TEST REPORT

Project No.: *IN-60105*

Equipment Under Test: *Electrical Insulating Mat*

Model/Type	:	*Class 0*
S/N	:	--

Manufactured by: *BEHINEH TAVAZON*

Applicant: *BEHINEH TAVAZON*

Tested According to: *IEC 61111 Edition 2.0: 2009*

Issue Date: *01-Mar-2021*

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Prepared by: Test Engineer
M. Danesh Payam
on behalf of

Verified by: Technical Manager
B. Hamidifard

Approved by:

Approved by: CEO
S. M. Mirsadri

Engineering Deputy of Test and Inspection
Prof. B. Vahidi

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1. GENERAL INFORMATION

1.1 Product Information

Equipment Under Test	: Electrical Insulating Mat
Model/Type	: Class 0
Normative document	: IEC 61111 Edition 2.0 : 2009

1.2 Client Information

Applicant	: BEHINEH TAVAZON
Telephone	: -

1.3 Tests Performed

- Visual Inspection and Measurements
- Mechanical Tests
- Dielectric Tests
- Ageing test
- Thermal Tests
- Acid Resistance
- Oil Resistance
- Marking

1.4 Results of Tests

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2. PERFORMANCE and RESULTS of TESTS

2.1. Visual Inspection and Measurements:

2.1.1. Classification:

2.1.1.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.1.1.2. Procedure of test

The electrical insulating matting covered by this standard shall be designated as follows:

- by electrical class: as class 0, class 1, class 2, class 3 and class 4;
- by adding the suffix "C" to the class designation, in case of category C matting (resistance to extremely low temperature).

2.1.1.3. Acceptance conditions of test

Compliance with the requirements of sub clause 5.2.2 of IEC 61111 had checked by inspection.

2.1.1.4. Result of test

Test was done according to IEC 61111, sub clause 5.2.2 and it passed the test. The class is 0.

✓ **PASSED**

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2.1.2. Dimensions, workmanship and finish:

2.1.2.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.1.2.2. Procedure of test

Electrical insulating matting shall be free from harmful physical irregularities on both surfaces. Electrical insulating matting shall not have length and width less than 600 mm. Manufacturers shall provide matting length and width. These dimensions for each matting shall be within a tolerance of ± 2% of the stated dimensions.

2.1.2.3. Acceptance conditions of test

Compliance with the requirements of sub clause 5.2.4 of IEC 61111 had checked by inspection.

2.1.2.4. Result of test

Test was done according to IEC 61111, sub clause 5.2.4 and it passed the test.
Width = 101 Cm

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2.1.3. Thickness:

2.1.3.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.1.3.2. Procedure of test

Thickness measurements shall be made at five or more points approximately uniformly distributed over the total area of the electrical insulating matting. According to ASTM D3767, the pressure exerted by the presser foot of the measuring device shall be (22 ± 5) kPa for matting material having a hardness equal to or greater than 35 IRHD, and (10 ± 2) kPa for matting material having a hardness less than 35 IRHD.

2.1.3.3. Acceptance conditions of test

The test shall be considered as passed if the requirements of 4.3.3.2.1 of IEC 61111 are fulfilled.

2.1.3.4. Result of test

Test was done according to IEC 61111, sub clause 5.2.5 and it passed the test.
Result= 2 mm, 2.01 mm, 2 mm, 2mm, 2.01 mm

✓ **PASSED**

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2.2. Mechanical Tests:

2.2.1. Mechanical puncture resistance:

2.2.1.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.2.1.2. Procedure of test

The test was carried out according to clause 5.5.2 of IEC 61111:
This test shall be carried out on both sides of the matting. The needle shall be positioned perpendicularly above the test piece (clamped between the plates) and shall be driven into and through the specimen. The rate of traverse shall be 500 mm/min ± 50 mm/min. The force required to perform the puncture shall be measured.

2.2.1.3. Acceptance conditions of test

The test shall be considered as passed if the puncture resistance is greater than 70 N.

