



**JET FIRE TEST REPORT OF CONCRETE SLAB PROTECTED WITH INSULATING
MATERIAL U STUCCO-FRX**

TEST DATE : 07/10/2023
LOCATION : Amguri Field, Assam
COMPANY : Oilmax Energy Pvt Ltd.
OPERATION IN-CHARGE : A.K. Singh (Senior-VP, OEPL)
PROJECT COORDINATOR : Shubham Singh (Senior Engineer, OEPL)
M/s SMARK INFRASTRUCTURE: Sujay Shah (MD - Smark Infrastructure)
REPRESENTATIVE

1. COMPANY DETAILS

Company	M/s Smark Infrastructure Solutions
Address	306 Ready Money Terraces, Dr. Annie Beasant Road, Worli, Mumbai-400018
Specimen	Concrete slab protected with insulating material U Stucco-FRX
Specified Standard	<ul style="list-style-type: none">• Health & Safety Executive, Offshore Technology Report OTI 95 634 "Jet Fire Resistance Test of Passive Fire Protection Materials"• Jet Fire Resistance Test of PFP Materials as per ISO 22899-1:2021 with natural gas

2. DESCRIPTION OF THE TEST SPECIMEN

The test specimen consists of concrete slab of 1620 mm X 1620 mm size, protected with insulating material, U Stucco-FRX. The slab was divided into four equal quadrants and on each quadrant, U Stucco-FRX insulating material was applied in different thickness as shown in Figure 1.

Before application of the material total eight thermocouples were fixed, with two in each quadrant of the concrete slab.:

The following are the specifications of the U Stucco-FRX material as specified by the sponsor:

- Curing Period: Minimum 4 to 8 hours
- Working time: Sets in 90 to 120 minutes after mixing depending on temperature, humidity and substrate conditions.
- Application thickness: The minimum thickness over any substrate is ½ inch (12 mm). Some assemblies may require specific minimum thickness. U-STUCCO™
- FRX can be applied up to 1 inch (25 mm) thickness with a single pass. UCCO™ FRX can be applied up to 1 inch (**25 mm**) thickness with a single pass.

