

CERTIFICATION REPORT OF A

STANDARD ROOM FIRE TEST

FOR

INSULATING CONCRETE FORMS

CLIENT:

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PREFACE

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INTRODUCTION

On December 22, 2003, Intertek Testing Services NA Ltd./Warnock Hersey conducted a room fire test in accordance with the Uniform Building Code Standard 26-3, 1997, *Room Fire Test Standard for Interior of Foam Plastic Systems*.

The objective of the test was to evaluate gypsum board fastening to the IntegraSpec[®] Insulating Concrete Forms (ICF)/Building System. The protection consisted of conventional 1/2 in. gypsum wallboard applied to the interior face of the EPS foam formwork, as described in the Test Sample Installation.

PRE-TEST INSPECTION

A pre-test inspection and sample selection was conducted at Contour Products, Kansas City, KA, on November 25, 2003 by Mr. Davis Bauer representing Intertek/Warnock Hersey. The details of that inspection are on file at Intertek/Warnock Hersey and will be used to form the basis for our follow-up factory inspection program.

MATERIAL SPECIFICATIONS

Description:	Interlocking, stackable, expanded polystyrene (EPS) foam concrete form units
Height:	12-1/4 in.
Length:	48 in.
Width:	2-1/2 in.
Overall Thickness:	11 in.
Material:	Type II expanded polystyrene foam (EPS), nominal 1.60 pcf density
Bead Type:	BASF BFL-327
Colour:	White
Web Description:	Polypropylene reinforcing webs cast into the EPS-ICF panels
Web Dimensions:	12-1/2 in. high by 9-5/8 in. wide by 1-5/8 in. thick
Web Spacing:	8 in.
Web Colour:	Black

FIGURE I
INSULATING CONCRETE FORM COMPONENTS



Web-Spacer



Standard Panel

TEST SAMPLE INSTALLATION

The IntegraSpec[®] Insulating Concrete Form (ICF) units were assembled with vertical joints staggered on successive rows to construct a wall with a 90 degree corner. The finished form was 8 ft. long in one direction, 8 ft. long in the other, and 8 ft. high. The final concrete thickness was nominally 6-1/8 in.

Concrete of 25 mpa strength, 5 to 6 in. slump without air entrainment and 3/8 in. clean, washed, pea sized aggregate was ordered. The concrete was pumped into the form using a concrete pumper truck. The concrete was poured on December 19, 2003 and allowed to cure for 48 hours prior to testing.

TEST ROOM CONSTRUCTION

Standard 1/2 in. gypsum wallboard was installed oriented vertically on to the right side wall foam surface and fastened through the foam into the ties using 2-1/4 in. standard drywall screws. Standard 1/2 in. gypsum wallboard was installed horizontally onto the left side wall foam surface. Each sheet of gypsum wallboard was fastened to the walls with screws every 16 in. on centres horizontally, and 12 in. on centres vertically, with screws penetrating into the plastic ties. The screws fastening the wallboard to the plastic ties along the upper edge row were installed 2 in. below the upper edge of the wallboard. The gypsum wallboard joints were taped with mesh type drywall tape, and filled with joint compound. The screw heads were also filled with joint compound.

The burn room was constructed around the sample wall such that the sample wall was located at the end of the room opposite the door opening and on the right side adjacent wall.

The remaining walls and ceiling of the room were constructed inside our laboratory building using 3-5/8 in. steel stud walls faced on the room interior side with 1/2 in. conventional gypsum wallboard. The room interior dimensions after the installation of the foam plastic and its protection were 8 ft. in height and width and 12 ft. in length ($\pm 1/2$ in. maximum). A door opening measuring 2 ft. 6 in. in width by 7 ft. in height was centred in the end 8 ft. wall. The ceiling was constructed from 3-5/8 in. steel studs faced on the underside with 1/2 in. conventional gypsum wallboard. The gypsum wallboard joints were tight.