2.2.1.4. Result of test

The puncture resistance is 70 N. Test was done according to IEC 61111, sub clause 5.5.2 and it passed the test.
Result > 86.5 N

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2.3. Dielectric Tests:

2.3.1. Voltage proof test:

2.3.1.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.3.1.2. Procedure of test

The electrical insulating matting or test piece shall be given a voltage test as specified in Table 4 of IEC 61111 using electrodes as specified in 5.6.2.2. of IEC 61111 The voltage shall be initially applied at a low value and gradually increased at a constant rate-of-rise of approximately 1000 V/s until the specified test voltage level is reached. The test period shall be considered to start at the instant the specified voltage is reached.

2.3.1.3. Acceptance conditions of test

The test shall be considered as passed if the specified test voltage is reached and maintained for 3 min without the occurrence of disruptive discharge or other electrical failure.

2.3.1.4. Result of test

Test was done according to IEC 61111, sub clause 5.6.4.2.1 and it passed the test.

✓ **PASSED**

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2.3.2. Alternative type - voltage proof test:

2.3.2.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.3.2.2. Procedure of test

The test was carried out according to clause 5.6.2.2.2 of IEC 61111:
If flashover happens during the conduct of the test with the standard type of electrodes of 5.6.2.2.1 of IEC 61111, the following type of electrodes shall be used.
A 1 270 mm × 1 270 mm sheet of insulating material 3 mm to 5 mm thick, which has a 762 mm × 762 mm opening in the centre, shall be placed on an earthed metal plate. This mask, which has a "picture frame" appearance, shall have the opening filled with a conductive material of such thickness as to bring the earth electrode to approximately the same level as the mask in order to maintain direct contact with the matting or test piece. The matting or test piece shall be placed over the mask.
A rectangular metal plate, 762 mm × 762 mm and approximately 5 mm thick, having smoothly rounded edges and corners, shall be placed on top of the matting or test piece. This top plate shall then be energized with the test voltage.

2.3.2.3. Acceptance conditions of test

The test shall be considered as passed if the specified test voltage is reached and maintained for 1 min without the occurrence of disruptive discharge or other electrical failure.

2.3.2.4. Result of test

Test was done according to IEC 61111, sub clause 5.6.2.2.2 and it passed the test.

✓ **PASSED**

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2.3.3. Voltage withstand test:

2.3.3.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.3.3.2. Procedure of test

Three test pieces having dimensions of 150 mm × 150 mm shall be cut from the electrical insulating matting. The test pieces are placed between metallic electrodes as specified in 5.6.2.3 and the whole arrangement is immersed in an insulating liquid (for instance, insulating oil). The test pieces shall not touch the wall of the tank. Only one voltage rise is applied to each test piece. The voltage shall be applied to each test piece at a constant rate-of-rise of 1000 V/s until the withstand voltage value given in Table 4 is reached.

2.3.3.3. Acceptance conditions of test

The test shall be considered as passed if no electrical puncture occurs.

2.3.3.4. Result of test

Test was done according to IEC 61111, sub clause 5.6.4.3 and it passed the test.

✓ **PASSED**

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2.4. Ageing Test:

2.4.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.4.2. Procedure of test

Two circular test pieces 50 mm in diameter shall be cut from the electrical insulating matting and placed in an air oven for 168 h at 70 °C ± 2 °C and a relative humidity less than 20 %. When the heating period is complete, the test pieces shall be removed from the oven and allowed to cool for not less than 16 h. At the end of this period, the mechanical puncture resistance test shall be carried out on the test pieces in accordance with 5.5.2. of IEC 61111.

2.4.3. Acceptance conditions of test

The test shall be considered as passed if the puncture resistance is not less than 80 % of the values obtained for un-aged test piece.

2.4.4. Result of test

Test was done according to IEC 61111, sub clause 5.7 and it passed the test.
Puncture > 86 N

✓ **PASSED**

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2.5. Thermal Tests:

2.5.1. Flame retardance test:

2.5.1.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.5.1.2. Procedure of test

The burner shall then be placed centrally below the test piece for 10 s and then withdrawn. It should be ensured that no air draught interferes with the test. The propagation of the flame on the test piece shall be observed for 55 s after the withdrawal of the testing flame.

2.5.1.3. Acceptance conditions of test

The test shall be considered as passed if the flame does not reach any point on a 50 mm diameter circle from the centre of the test piece, during the observation period.

2.5.1.4. Result of test

Test was done according to IEC 61111, sub clause 5.8.1 and it passed the test.