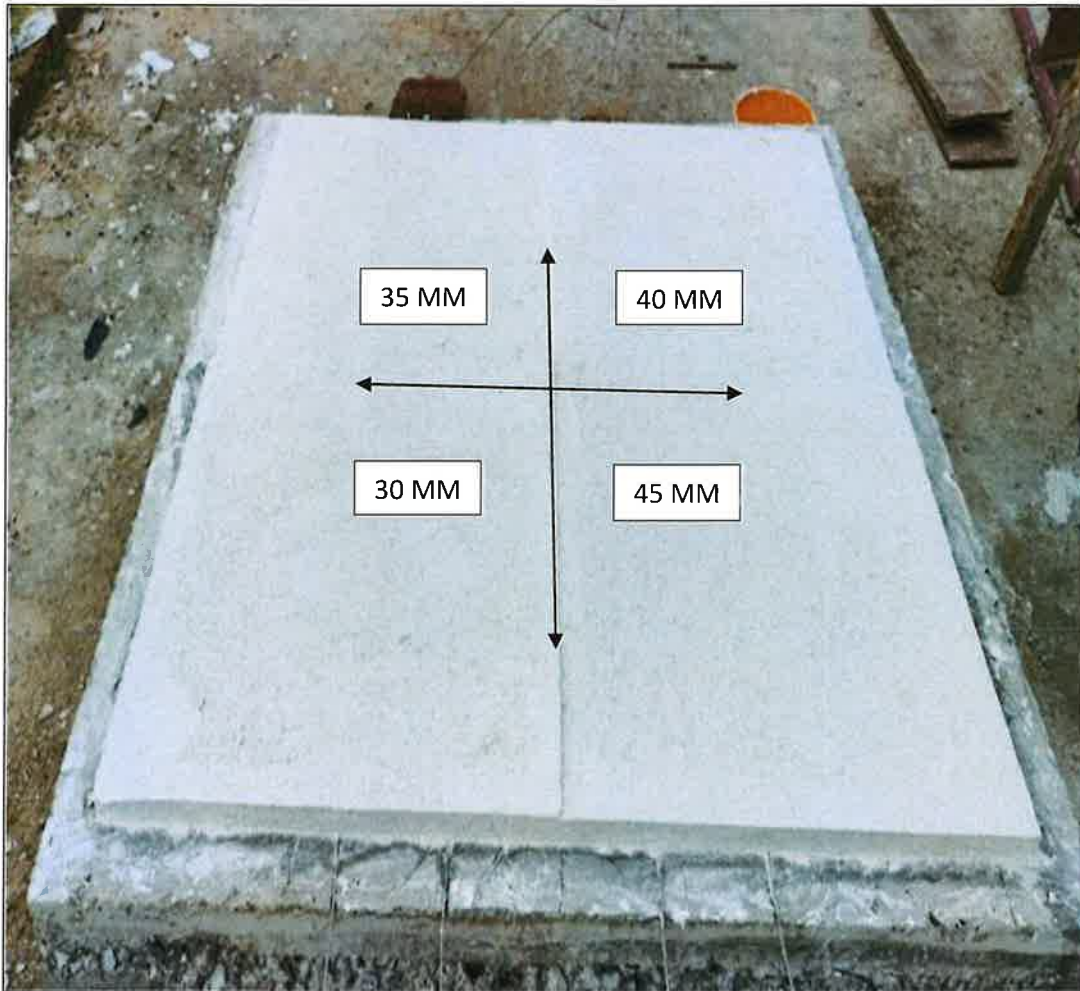


Figure 1: Construction details of Concrete slab protected with insulating material U Stucco-FRX

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3. TESTING

3.1 Fire Exposure

The specimen is tested as per the procedure defined in ISO 22899 using natural gas. The test set-up is depicted in Figure 1. During the fire exposure the temperature on the exposed side of the specimen was recorded at different locations as shown in Figure 2.



Figure 1: Jet fire resistance test at Amguri field, Assam



Figure 2: Thermocouple location on the exposed side of specimen

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3.2 Temperature on Protected Concrete Surface

During the fire exposure, temperature on the surface of concrete protected with U Stucco-FRX material was measured at different locations as shown in Figure 3.



Figure 3: Thermocouple location of the test specimen

4. TEST RESULTS OF THE U STUCCO-FRX

4.1 Temperature Variation

4.1.1 Exposed face

The temperature variation of the flame re-circulation temperature of concrete slab protected with insulating material U Stucco-FRX is plotted in Figure 4

