

TEST REPORT

Report Number: 200940
Date of Issue: August 24, 2020

Report to:

Hanwha Techwin Co., Ltd.

6, Pangyo-ro 319beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, Korea

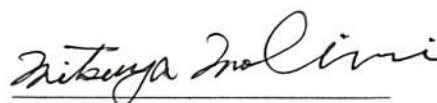
Reported by:

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- (1) Chemitox is accredited by the following agency to ISO/IEC 17025.
American Association for Laboratory Accreditation (A2LA) — Certificated No: 1136.03
- (2) This TEST REPORT refers only to the sample tested, unless stated otherwise.

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Hanwha Techwin Co., Ltd.
6, Pangyo-ro 319beon-gil, Bundang-gu,
Seongnam-si, Gyeonggi-do, 13488, Korea

ISO 5658-2 Spread of Flame Test Report

1. Objective

As per client's request, spread of flame test is conducted in accordance with ISO 5658-2 :2006+A1:2011 "Reaction to fire tests — Spread of flame — Part 2:Lateral spread on building and transport products in vertical configuration".

2. Date of Test

August 21, 2020

3. Description of Test Specimens

The description of the specimens given in Table 1 has been prepared from information provided by Hanwha Techwin Co., Ltd. This information has not been independently verified by Chemitox. All values quoted are nominal, unless specified.

Table 1 Description of test specimens

Generic description	Steel (SECC) plate with painting on one side
	Steel thickness: 1.2mm
	Steel density: 7.8g/cm ³
	Paint: EMS BLACK MATT(MNC)-1 made by Akzonobel
	Paint thickness: 15-20µm
Product Name	Painted steel for enclosure
Color	Black
Nominal Dimension	155 x 800 mm
Received on	August 17, 2020

4. Test Conditions

Test conditions of Spread of Flame are shown in Table 2.

Table 2 Test conditions

Test	Spread of Flame Test
Applicable Standard	ISO 5658-2:2006+A1:2011: Reaction to fire tests — Spread of flame — Part 2:Lateral spread on building and transport products in vertical configuration EN 45545-2:2013+A1:2015: Railway applications — Fire protection on railway vehicles Part 2: Requirements for fire behavior of materials and components
Conditioning	Specimens are conditioned to be stabilized constant mass at 23±3°C/50±5%RH
Exposed Face	Coated face
Substrate	The specimens were tested with a 12mm thick calcium silicate based backing board present.
Gas used in the pilot flame	Propane

5. Test Method

ISO 5658-2:2006+A1:2011 specifies a method of test for measuring the lateral spread of flame along the surface of a specimen of a product orientated in the vertical position. It provides data suitable for comparing the performance of essentially flat materials, composites or assemblies, which are used primarily as the exposed surfaces of walls in buildings and transport vehicles, such as ships and trains.

6. Test Result

Summarized test results are shown in Table 3. See Appendix for details.

Table 3 Summarized test results

Parameter	Unit	Specimen Number				Average
		1	2	3	4*	
Heat for Sustained Burning (Q_{sb})	MJ/m ²	-	3.99	3.29	3.48	3.59
Critical heat flux at Extinguishment (CFE)	kW/m ²	-	36.4	34.0	30.3	33.6
Flaming droplets with sustained flaming (>10s)	N/A	N/A	N/A	N/A	N/A	N/A

*: retest

These test results relate only to the behaviour of the product under the particular conditions of this test and they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

7. Test Location

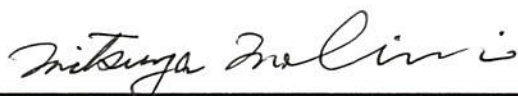
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8. Performed by



Taiki Kitta, PV Testing · Material Testing & Evaluation Div. (Level 2)

9. Reviewed by



Mitsuya Mochizuki, Responsible Officer Engineering Leader

Note: This report shall not be reproduced except in full.

Appendix

(1 Page)

- Detailed test results

Appendix

Table 4 Flame Spread Detail

	Specimen Number			
	1	2	3	4*
Achieve the 50mm measuring line [s]	-	63.8	52.6	78.8
Achieve the 100mm measuring line [s]	-	68.6	60.3	81.6
Achieve the 150mm measuring line [s]	-	84.4	70.1	82.8
Achieve the 200mm measuring line [s]	-	101.7	83.1	84.1
Achieve the 250mm measuring line [s]	-	168.3	115.2	89.7
Achieve the 300mm measuring line [s]	-	-	-	153.6
Achieve the 350mm measuring line [s]	-	-	-	-
Achieve the 400mm measuring line [s]	-	-	-	-
Achieve the 450mm measuring line [s]	-	-	-	-
Achieve the 500mm measuring line [s]	-	-	-	-
Achieve the 550mm measuring line [s]	-	-	-	-
Achieve the 600mm measuring line [s]	-	-	-	-
Achieve the 650mm measuring line [s]	-	-	-	-
Achieve the 700mm measuring line [s]	-	-	-	-
Achieve the 750mm measuring line [s]	-	-	-	-

*: retest

Table 5 Observations

	Specimen Number			
	1	2	3	4*
Ignition time [s]	-	60.2	47.8	77
Flame extinguished after [s]	-	244.5	168.4	167.6
Spread of flame Max [mm]	-	250	270	300
Test time [s]	-	844.0	768.0	768.0

*: retest

Table 6 Detailed Test Results

	Specimen Number				Average
	1	2	3	4*	
Heat for ignition Q_i [MJ/m ²]	-	3.78	3.14	3.70	3.54
Heat for sustained burning Q_{sb} [MJ/m ²]	-	3.99	3.29	3.48	3.59
Critical heat flux at extinguishment CFE [kW/m ²]	-	36.4	34.0	30.3	33.6

*: retest