✓ **PASSED**

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2.5.2. Low temperature folding test:

2.5.2.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.5.2.2. Procedure of test

Three rectangular test pieces 200 mm × 500 mm shall be cut from electrical insulating matting. Each test piece shall be placed in a chamber for 4 h at a temperature of −25 °C ± 3 °C. Two polyethylene plates 200 mm × 200 mm × 5 mm thick shall be conditioned at the same temperature and for the same time. Within 1 min after removal from the chamber, each test piece shall be folded at the mid-point and placed between the two polyethylene plates and subjected to a force of 100 N for 30 s as shown in figure 5 of IEC 61111.

2.5.2.3. Acceptance conditions of test

The test shall be considered as passed if no tear, break or crack is visible. The test piece shall also pass the dielectric withstand test (see 5.6.4.3 of IEC 61111) but without conditioning for moisture absorption.

2.5.2.4. Result of test

Test was done according to IEC 61111, sub clause 5.8.2 and it passed the test.

✓ **PASSED**

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2.5.3. Extremely low temperature folding test:

2.5.3.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.5.3.2. Procedure of test

Each test piece shall be placed in a chamber for 24 h ± 0.5 h at a temperature of −40 °C ± 3 °C. Two polyethylene plates 200 mm × 200 mm × 5 mm thick shall be conditioned at the same temperature and for the same time. Within 1 min after removal from the chamber, the test pieces shall be folded at the mid-point, placed between the two polyethylene plates and subjected to a force of 100 N for 30 s as shown in figure 5 of IEC 61111.

2.5.3.3. Acceptance conditions of test

The test shall be considered as passed if no tear, break or crack is visible. The test piece shall also pass the dielectric withstand test (see 5.6.4.3 of IEC 61111) but without conditioning for moisture absorption.

2.5.3.4. Result of test

N/A

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2.6. Acid Resistance:

2.6.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.6.2. Procedure of test

They shall be conditioned by immersion in 32 °Baumé sulphuric acid solution at a temperature of 23 °C ± 2 °C for 8 h ± 0,5 h. Following acid conditioning, the test pieces shall be rinsed in water and dried for 2 h ± 0,5 h at approximately 70 °C. The time elapsed between the end of drying and start of testing shall be 45 min ± 15 min. Tests shall then be carried out on three test pieces for withstand tests (see 5.6.4.3 of IEC 61111) but without conditioning for moisture absorption and on one test piece for the mechanical puncture test (see 5.5.2of IEC 61111).

2.6.3. Acceptance conditions of test

The acid resistance test shall be considered as passed if the electrical withstand tests are fulfilled and the values obtained for the mechanical tests are not less than 75 % of values obtained in the tests carried out on a test piece from the same batch without acid conditioning.

2.6.4. Result of test

Test was done according to IEC 61111, sub clause 5.9 and it passed the test.
Puncture > 86 N
Withstand test= 10 kV

✓ **PASSED**

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2.7. Oil Resistance:

2.7.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.7.2. Procedure of test

The test pieces shall be preconditioned in air for not less than 3 h ± 0,5 h at 23 °C ± 2 °C, and 50 % ± 5 % relative humidity, then they shall be conditioned by immersing in liquid 102 (see Annex E of IEC 61111) at a temperature of 70 °C ± 2 °C for 24 h ± 0,5 h. Following conditioning, the test pieces shall be dried using a lint-free clean absorbent cloth. Time elapsed between removal from oil and start of testing shall be 45 min ± 15 min. Tests shall then be carried out on three test pieces for withstand tests (see 5.6.4.3 of IEC 61111) but without conditioning for moisture absorption and on one test piece for mechanical puncture test (see 5.5.2 of IEC 61111).

2.7.3. Acceptance conditions of test

The oil resistance test shall be considered as passed if the electrical withstand tests are fulfilled and the values obtained for the mechanical tests are not less than 75 % of values obtained in the tests carried out on a test piece from the same batch without oil conditioning.

