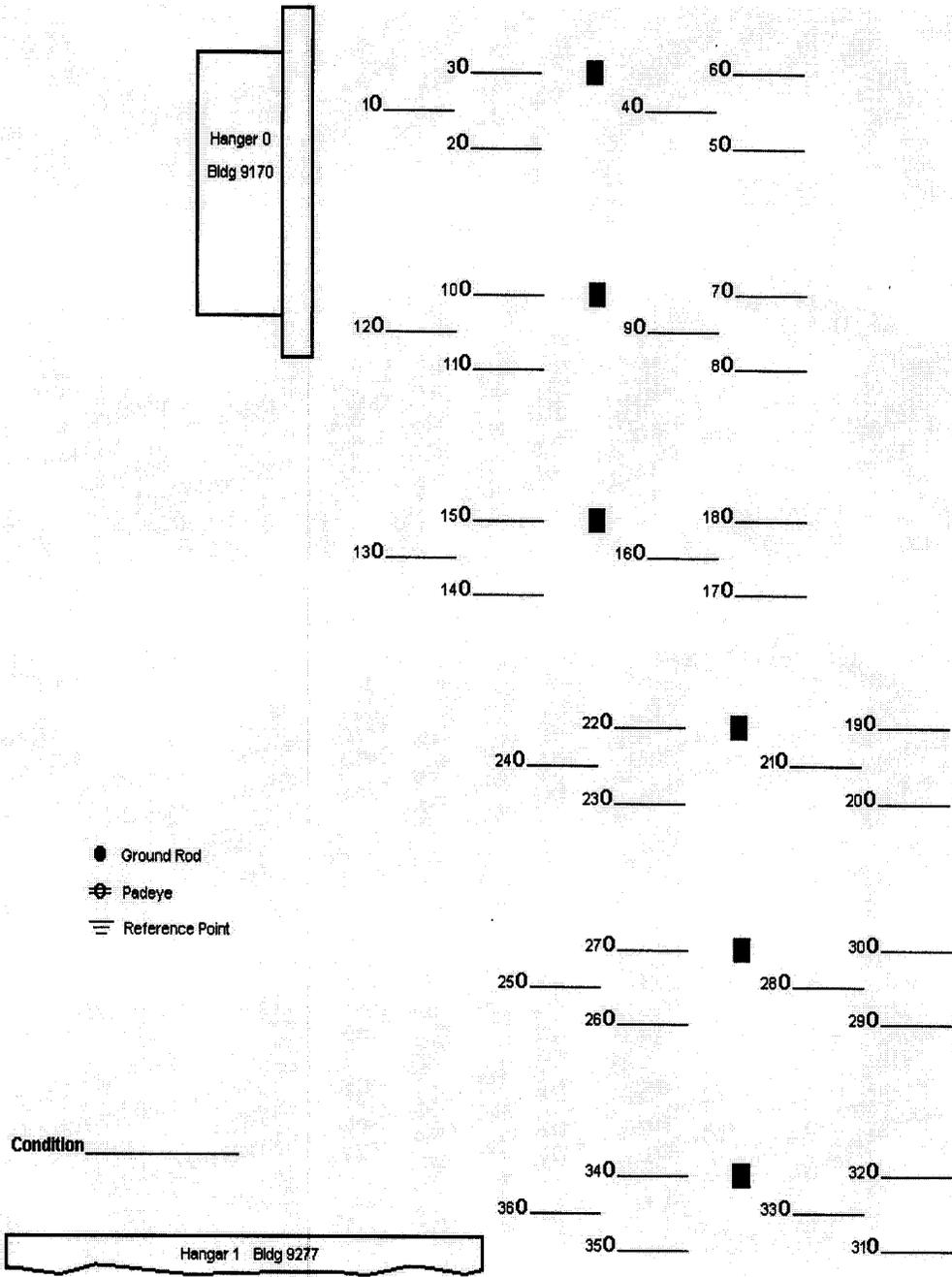
Point	Reading	Point	Reading	Point	Reading	Point	Reading
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2		18		34		50	
3		19		35		51	
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5		21		37		53	
6		22		38		54	
7		23		39		55	
8		24		40		56	
9		25		41		57	
10		26		42		58	
11		27		43		59	
12		28		44		60	
13		29		45		61	
14		30		46		62	
15		31		47		63	
16		32		48			

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

Condition _____

Inspector/Date	ESO Validation/Date
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HANGER 0 PARKING APRON GROUND POINTS



Condition _____

Inspector/Date	ESO Validation/Date
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HANGER 1 PARKING APRON GROUND POINTS