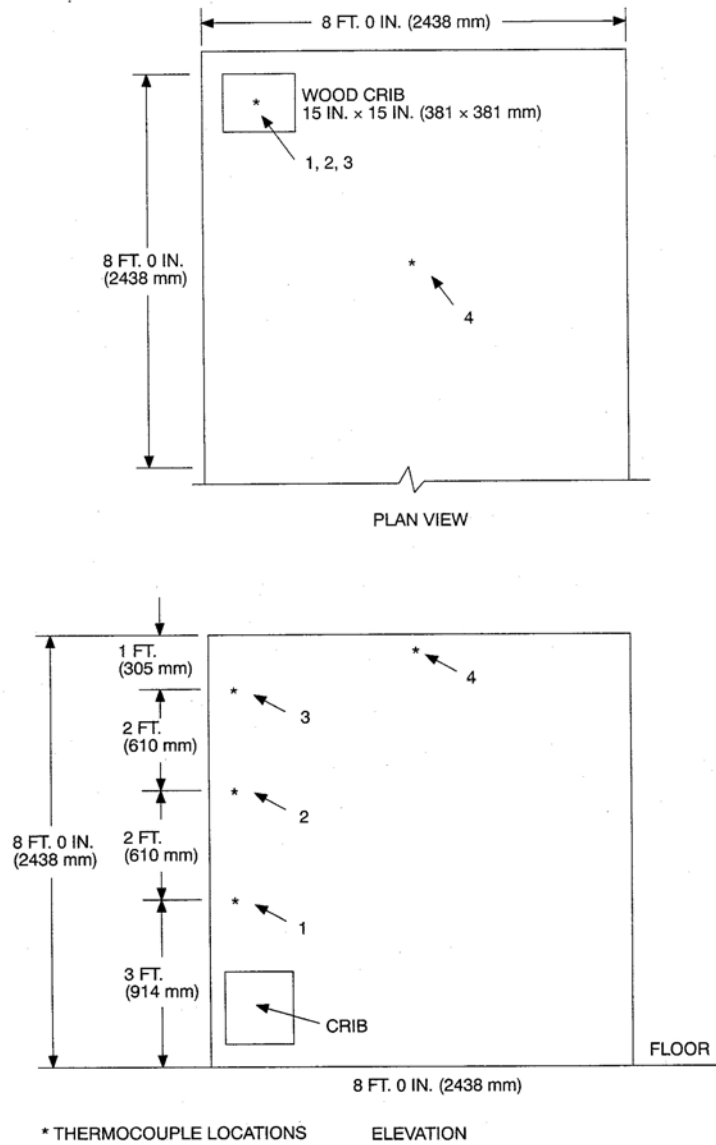
THERMOCOUPLE LOCATIONS

A total of four 24 gauge Type K welded thermocouples were installed in the corner above the wood crib at the following locations:

Thermocouple No.	Location
1	60 in. below ceiling, 3 in. from adjacent wall surfaces
2	36 in. below ceiling, 3 in. from adjacent wall surfaces
3	12 in. below ceiling, 3 in. from adjacent wall surfaces
4	1 in. below ceiling, 4 ft. from each test sample wall

Thermocouples 1, 2, and 3 were fastened to a metal support frame built for this test. The support frame has horizontal rods extending from it to allow for thermocouple mounting at the required elevations.

FIGURE II
THERMOCOUPLE LOCATIONS



- NOTES:**
1. Thermocouples 1, 2 and 3 located 3 inches (76 mm) from adjacent wall surfaces.
 2. Thermocouple 4 located 1 inch (25 mm) below the ceiling, 4 feet (1219 mm) from each of three walls.

FIGURE 26-3-2—THERMOCOUPLE LOCATIONS

THE FIRE TEST

A wood crib was constructed from nominal 1-1/2 in. by 1-1/2 in. clear Douglas Fir kiln dried, finish lumber, measuring 15 in. by 15 in. The crib used for the test was purchased preconditioned from Carr Lumber and Manufacturing based in Bedford Park, Illinois. The crib was constructed with five sticks in each of ten tiers and was fastened together with one 8d nail at each end of each stick. The crib was placed into our conditioning room at $23 \pm 3^{\circ}\text{C}$ and $50 \pm 5\%$ humidity until immediately before the fire test. At the time of test it averaged 11.3% moisture content, and weighed 29.6 lbs. The crib was supported on its corners on cut bricks such that it was located 3-1/2 in. above the floor. A 24 in. by 24 in. section of 5/8 in. Type "X" gypsum wallboard was placed on the floor beneath the crib to prevent the concrete floor from spalling due to the heat of the fire during the test.

One pound of shredded and fluffed wood excelsior was distributed around the bricks covering an area approximately 21 in. by 21 in. Just prior to the start of the test, the excelsior was soaked with 4 ounces of reagent ethyl alcohol, except for an area approximately 6 in. diametrically opposite the intersection of the walls.

The crib was placed on the bricks and positioned 1 in. from the test wall surfaces, the excelsior was ignited and the test was started. Observations were recorded throughout the 15 minute test duration. The temperatures of the thermocouples were automatically recorded every 10 seconds using a calibrated Hydra "data bucket" automatic data recorder, with the Intertek identification "Hydra #1". A video camera was used to record the test, a digital camera was used to photograph the test once a minute, and lights were used to show smoke levels and enhance the video picture.

