



WESTERN FIRE CENTER, INC.

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Fire Performance of Interior Ceiling Grid Assembly

Indicative testing conducted following a modified test methodology described in UBC 26-3, Room fire test standard for interior of foam plastic systems

Conducted For:

**Advanced Technology Inc.
6106 West Market St.
Greensboro, NC 27409**

Mirroflex Ceiling Tiles (0.013" thick, White PVC)

15/16 Grid System

WFCi Report #19041

Test Date: June 4, 2019

Report Issued: June 19, 2019

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INTRODUCTION

This report documents the testing of the fire performance characteristics of a ceiling grid system assembly in a modified UBC 26-3, *Room fire test standard for interior of foam plastic systems*. This evaluation was performed on June 4, 2019 for Advance Technology Inc. of Greensboro, NC.

The ceiling grid system evaluation consisted of plastic grid insert liner tiles composing the entire ceiling of the standard room. Modifications to the standard were made to include active sprinklers to verify when/if they would activate in a fire environment in coordination to the falling of the plastic tiles.

SUMMARY OF TEST METHOD

UBC 26-3, *Room fire test standard for interior of foam plastic systems*, is a standard which describes the contribution of interior materials to room fire growth for specific fire exposure conditions. Materials were placed within a standard room and exposed to a standardized wood crib. A summary of this standard with acceptance criteria is described below:

26.304 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-min period after ignition of the excelsior. Discoloration extending not more than ¼" into the foam plastic shall not be considered charring.
2. Smoke levels generated during the test period shall not be excessive (not measured for this test).
3. Structural panels shall sustain the applied load during the test period.

Other parameters that was monitored was flashover (e.g., flames exit the doorway) and heat release rate (e.g., as in NFPA 286). This test was also modified to include the use of sprinklers designed to activate when exposed to significant heat. Because of the use of sprinklers, smoke accumulation was also not monitored for this test.

The room construction was a standard 8'×12'× 8' wood stud construction. The interior of the room was covered with 5/8" type X gypsum. This modified version set the grid material at 8' from the floor, but the cavity above it extended an additional 1', also lined with 5/8" type X gypsum.

The ignition source for the test was a 30 lb wood crib burner set on top of 1 lb of wood excelsior. Ethanol (4 oz) was poured onto the excelsior and then ignited to begin the test.

The room was instrumented with thermocouples (TC, Figure 1) that recorded temperature throughout the testing process. Three TCs (TC₁₋₃) were placed just above the burner at 3', 5', and 7' from the floor, respectively. Additional TCs were placed at 4' from the back wall and 4' for the side walls, one (TC₄) 1" below the ceiling grid and one (TC₅) 1" below the ceiling in the cavity above the grid.

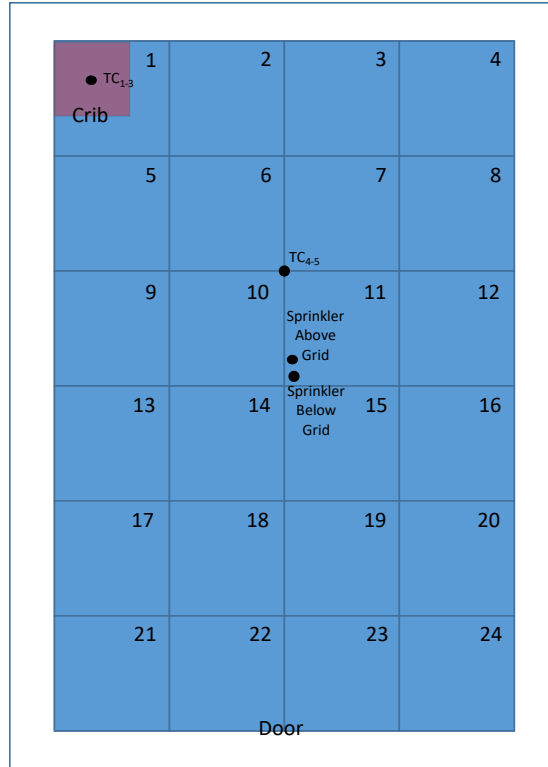


Figure 1. Grid schematic for ceiling.

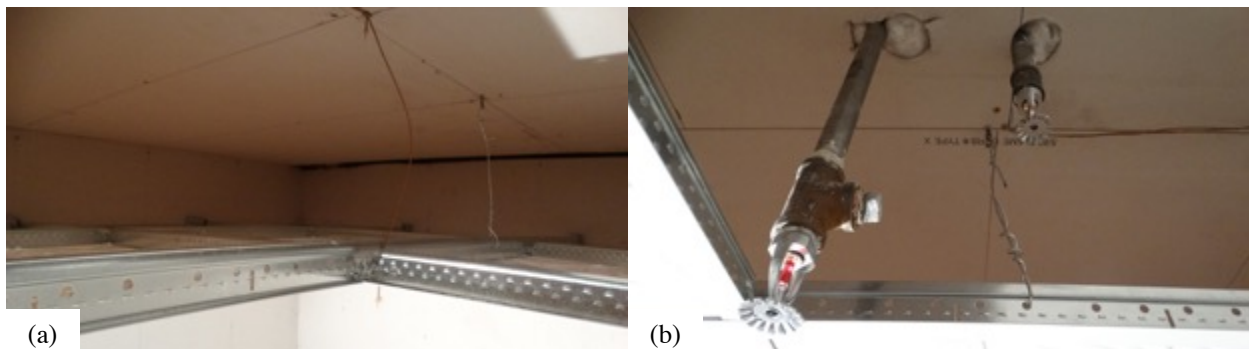


Figure 2. Room/corner images showing (a) cavity extension and (b) sprinklers below and inside cavity.