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

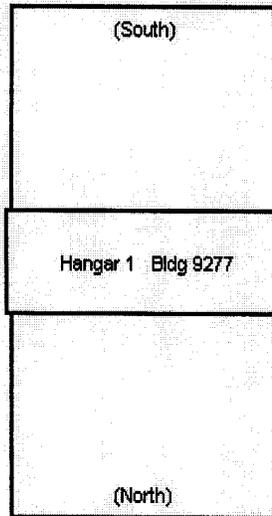
Condition _____

8	0	_____	_____	0	9
7	0	_____	_____	0	10
6	0	_____	_____	0	11
5	0	_____	_____	0	12
4	0	_____	_____	0	13
3	0	_____	_____	0	14
2	0	_____	_____	0	15
1	0	_____	_____	0	16

24	0	_____	_____	0	9
23	0	_____	_____	0	10
22	0	_____	_____	0	11
21	0	_____	_____	0	12
20	0	_____	_____	0	13
19	0	_____	_____	0	14
18	0	_____	_____	0	15
17	0	_____	_____	0	16

34	0	_____	_____	0	35
33	0	_____	_____	0	36
32	0	_____	_____	0	37
31	0	_____	_____	0	38
30	0	_____	_____	0	39
29	0	_____	_____	0	40
28	0	_____	_____	0	41
27	0	_____	_____	0	42
26	0	_____	_____	0	43
25	0	_____	_____	0	44

45	0	_____	_____	0	92
46	0	_____	_____	0	91
47	0	_____	_____	0	90
48	0	_____	_____	0	89
49	0	_____	_____	0	88
50	0	_____	_____	0	87
51	0	_____	_____	0	86
52	0	_____	_____	0	85
53	0	_____	_____	0	84
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56	0	_____	_____	0	81
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58	0	_____	_____	0	79
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67	0	_____	_____	0	70
68	0	_____	_____	0	69

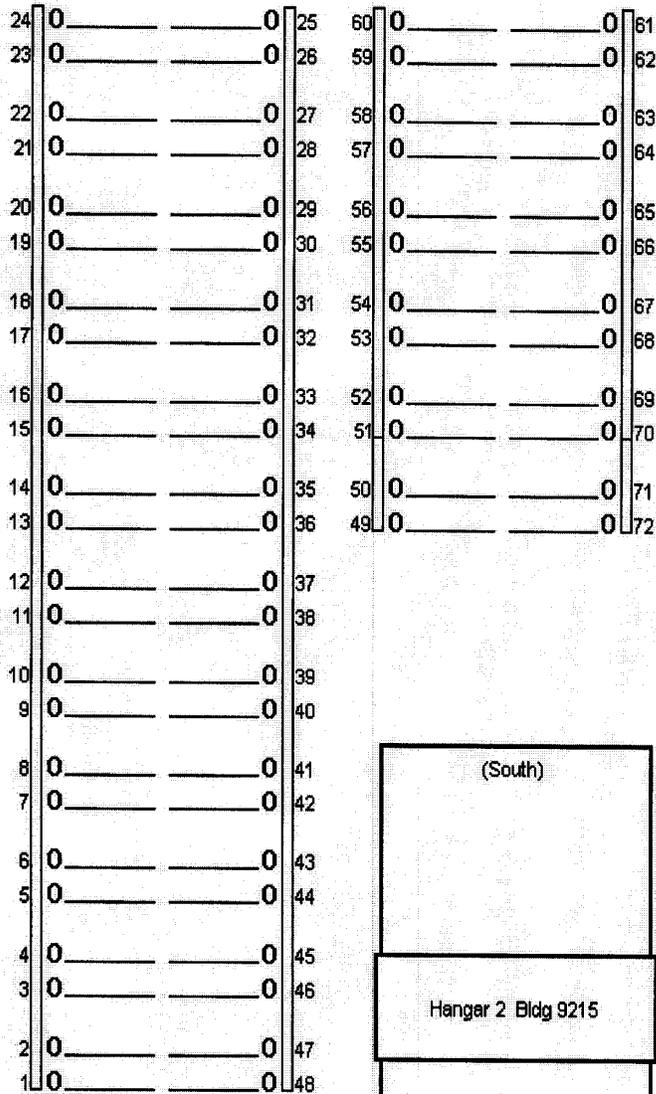


Boyington Road

Inspector/Date	ESO Validation/Date
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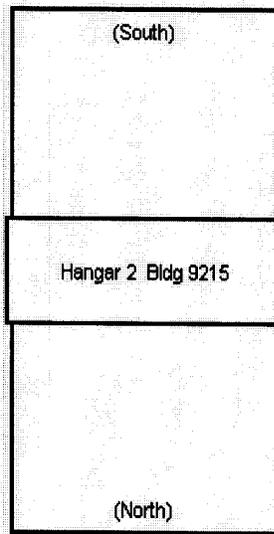
30 MAY 2001