FIRE TEST OBSERVATIONS

TIME	EXPOSED SIDE
0:22	Flames to 3 feet
1:00	Flames to 4 feet
1:10	Flames to 5 feet
1:30	Flames to 6 feet
1:40	Flames to 7 feet
1:50	Flames are touching the ceiling
2:30	Heavy charring of drywall in the corner, reaching to the ceiling
3:10	Medium venting through door (not too dense)
4:40	Flames are back down to 7 feet
5:18	Charring of drywall on the ceiling
5:50	Ash is visible in the air
7:15	Flames continue to burn at 7 feet, no change in drywall condition, venting still not dense
9:20	Discolouration of drywall along ceiling corners has spread 3 feet
10:00	Smoke has increased, density has increased by approximately 20%
11:30	Venting has increased
12:30	The drywall is beginning to fail
12:43	Smoke is still somewhat clear
14:30	Flames to 5 feet
15:00	Test discontinued

PHOTOGRAPHS



Test Sample After Fire Test



Test Sample After Removal of All Gypsum Wallboard, Crib Area

PHOTOGRAPHS - *Continued*



Test Sample After Removal of All Gypsum Wallboard, Right Wall

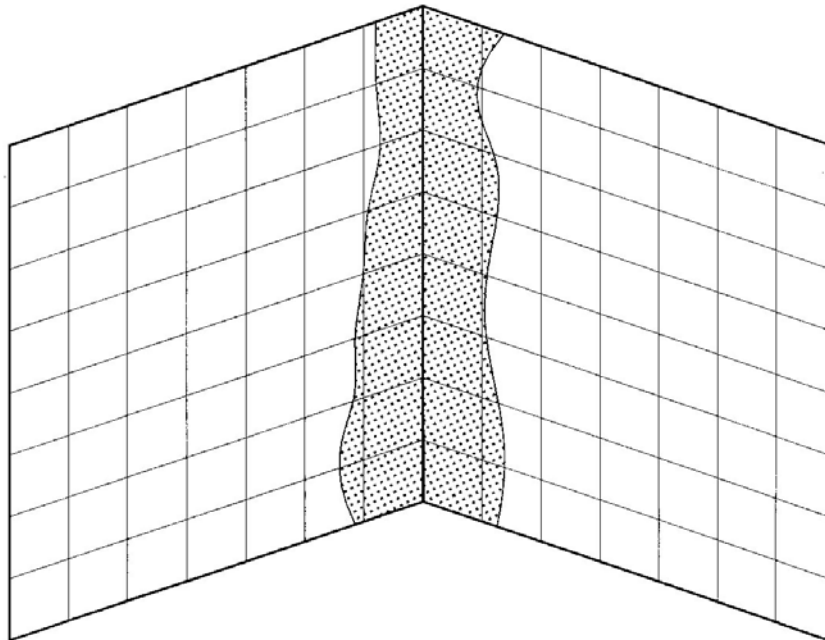


Test Sample After Removal of All Gypsum Wallboard, Left Wall

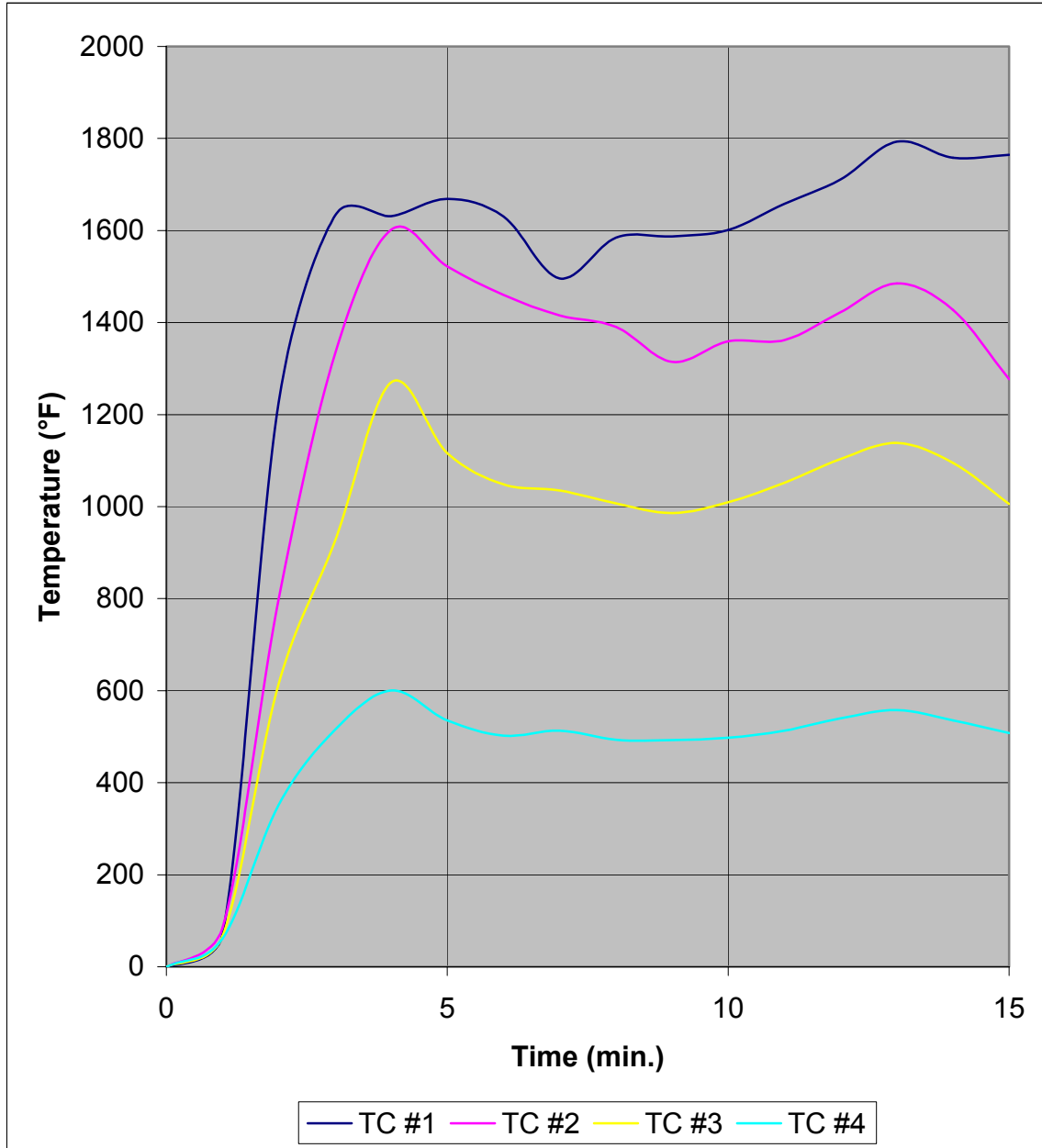
FIGURE III
EXTENT OF FIRE DAMAGE ON EPS FORMS

Elevation Above Floor	Extent of Damage LHS	Extent of Damage RHS
8 ft.	9-1/2 in.	16-1/2 in.
7 ft.	9-1/2 in.	11 in.
6 ft.	8-1/4 in.	14-1/2 in.
5 ft.	11-1/2 in.	15 in.
4 ft.	12 in.	13 in.
3 ft.	14 in.	13 in.
2 ft.	14 in.	15-1/2 in.
1 ft.	17 in.	16-1/2 in.
6 in.	14 in.	15 in.
2 in.	13-3/4 in.	15 in.

Grid lines show 1 ft. square sections to visually represent the extent of charring.



THERMOCOUPLE TEMPERATURES (°F)



CONDITIONS OF ACCEPTANCE

Section 26.304 states:

