Test Report

No. AJFS1908007680FF **Date: AUG.21, 2019** **Page 1 of 12**

SHENZHOU CITY LINSEN WOOD INDUSTRY CO. LTD.

LINSEN RAILWAY VEHICLE FACILITIES CO. LTD.

NO. 198 SHUNFA STREET SHENZHOU CITY HEBEI PROVINCE

The following sample(s) was / were submitted and identified on behalf of the client. SGS is not responsible for the authenticity, integrity and results of the data and information and / or the validity of the conclusion. results apply to the sample as received.

Sample Name: COMPOSITE FLOOR

SGS Ref No.: CARS201908007130

Style/Item No.: /

Test Requested:

EN 45545-2:2013+A1:2015 Railway applications—Fire protection on railway vehicles Part 2: Requirements for fire behaviour of materials and components, and testing according to Table 5 — Material requirement sets (R10)

Test Results: -- See attached sheet --

Test Period:

Sample Receiving Date	:	AUG.06, 2019
Test Performing Date	:	AUG.06, 2019 TO AUG.19, 2019

Signed for and on behalf of
SGS-CSTC Co., Ltd. Anji Branch

Allen Zou
Lab Manager

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I. Description of Test specimens

Sample Description	Composite floor
Color	Wood
Density	About 737.9 kg/m^3
Exposed (test) surface	The smooth surface
Size of specimens	T04 EN ISO 9239-1: 1050mm×230mm×20mm
	T03.02 ISO 5660-1: 100mm×100mm×20mm
	T10.03 & T11.02 EN ISO 5659-2: 75mm×75mm×20mm

II. Summary of test results

Requirement set (used for)	Test method reference	Parameter Unit	Test results *
R10 (IN1C; IN15)	T04 EN ISO 9239-1	CHF kW/m^2	⩾11.0
	T03.02 ISO 5660-1: 25 kW/m^2	MARHE kW/m^2	58.9
	T10.03 EN ISO 5659-2: 25 kW/m^2	$D_{s\ max.}$ dimensionless	15.9
	T11.02 EN ISO 5659-2: 25 kW/m^2	CIT_G dimensionless	0.018

***** For the test details, please see the appendix of this test report.

III. Conclusion

According to the test results, the submitted sample **meets** the requirements of **R10** (detailed in Table 5 of EN 45545-2:2013+A1:2015) for **HL3** Hazard Level Classification.

To be continued…

Test Criteria for EN 45545-2:2013+A1:2015 Table 5 Material requirement sets (R10)

Requirement set (used for)	Test method reference	Parameter Unit	Requirement Definition	HL1	HL2	HL3
R10 (IN1C; IN15)	T04 EN ISO 9239-1	CHF kW/m^2	Minimum	4.5	6	8
	T03.02 ISO 5660-1: 25 kW/m^2	MARHE kW/m^2	Maximum	--	--	--
	T10.03 EN ISO 5659-2: 25 kW/m^2	$D_{s\ max.}$ dimensionless	Maximum	600	300	150
	T11.02 EN ISO 5659-2: 25 kW/m^2	CIT_G dimensionless	Maximum	1.2	0.9	0.75

Statements:

This declaration of conformity is only based on the result of this laboratory activity, the impact of the uncertainty of the results was not included.

The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The test results relate only to the specimens of the product in the form in which were tested.

To be continued…

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APPENDIX 1: T04 EN ISO 9239-1:2010 Reaction to fire tests for floorings Part 1: Determination of the burning behaviour using a radiant heat source (ISO 9239-1:2010)

1. Conditioning

T: 23±2°C, R.H: 50±5%, at least 48 h and until the test sample was conditioned to constant mass.

2. Test results

Mounting of Test Assembly:

Aluminum, with the density about 2700kg/m^3, thickness about 1.0mm, is as the substrate. The test specimens are fixed mechanically to the substrate. No joint in the specimens.

Distance (mm)	S1	S2	S3
	Time (mm:ss)	Time(mm:ss)	Time(mm:ss)
50	7:33	7:10	7:25
100	---	---	---
150	---	---	---
200	---	---	---
250	---	---	---
300	---	---	---
350	---	---	---
400	---	---	---
450	---	---	---
500	---	---	---
550	---	---	---
600	---	---	---
650	---	---	---
700	---	---	---
750	---	---	---
800	---	---	---
850	---	---	---
900	---	---	---
950	---	---	---
1000	---	---	---
Extinguishing time (mm:ss)	12:00	12:00	12:00
The final maximum flame spread distance (mm)	60	60	60
CHF value at extinguishment (kW/m^2)	≥11.0	≥11.0	≥11.0

To be continued….