HANGER 2 PARKING APRON GROUND POINTS



- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

Condition _____



Boyington Road

Inspector/Date	ESO Validation/Date

ENCLOSURE (25)

HANGER 3 PARKING APRON GROUND POINTS

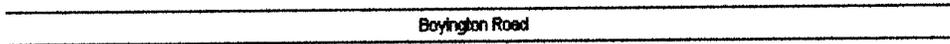
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0 10 19 0	0 42 51 0	0 74 83 0
0 9 20 0	0 41 52 0	0 73 84 0
0 8 21 0	0 40 53 0	0 72 85 0
0 7 22 0	0 39 54 0	0 71 86 0
0 6 23 0	0 38 55 0	0 70 87 0
0 5 24 0	0 37 56 0	0 69 88 0
0 4 25 0	0 36 57 0	0 68 89 0
0 3 26 0	0 35 58 0	0 67 90 0
0 2 27 0	0 34 59 0	0 66 91 0
0 1 28 0	0 33 60 0	0 65 92 0
29 0	0 32 61 0	0 64
30 0	0 31 62 0	0 63

● Ground Rod

⊕ Padeye

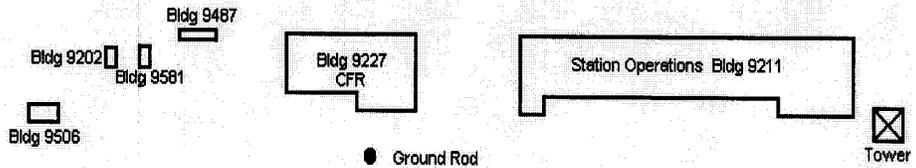
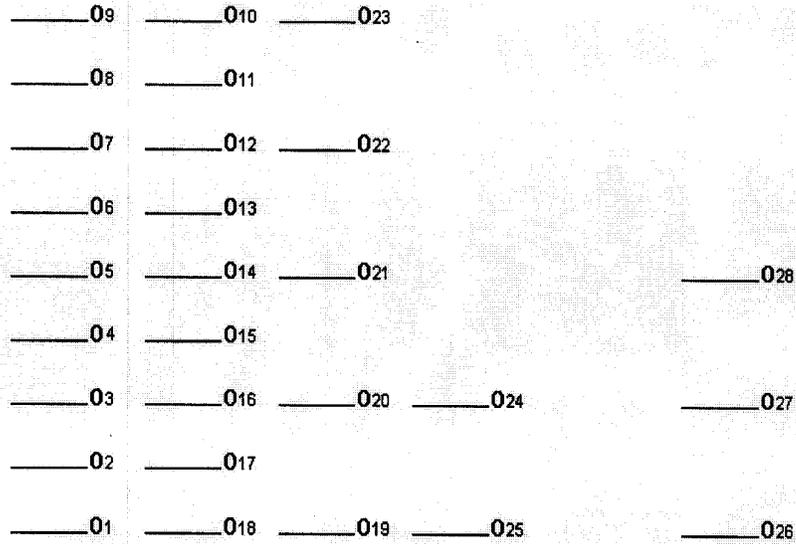
≡ Reference Point

Condition _____



Inspector/Date	ESO Validation/Date
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VAL LINE PARKING APRON GROUND POINTS



Hanger 3 Bldg 9500

Condition _____

Inspector/Date	ESO Validation/Date
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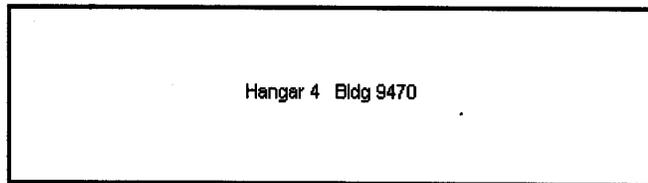
HANGER 4 PARKING APRON GROUND POINTS



_____07	_____08	_____021
_____06	_____09	_____020
_____05	_____010	_____019
_____04	_____011	_____018
_____03	_____012	_____017
_____02	_____013	_____016
_____01	_____014	_____015

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

Condition _____



_____ Pless Avenue _____

Inspector/Date	ESO Validation/Date
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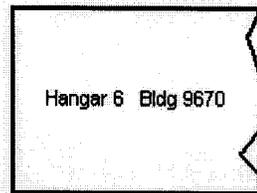
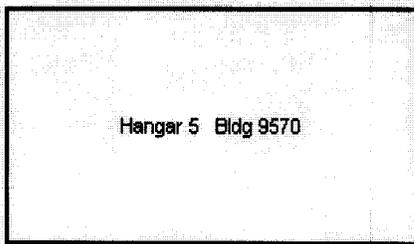
ENCLOSURE (28)