"A foam plastic wall or ceiling assembly shall be considered as meeting the requirements for acceptable performance within the following conditions:

1. Charring of the foam plastic shall not extend to the outer extremities of the test area within a 15 minute period after ignition of the excelsior. Discolouration extending not more than 1/4 in. (6 mm) into the foam plastic shall not be considered as charring.
2. Smoke levels generated during the test period shall not be excessive.
3. Structural panels shall sustain the applied load during the test period."

TEST RESULTS

1. There was melting of the EPS foam in the vicinity of the wood crib and the flame column to the ceiling. There was no damage to the foam at the outer extremities of the test area.
2. The video record shows the degree of smoke produced during the test. The view of the fire was not obscured by smoke at any time and, consequently, we do not consider the smoke levels generated to be excessive.
3. Since the concrete core was undamaged during the fire test, the structural properties of the wall were not reduced. If a load had been applied, it is our opinion that the wall would have been able to sustain the load.

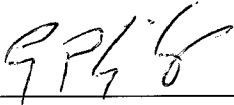
CONCLUSIONS

The Phil-Insul Corporation IntegraSpec® Insulating Concrete Forms (ICF)/Building System, protected by 1/2 in. conventional gypsum wallboard and installed as described in this report, met the conditions of acceptance of Uniform Building Code Standard UBC 26-3, 1997.

The Phil-Insul Corporation IntegraSpec® Insulating Concrete Forms (ICF)/Building System is consequently eligible for listing and labelling under our follow-up factory inspection and certification service


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