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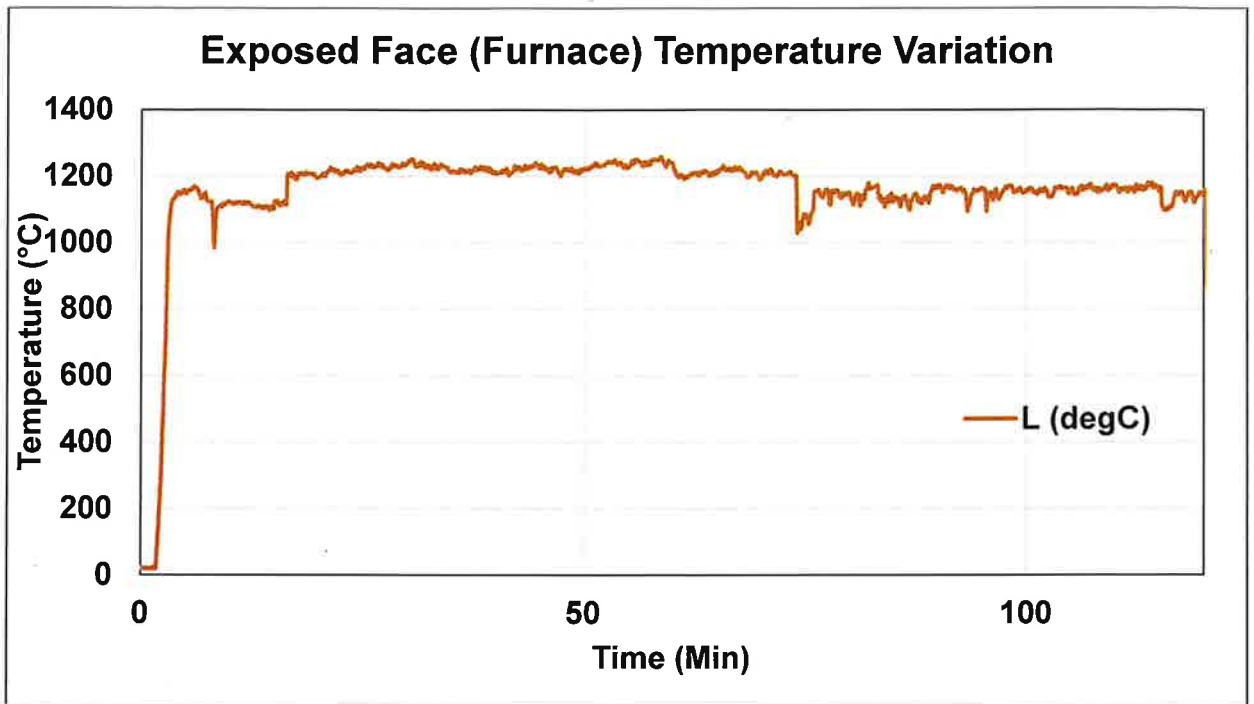


Figure 4: Temperature variation of the flame re-circulation temperature Concrete slab protected with insulating material U Stucco-FRX

4.1.2 Concrete surface

The variation of the temperature on the surface of concrete protected by different thickness of the U Stucco-FRX protection material as recorded during fire exposure is given in Table 1 and plotted in Figure 5.

Table 1: Temperature variation on the surface of concrete

S.N.	Time (Min)	Temperature on concrete surface protected with different thickness of U Stucco-FRX protection material			
		30 mm	35 mm	40 mm	45 mm
1	0	22	38	42	22
2	5	23	42	45	25
3	10	33	44	49	37
4	15	37	50	52	42
5	20	39	56	5	43
6	25	48	60	61	46
7	30	51	63	63	48
8	35	52	66	66	51

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9	40	53	69	67	53
10	45		75	69	55
11	50		78	70	57
12	55		81	73	59
13	60		84	74	60
14	65		87	76	62
15	70		87	77	63
16	75		90	79	64
17	80		93	81	65
18	85		96	81	66
19	90		98	83	69
20	95		102	84	69
21	100		109		69
22	105		115		69.5
23	110				70
24	115				72
25	120				73