HANGER 5 PARKING APRON GROUND POINTS

7 _____0	8 _____0	21 _____0
6 _____0	9 _____0	20 _____0
5 _____0	10 _____0	19 _____0
4 _____0	11 _____0	18 _____0
3 _____0	12 _____0	17 _____0
2 _____0	13 _____0	16 _____0
1 _____0 CH-53	14 _____0 CH-53	15 _____0 CH-53

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

Condition _____



_____ Pless Avenue _____

Inspector/Date	ESO Validation/Date
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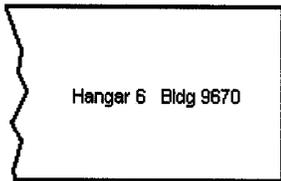
30 MAY 2001

HANGER 6 PARKING APRON GROUND POINTS

____011	____012	____033	____034
____010	____013	____032	____035
____009	____014	____031	____036
____008	____015	____030	____037
____007	____016	____029	____038
____006	____017	____028	____039
____005	____018	____027	____040
____004	____019	____026	____041 AHUH-1
____003	____020	____025	
____002	____021	____024	
____001 CH-46	____022 CH-46	____023 CH-46	

- Ground Rod
- ⊕ Padeye
- ≡ Reference Point

Condition _____



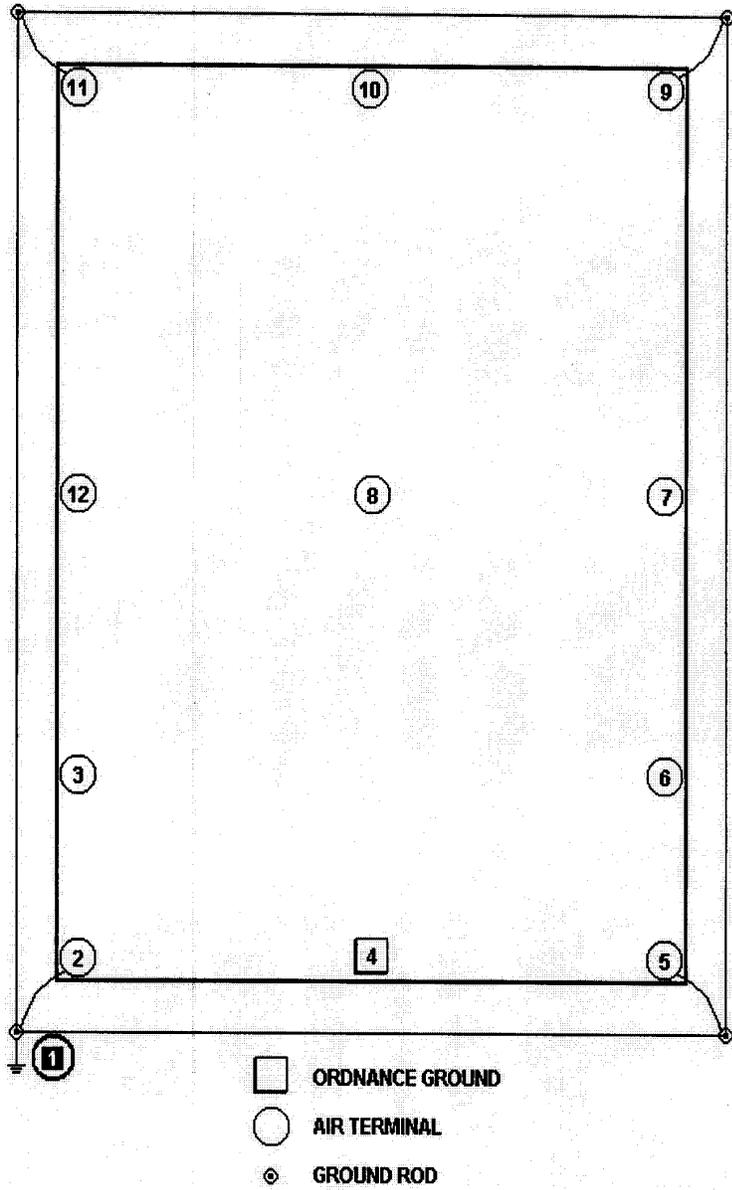
_____ Pless Avenue _____

Inspector/Date	ESO Validation/Date
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ENCLOSURE (30)

30 MAY 2001

EOD INERTING FACILITY



Inspector/Date	ESO Validation/Date
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ENCLOSURE (31)