Summary of test results:

Parameter	S1	S2	S3	Avg
The integral of the smoke (%×min)	134.2	118.9	146.3	133.1
Max. light attenuation (%)	15.7	14.6	17.8	16.0
CHF (kW/m^2)	≥11.0	≥11.0	≥11.0	≥11.0

To be continued….

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APPENDIX 2: T03.02 ISO 5660-1:2015 Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method), Heat flux: 25 kW/m².

1. Conditioning

T: 23 ± 2°C, R.H: 50 ± 5%, until the test sample was conditioned to constant mass.

2. Test result

Sample number	1	2	3	Avg
The exposed surface area of the test specimen/ m^2	0.0088	0.0088	0.0088	0.0088
Irradiance /（kW/m^2）	25	25	25	25
Initial mass / g	139.0	139.8	138.1	139.0
Mass at sustained flaming /g	135.7	137.4	136.1	136.4
Remained mass / g	93.9	95.1	95.7	94.9
Average rate of specimen mass loss per unit area $\dot{m}_{A,10-90}$ /($g \cdot m^{-2} \cdot s^{-1}$)	4.1	4.1	3.9	4.0
Time to sustained flaming / s	108	112	102	107.3
Whether re-insert the spark igniter 1)	No	No	No	---
Maximum heat release rate per unit area/（kW/m^2）	267.8	219.6	257.8	248.4
Average heat release rate per unit area for 180s after ignition /（kW/m^2） 2)	74.7	78.8	75.6	76.4
Average heat release rate per unit area for 300s after ignition /（kW/m^2）	48.5	50.0	49.8	49.4
Total heat release /（MJ/m^2）	28.2	29.4	28.7	28.8
Average effective heat of combustion /（MJ/kg）	6.0	6.2	6.3	6.2
Total smoke production per unit area over the non-flaming phase /m^2m^{-2}	9.1	36.6	16.3	20.7
Total smoke production per unit area over the flaming phase /m^2m^{-2}	415.7	500.2	353.5	423.1
Test duration /s 3)	1200	1200	1200	1200
Maximum value of average rate of heat emission (MARHE) / KW/m^2	63.5	56.6	56.7	58.9
Additional observations 4)	---			
Special mounting procedures 5)	---			

To be continued….

Remark:

1) If the flame extinguishes in less than 60 s after turning off the spark, re-insert the spark igniter and turn on the spark within 5 s, do not remove the spark until the entire test is completed.

2) The 180 s mean heat release readings shall be compared for the three specimens. If any of these mean readings differ by more than 10 % from the arithmetic mean of the three readings, then a further set of three specimens shall be tested unless the mean value is less than 10 kW m^{-2}.

3) Collect all data until:
   - ☐ a. 32 min after the time to sustained flaming (the 32 min consist of a 30 min test period, and an additional 2 min post-test period to collect data that will be time-shifted). Data are processed to the time to sustained flaming plus 30 min.
   - ☐ b. 30 min have elapsed and the specimen has not ignited;
   - ☐ c. XO_2 returns to a value greater than the pre-test value minus 100 µl/l of oxygen concentration for 10 min. The end of test is the beginning of the 10 min period
   - ☐ d. The mass of the specimen is less than 0.1 g for 60 s. The end of test is the beginning of the 60 s period.
   - ☑ e. 20min (specified in EN 45545-2:2013+A1:2015 T03.02).

4) Observe and record physical changes to the sample such as melting, swelling, and cracking.