2.7.4. Result of test

Test was done according to IEC 61111, sub clause 5.10 and it passed the test.
Puncture > 86 N
Withstand test= 10 kV

✓ **PASSED**

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2.8. Marking:

2.8.1. Visual Inspection and Measurement:

2.8.1.1. Test data

Location	: E.P.I.L.
Date	: 01-Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.8.1.2. Procedure of test

Electrical insulating matting complying with the requirements of this standard shall be marked on the product with the following items of marking:

- Name, trademark or identification of the manufacturer;
- Symbol IEC 60417-5216 (2002-10) – Suitable for live working convenience;
- Number of the relevant IEC standard immediately adjacent to the symbol, (IEC 61111);
- Month and year of manufacture;
- Category if applicable;
- Class designation.

When a color code is used, the color of the symbol (double triangle) shall correspond to the following code:

- Class 0 – red
- Class 1 – white
- Class 2 – yellow
- Class 3 – green
- Class 4 – orange

2.8.1.3. Acceptance conditions of test

Compliance with the requirements of sub clause 4.6 of IEC 61111 had checked by inspection.

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2.8.1.4. Result of test

Test was done according to IEC 61111, sub clause 5.3.1 and it Passed the test.

✓ PASSED

2.8.2. Durability of Marking:

2.8.2.1. Test data

Location	: E.P.I.L.
Date	: 01- Mar-2021
Engineer of EPIL	: B. Hamidifard
Normative document	: IEC 61111 Edition 2.0 : 2009

2.8.2.2. Procedure of test

The durability of the items marked on the electrical insulating matting shall be checked by rubbing vigorously for 15 s with a piece of lint-free cloth soaked in soapy water and then rubbing it for a further 15 s with a piece of lint-free cloth soaked in isopropanol.

2.8.2.3. Acceptance conditions of test

The test shall be considered as passed if the items of marking remain legible and the letters do not smear.

2.8.2.4. Result of test

Test was done according to IEC 61111, sub clause 5.3.2 and it passed the test.

✓ **PASSED**

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3. FIGURES:

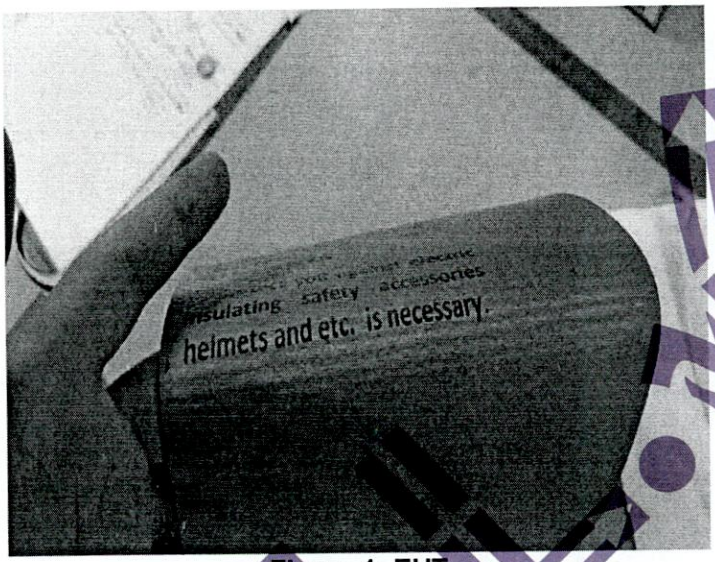

Figure 1: EUT

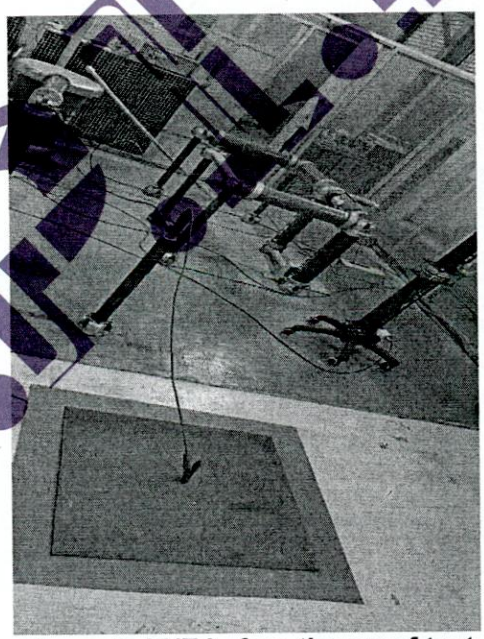

Figure 2: EUT before the proof test

Figure 3: EUT before the withstand test

Figure 4: EUT under mechanical puncture resistance test

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