EAST MIRAMAR GATES

Gate ID	Bonding: Gate to			Resistance		Remarks (wet/dry)
	L Grnd	R Grnd	Gate	L Grnd	R Grnd	
AREA 1 East Gate						
AREA 1 West Gate						
22103 North Gate						
22103 South Gate						
22103 Sign (North)						
22103 Sign (South)						
AREA 2 West Gate						
AREA 2 East Gate						
22106 West Gate						
22106 East Gate						
Area 3 Gate						

1. Earth resistance measurements of gate post ground rods shall be less than 25 ohms.

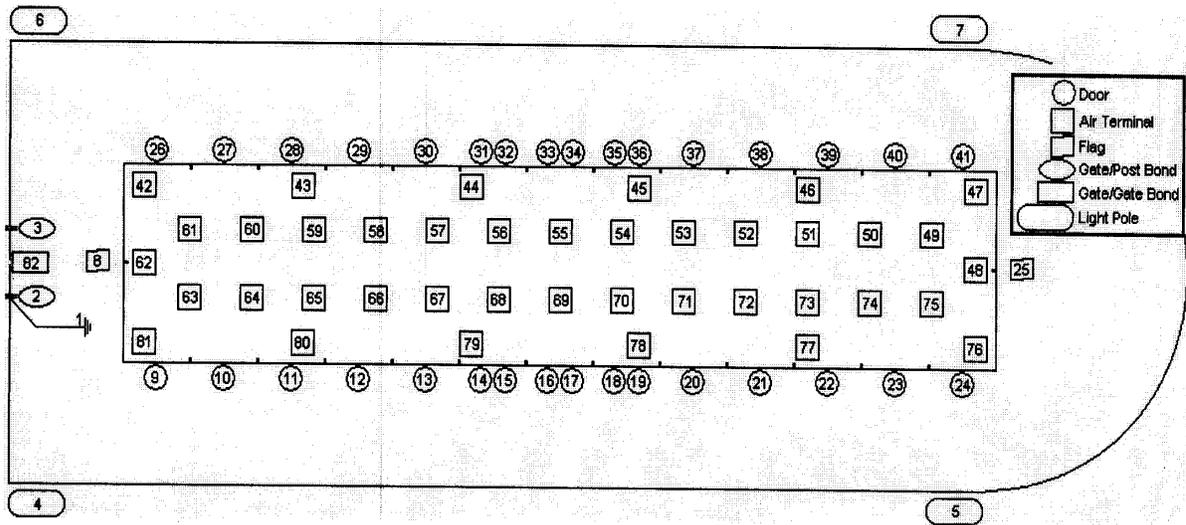
2. Bonding test shall be made from: (1) the inner vertical support structure of the gate (the side opposite of the hinges) to its respective gate post ground, (2) gate post to gate post. Bonding measurements shall be less than 1 ohm.

NOTE: Left/Right orientation is from outside looking into the area or facility.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (32)

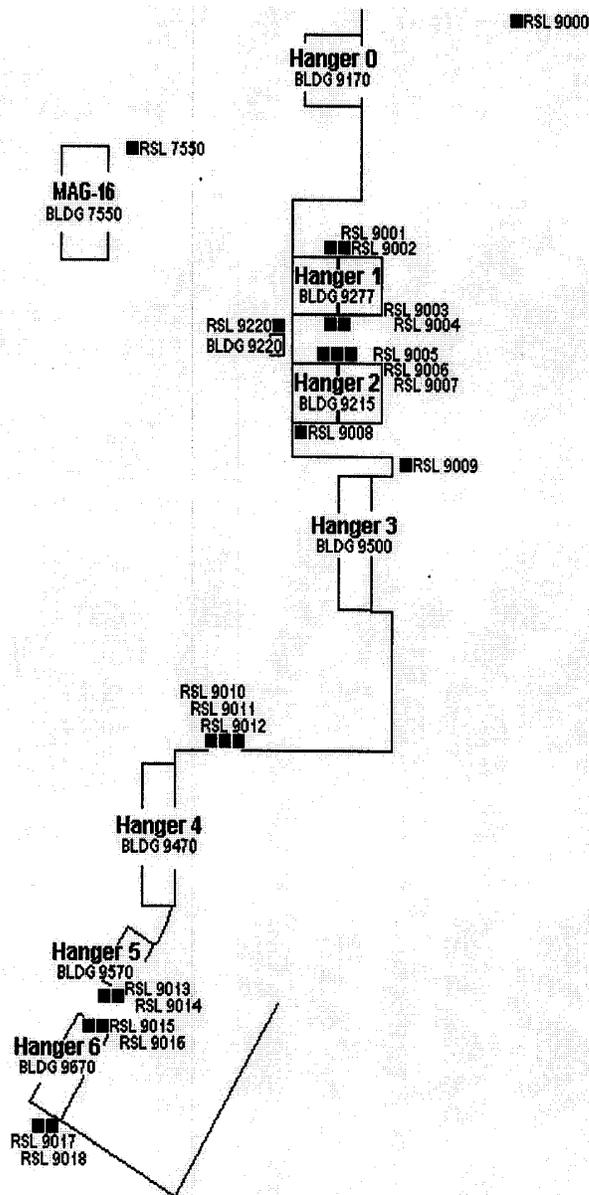
WEST MIRAMAR READY SERVICE MAGAZINE (BLDG 9605)