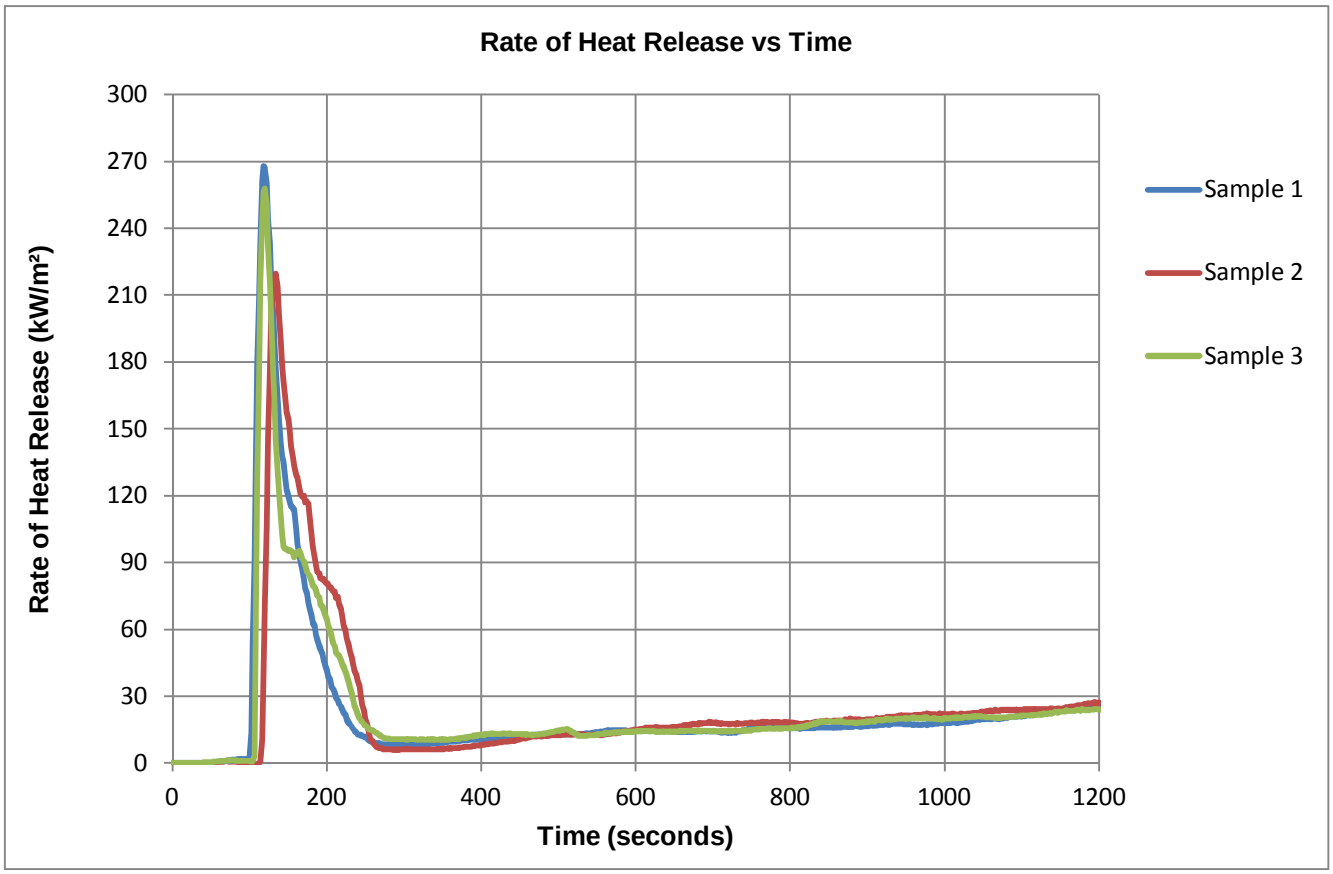
5) Special mounting procedures that were used:
   - ☐ a. Samples that intumesce or deform so that they contact the spark plug prior to ignition, or the underside of the cone heater after ignition, shall be tested with the separation of 60 mm between the base plate of the cone heater and the upper surface of the specimen.
   - ☐ b. Other dimensionally unstable products, for example products that warp or shrink during testing, shall be restrained against excessive movement. This shall be accomplished with 4 tie wires. A tie wire is then looped around the sample holder and retainer frame assembly, so that it is parallel to and approximately 20 mm away from one of the 4 sides of the assembly. The ends of the wire are twisted together such that the wire is pulled firmly against the retainer frame. Excess wire is trimmed from the twisted section before testing. The 3 remaining wires shall be fitted around the specimen holder and retainer frame assembly in a similar manner, parallel to the three remaining sides.
   - ☐ c. Materials that distort so extensively that they cannot be held by 4 wires should be tested using the fine wire grid made of (0,8 ± 0,1) mm with wire spacing of (20 ± 2) mm.
   - ☐ d. Materials that intumesce in a fluid phase such that molten materials overflow the edge frame or seep between the edge frame and the specimen holder invalidate the test. Therefore, such materials should be tested without the edge frame and should be housed in 0,1 mm thick aluminum tray wrappings which extends 10mm above the top edge of the test specimen.
   - ☐ e. Materials, such as fibres, which need to be both physically restrained or compressed to be tested at installed densities should be tested in a wire cage structure made of (1,0 ± 0,1) mm steel wire with (9 ± 1) mm spacing which provides appropriate artificial boundaries to enable the materials to be tested
   - ☑ f. No special mounting procedures that were used.

