Fermilab	ESH Section Procedures	
Procedure Number/Name ESH-RPE-INTLK-2116 – MTA Electrical Safety System Test Procedure		**Revision Number:** 4
Written by: Glenn Federwitz		**Revision Date:** 7/16/2020

MTA Electrical Safety System Test Procedure

REVIEWED BY: _____ DATE 9/3/2020
ESH Section Assigned Radiation Safety Officer

REVIEWED BY: _____ DATE 9/4/2020
ESH Section Interlock Engineer

APPROVED BY: _____ DATE 9/4/2020
ESH Section Radiation Physics Engineering Department Head

Revision History

Revision Number	Author	Description of Change	Revision Date
3	J. Federwitz	Reformatted (now ESH&Q procedure)	10/3/2017
3	G. Federwitz	Cleaned up some formatting.	10/3/2017
4	G. Federwitz	Removed Q from ESH&Q, Changed any indications of MuCool to MTA	7/16/2020

Table of Contents

1.0 Purpose and Scope

The purpose of this procedure is to thoroughly test the MTA Enclosure Electrical Safety System.

2.0 System Testing Approach

The majority of the system will be tested using an event / response relationship. This will be accomplished by causing a system violation and verifying that the system reacts correctly.

3.0 Marking Procedure

The Test Director shall document the results of safety system testing with the following colors:

a. Red for system malfunction or failure;

b. Blue for correct operation; or

c. Green for editorial comments or changes in the procedure.

The Test Director shall document the results of safety system tests in the test record and ensure all test team members and test escorts sign the test record.

The test record is written with the response yes or no for each item tested. The test director shall circle the yes response for correct system operation or the no response for system malfunction or failure.

4.0 Modifications of Safety System Interlock Procedures

In the event of non-standard situations, the test director may deviate from the approved test procedure if the intent of the procedure is being followed. The test director shall document the deviation on the test procedure as stated above.

5.0 Reporting Non-conformance during use of Safety System Interlock Test Procedures

Tested items that fail during testing or which are found in an inoperable condition during the test will be replaced or repaired, documented, and fully retested prior to acceptance of the system.

MTA ESS

Date Tested_____

Test Director

_____ Date _____

Test Team

_____ Date _____

_____ Date _____

_____ Date _____

_____ Date _____

Accepted by:

_____

ESH Section Radiation Physics Engineering Department Head Date

6.0 Electrical Safety System

6.1 Section 1 preparation procedures

This section requires no preparation procedures for test team personnel safety.

6.2 MTA Key Tree Test

Purpose

The following test is to ensure that each of the MTA keys located in the Main Control Room will drop the Key Tree "A" and "B" input circuits in the MTA ESS.

Procedure

Turn each of the MTA keys to the off position and document that they drop the Key Tree "A" and "B" signals of the MTA ESS.

MTA Keys

Module	MTA ESS			
Key #	KT A		KT B	
1	Yes	No	Yes	No
2	Yes	No	Yes	No
3	Yes	No	Yes	No
4	Yes	No	Yes	No
5	Yes	No	Yes	No
6	Yes	No	Yes	No
7	Yes	No	Yes	No
8	Yes	No	Yes	No
9	Yes	No	Yes	No
10	Yes	No	Yes	No
11	Yes	No	Yes	No
SS1	Yes	No	Yes	No

6.3 ESS Control Module Input Test

Purpose

This test is to ensure that the interlocks listed in the Control Module Input Table drop the appropriate input circuits. The safety system has been designed to force the search and secure team to secure the interlocks in a pre-defined sequence. During testing of the system, it is necessary to bypass the sequence to properly test the system. The following outlines the procedures to follow in performing this process.
In addition, we wish to test that the ground fault circuits drop the A input circuit.

Door Interlock Test Procedure

1. Clean each interlock box and make sure the lamps in the interlock box are working properly.
2. Install the testing jumper in the Interlock box.
3. While the remote test team opens the door of a specific interlock, the Test Director monitors the ESS Control Module status bits and notes that the appropriate A and B circuits are interrupted. The Test Director should make sure only the A circuit makes up after the door is closed and before the interlock is reset.
4. Remove jumper and proceed to the next interlock to be tested.

Ground Fault Circuit Test Procedure

1. Testing of the ground fault circuits is accomplished by connecting a 680 ohm resistance to ground from the positive and negative side of the H.L. and L.L. power supply, and insuring that the A circuit is interrupted.

Flashing sign Test Procedure

1. While the enclosure is secure verify the sign is working properly.

MTA ESS Control Module Input Tests

Module	**MTA ESS**		**Flashing Sign**
Interlock No.	**A Circuit**	**B Circuit**	**Status**
Ground Fault +	Yes No		
Ground Fault -	Yes No		
Interlock 1			
Interlock 2	Yes No	Yes No	Yes No
Interlock 3	Yes No	Yes No	Yes No

6.4 Siren Test

Purpose
To ensure the speakers' volume, clarity, and physical structure is in working condition.

Test Procedure

1. Actuate the speakers while someone in the tunnel checks their operation.

Speaker Loc.	Speaker Status
MTA Enclosure	Yes No

6.5 ESS Control Module Output Circuit Test.

Purpose
The above tests checked the input circuits for the ESS Control Module. This test is to check that each of the input circuits interrupts the control module output circuit.

Procedure

At the ESS Control Module in the MTA Junction Box, interrupt each of the input circuits by pressing the appropriate test switch. Confirm the appropriate output circuit of the ESS and input circuit of the below listed logic module and critical device controller are interrupted.

Module	MTA ESS		MTA CDC	
Test Switch	A Permit	B Permit	A Permit	B Permit
A Circuit	Yes No	Yes No	Yes No	Yes No
B Circuit	Yes No	Yes No	Yes No	Yes No
KT A	Yes No	Yes No		
KT B	Yes No	Yes No		

6.6 Section 1 Conclusion

Purpose
The tests in this section are complete and the safety system needs to be returned to normal operating condition.

6.7 Test Jumper

Purpose

To ensure the testing jumper used to test the interlock boxes is returned and not left in the system.

Test jumper returned by: _____ Initial

6.8 Key Audit

Purpose

The keys listed in the table below are extra (spare) keys that are used solely to replace broken keys. These keys are locked up with a Pad 118 in the VIK (Very Important Key) cabinet located in the Safety Office.

Procedures

Obtain a Pad 118 key and open the VIK cabinet. Count the number of keys and document in the table below.

Key Number	Key Type	Key Quantity	Key Quantity	Key Use
PCHYP 32	Access	1		Access the MTA Enclosure
PE 15	Reset	5		Reset the MTA Reset Boxes
P Control	Control	3		Remove MTA Enclosure Cores