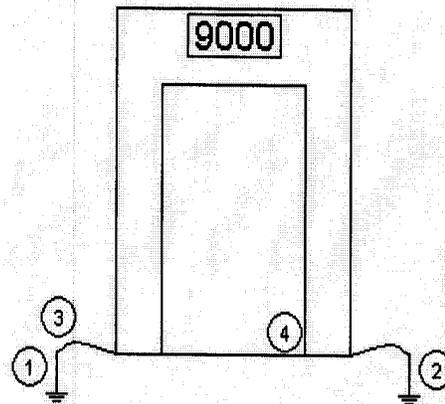
Test Point	Reading	Test Point	Reading	Test Point	Reading	Test Point	Reading
1		22		43		64	
2		23		44		65	
3		24		45		66	
4		25		46		67	
5		26		47		68	
6		27		48		69	
7		28		49		70	
8		29		50		71	
9		30		51		72	
10		31		52		73	
11		32		53		74	
12		33		54		75	
13		34		55		76	
14		35		56		77	
15		36		57		78	
16		37		58		79	
17		38		59		80	
18		39		60		81	
19		40		61		82	
20		41		62			
21		42		63			
Inspector/Date				ESO Validation/Date			

ENCLOSURE (33)

RSL LOCATIONS



RSL GROUP 01 GROUND POINTS

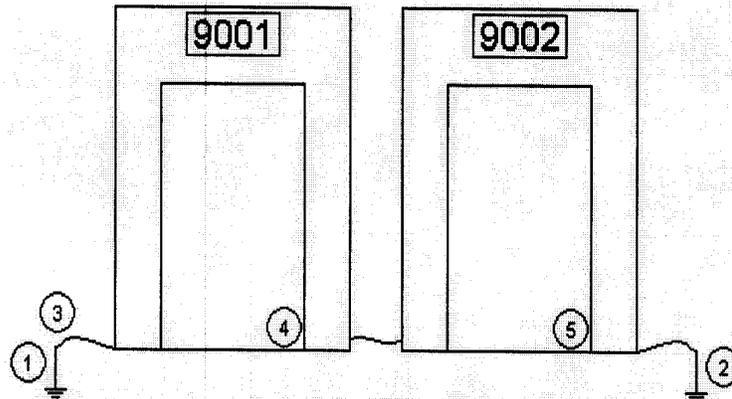


Test Point	Test Value
1	
2	
3	
4	

- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.

Inspector/Date	ESO Validation/Date
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RSL GROUP 02 GROUND POINTS

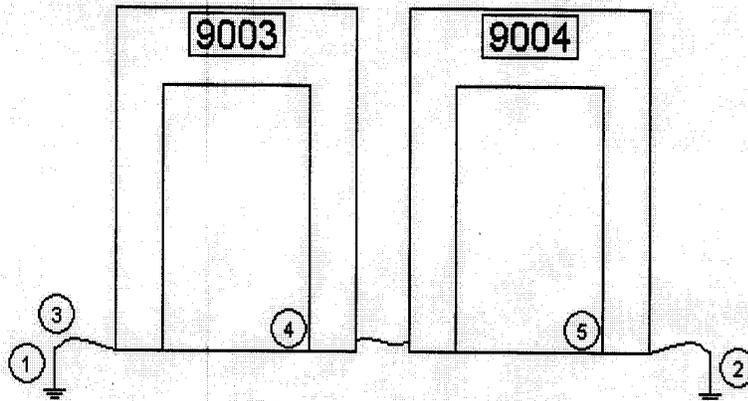


Test Point	Test Value
1	
2	
3	
4	
5	

- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.