6) Heat release rate (per unit area), expressed in kilowatts per square metre curve of specimens is given in figure 1.

7) The orifice constant is 0.04 ; the exhaust flow rate is 0.024±0.002 m^3/s.

To be continued…

Curves:



To be continued…

APPENDIX 3: T10.03 EN ISO 5659-2:2017 Plastics—Smoke generation — Part 2: Determination of optical density by a single- chamber test. Heat flux 25kW/m^2 with pilot flame, test duration is 10 min.

1. Conditioning

T: 23±2 ºC, R.H: 50±5%, until the test sample was conditioned to constant mass.

2. Test Results

Parameters	1	2	3	Avg
$D_{s\ (1.5)}$	0	0	0	0
$D_{s\ (4)}$	0	0	0	0
$D_{s\ (10)}$	0	0	0	0
VOF_4 min	0	0	0	0
$D_{s\ max}$	16.9	18.4	12.3	15.9
T ($D_{s\ max}$) s	599	600	597	599

NOTE:

$D_{s\ (n)}$ is the specific optical density at n^{th} min;

VOF_4 is the cumulative value of specific optical densities in the first 4 min of the test.

$D_{s\ max}$ is the maximum optical density in the test chamber.

To be continued…

APPENDIX 4: T11.02 EN 45545-2:2013+A1:2015, Annex C Gas analysis in the smoke chamber EN ISO 5659-2, using FTIR technique. Heat flux 25 kW/m² with pilot flame, test duration is 10min.

1. Conditioning

T: 23±2°C and R.H 50±5%, until the test sample was conditioned to constant mass.

2. Test results

1) 4 min after the test start

Gas	1	2	3	Avg
Carbon Dioxide (CO_2)	1413.2	1318.2	1562.4	1431.3
Carbon Monoxide (CO)	9.1	7.7	7.6	8.1
Hydrogen Fluoride (HF)	ND	ND	ND	--
Hydrogen Chloride (HCl)	ND	ND	ND	--
Hydrogen Bromide (HBr)	ND	ND	ND	--
Hydrogen Cyanide (HCN)	1.3	1.6	1.5	1.5
Nitrogen Oxides (NO_x)	2.0	2.0	2.0	2.0
Sulphur Dioxide (SO_2)	8.5	12.5	11.8	10.9

2) 8 min after the test start

Gas	1	2	3	Avg
Carbon Dioxide (CO_2)	1906.7	1733.3	197.8	1945.9
Carbon Monoxide (CO)	17.8	16.4	19.7	18.0
Hydrogen Fluoride (HF)	ND	ND	ND	--
Hydrogen Chloride (HCl)	ND	ND	ND	--
Hydrogen Bromide (HBr)	ND	ND	ND	--
Hydrogen Cyanide (HCN)	2.4	2.4	3.0	2.6
Nitrogen Oxides (NO_x)	2.9	2.6	3.3	2.9
Sulphur Dioxide (SO_2)	14.1	17.2	19.7	17.0

Where, ND indicates Non-detected.

Note: All values given are in mg/m³.

To be continued…

3) Calculation of CIT_G

Gas component	Reference concentration; mg/m^3
Carbon Dioxide (CO_2)	72 000
Carbon Monoxide (CO)	1 380
Hydrogen Fluoride (HF)	25
Hydrogen Chloride (HCl)	75
Hydrogen Bromide (HBr)	99
Hydrogen Cyanide (HCN)	55
Nitrogen Oxides (NO_x)	38
Sulphur Dioxide (SO_2)	262

$$CIT_G = 0.0805 \cdot \sum_{i=1}^{i=8} \frac{c_i}{C_i}$$

Where,

CIT_G – Conventional Index of Toxicity;

c_i – Concentration of the ith gas;

C_i – Reference concentration of the ith gas.

PARAMETER	1	2	3	Avg
CIT_G (4 min)	0.011	0.012	0.012	0.012
CIT_G (8 min)	0.017	0.017	0.021	0.018

To be continued…

Photo Appendix:

SGS authenticate the photo on original report only

End of Report

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