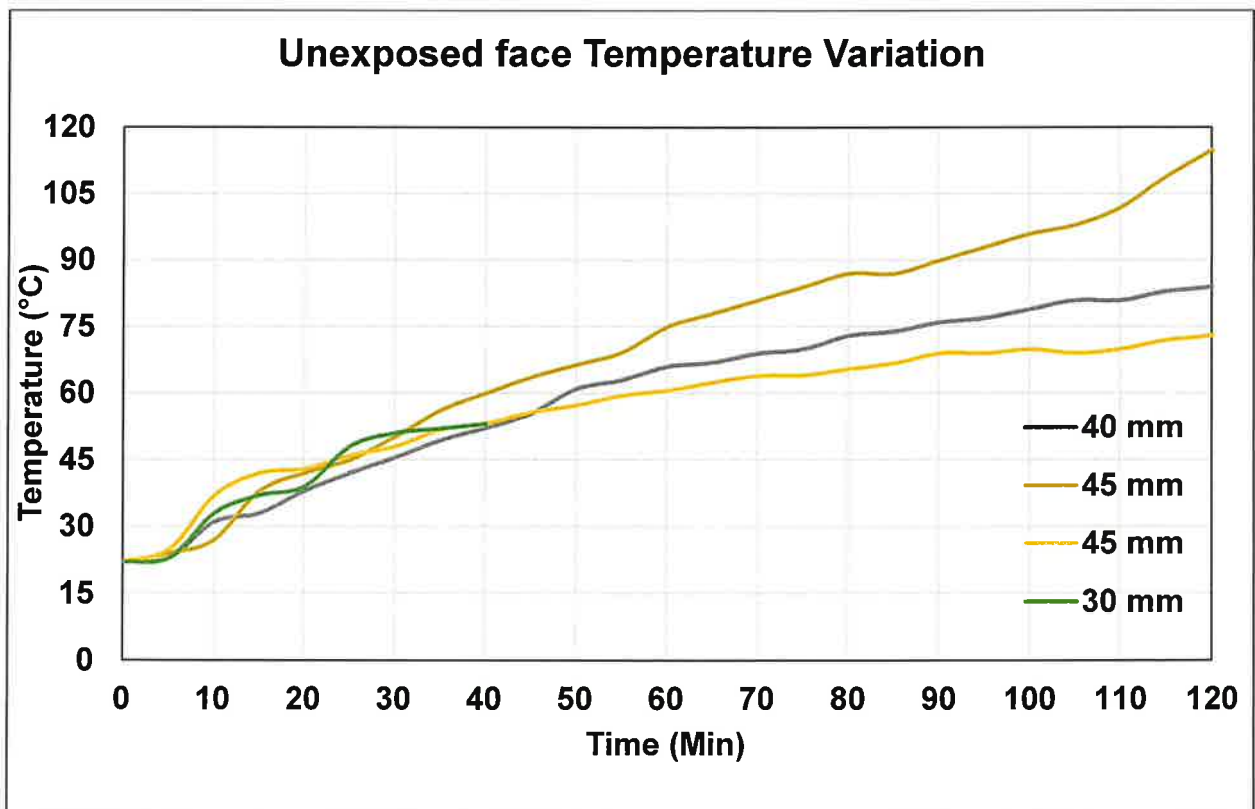


Figure 5: Unexposed side temperature variation of Concrete slab protected with insulating material U Stucco-FRX

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5. VISUAL OBSERVATIONS

- During fire exposure no spalling puffing was observed on the protection material.as shown in Figure 6 and 7.
- After 120 minutes of jet fire exposure no spalling puffing was observed on the protection material.as shown in Figure 6 and 7.
- After the fire exposure surface cracks were observed on the all the four quadrants protected with 30 mm, 35 mm, 40 mm and 45 mm U Stucco-FRX protection material.
- The condition of the cracks on the surface of the protection material just after the fire exposure and after few minutes of cooling are shown in Figure 8, and 9 respectively.
- No further cracking and widening of cracks took place during cooling and after attaining the ambient conditions as shown in Figure 10 and 11 respectively.
- When the specimen cooled down to ambient condition, it was observed that the depth of cracks was around 15 to 20 mm.
- To observe the condition of protected surface of concrete after fire exposure, chisel and hammer was used to remove the exposed layer of insulating material i.e. U Stucco-FRX. It showed that U Stucco-FRX insulating material has sufficient strength after 120 minutes of jet fire exposure.



Figure 6: Condition of exposed face after fire exposure

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Figure 7: Close up showing condition of exposed face after fire exposure

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**Figure 8: Close up showing condition of exposed face just after fire exposure:
Cracking pattern on the surface is visible**



**Figure 9: Close up showing condition of exposed face after few minutes of
shutting off the burner**

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Figure 10 Close up showing condition of exposed face of the specimen during cooling.

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Figure 11 Close up showing condition of exposed face after attaining the ambient condition on exposed face

Shubham Singh

Senior Engineer

Shubham Singh