Inspector/Date	ESO Validation/Date
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RSL GROUP 03 GROUND POINTS

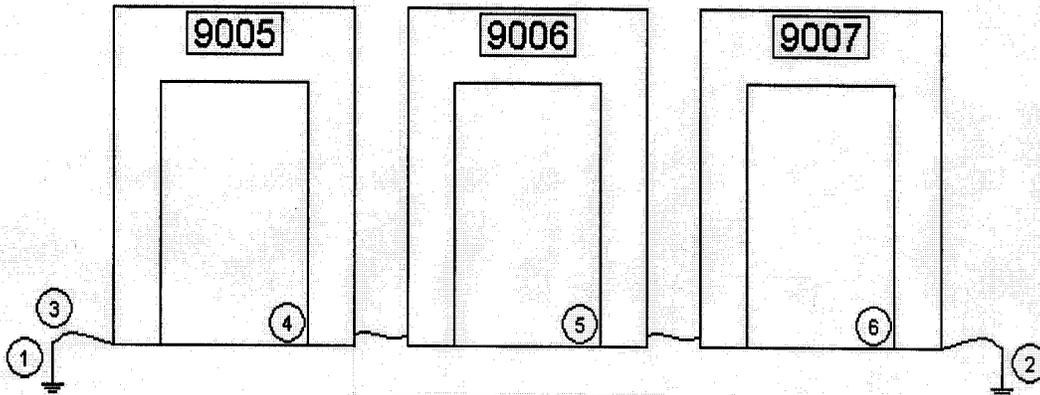


Test Point	Test Value
1	
2	
3	
4	
5	

- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.

Inspector/Date	ESO Validation/Date
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RSL GROUP 04 GROUND POINTS



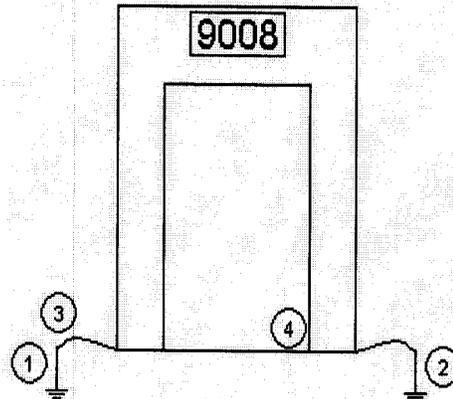
Test Point	Test Value
1	
2	
3	
4	
5	

- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.
- Perform bonding test between points 2 and 6.

Inspector/Date	ESO Validation/Date
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RSL GROUP 05 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	

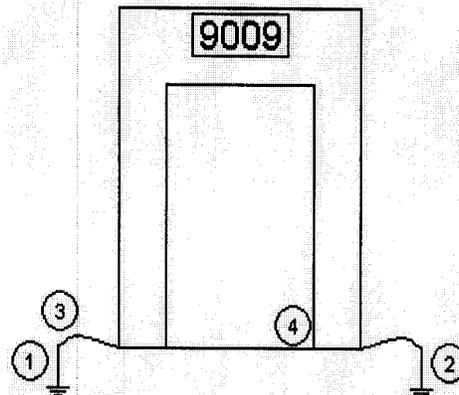
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (39)

30 MAY 2001

RSL GROUP 06 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	

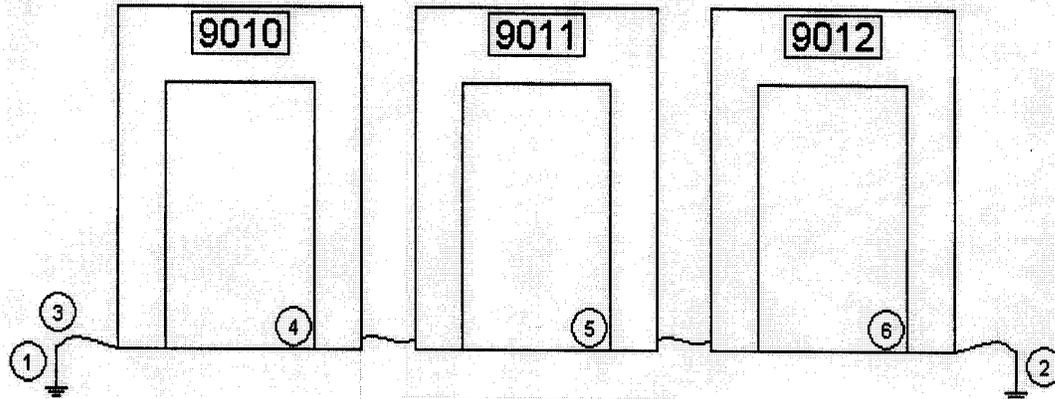
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (40)

30 MAY 2001

RSL GROUP 07 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	
5	

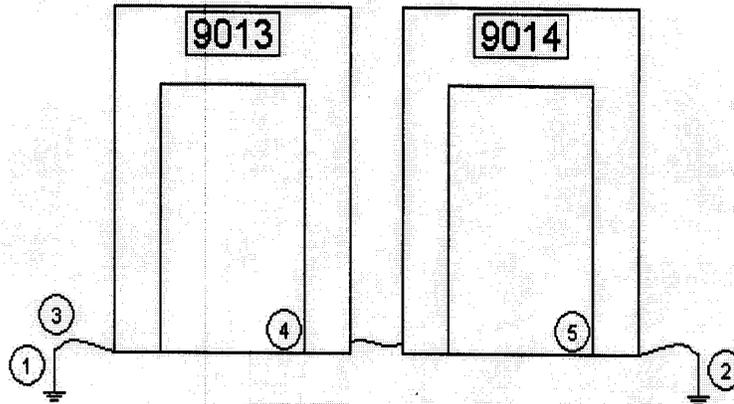
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.
- Perform bonding test between points 2 and 6.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (41)

30 MAY 2001

RSL GROUP 08 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	
5	

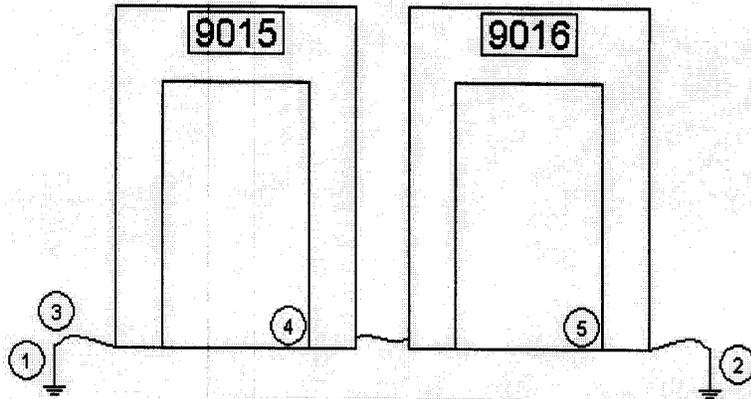
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (42)

30 MAY 2001

RSL GROUP 09 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	
5	

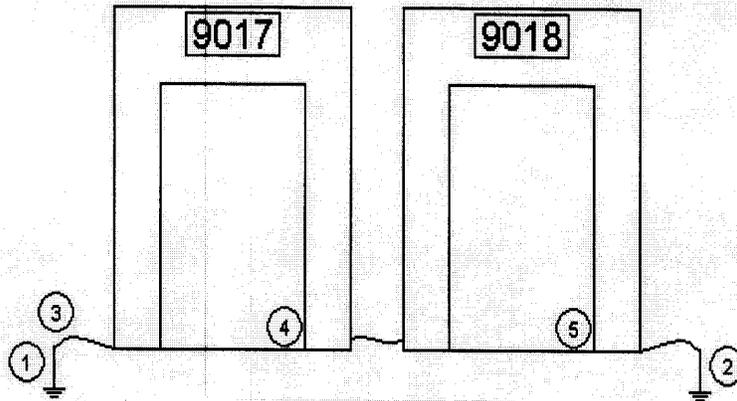
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (43)

30 MAY 2001

RSL GROUP 10 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	
5	

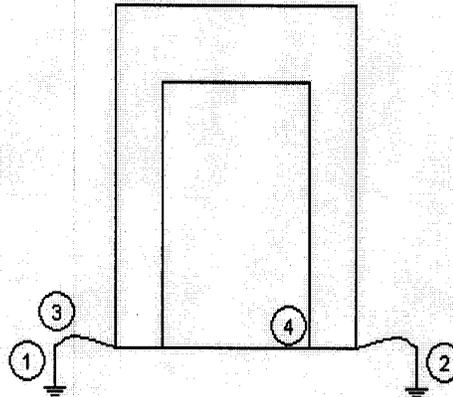
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.
- Perform bonding test between points 2 and 5.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (44)

30 MAY 2001

RSL 9220 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	

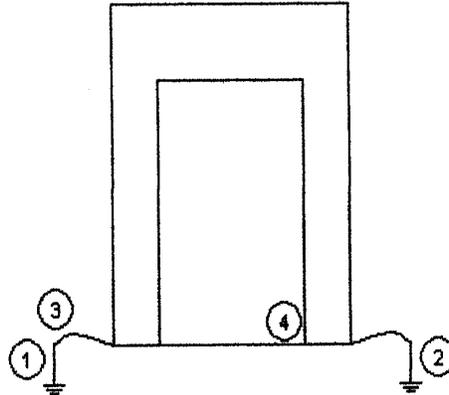
- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (45)

30 MAY 2001

RSL 7550 01 GROUND POINTS



Test Point	Test Value
1	
2	
3	
4	

- Perform earth resistance test at point 1.
- Perform earth resistance test at point 2.
- Perform bonding test between points 2 and 3.
- Perform bonding test between points 2 and 4.

Inspector/Date	ESO Validation/Date
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ENCLOSURE (46)