Two separate sprinklers (Tuna UL Listed ½ NPT, Standard Response) were located at the center of the room, one just below the ceiling grid and one inside the cavity above the ceiling. The operating pressure of the water for the sprinklers was 15 psi, well above their operating minimum (7 psi). The grid panels are designed to fall from the ceiling when exposed to heat, allowing heat accumulation to activate the higher sprinkler in the ceiling cavity.

The room construction was placed under WFCi’s hood calorimeter to obtain heat release data and exhaust the heat from the fire test.

SAMPLE DESCRIPTION

At the 8’ height in the room/corner assembly, an Armstrong Prelude ML 15/16 steel grid was installed in the 8’×12’ ceiling with 2’×2’ grid spacing. With the grid system in place, ATI Decorative Laminates “Mirroflex” ceiling tiles (0.013” thick, White PVC) were installed and

numbered according to Figure 1. A 2" hole was placed in tile #11 to allow for the sprinkler to protrude through the ceiling and allow the tile to freely fall when exposed to heat.

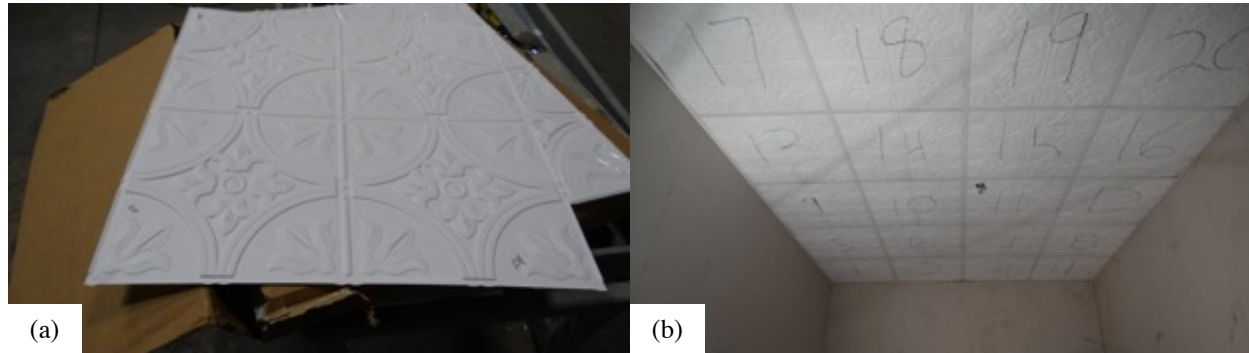


Figure 3. Tile images showing (a) 2'x2' tile and (b) installed ceiling.

TEST RESULTS

Testing of the ceiling grid assembly took place on June 4, 2019. Temperatures from the crib and ceiling TCs and heat release rate (in accordance with NFPA 286) were continuously monitored at 1 Hz throughout the test. These data as well as photographs and individual observations of the sample during and after each test are presented below.

Test Date & Time: 06/4/19, 10:50 AM

Test Apparatus: Standard room per UBC 26-3 under hood calorimeter

Laboratory Conditions: 19°C, 42% RH

The crib was ignited to begin the test ($t = 0$ s). Once the tiles heated up, they began to fall from the grid system and the time they fell is shown in Table 1. The upper sprinkler (in the ceiling cavity) activated at 1 m 30 s into the test, cooling the room. The water accumulated so the test could not be continued beyond 2 min, after which the test was terminated. Sixteen (16) of the 24 tiles had fallen during the test, primarily the ones closer to the wood crib. The lower sprinkler (below the ceiling grid) never activated. The fallen tiles did not appear to burn significantly other than those that fell right next to the wood crib.

Table 1. Time during test when tiles fell from grid system.

Tile 1 0:05	Tile 2 0:27	Tile 3 0:34	Tile 4 0:34-1:09
Tile 5 0:27	Tile 6 0:36	Tile 7 1:09-1:19	Tile 8 1:19-1:23
Tile 9 0:37	Tile 10 1:12	Tile 11 1:21	Tile 12 1:19-1:23
Tile 13 1:16	Tile 14 1:25	Tile 15 1:34*	Tile 16 X
Tile 17 1:27	Tile 18 X	Tile 19 X	Tile 20 X
Tile 21 X	Tile 22 X	Tile 23 X	Tile 24 X
Typically determined from video. If not visible from video, determined from still photos in a range. * Fallen after cavity sprinkler activated. X Did not fall during test			

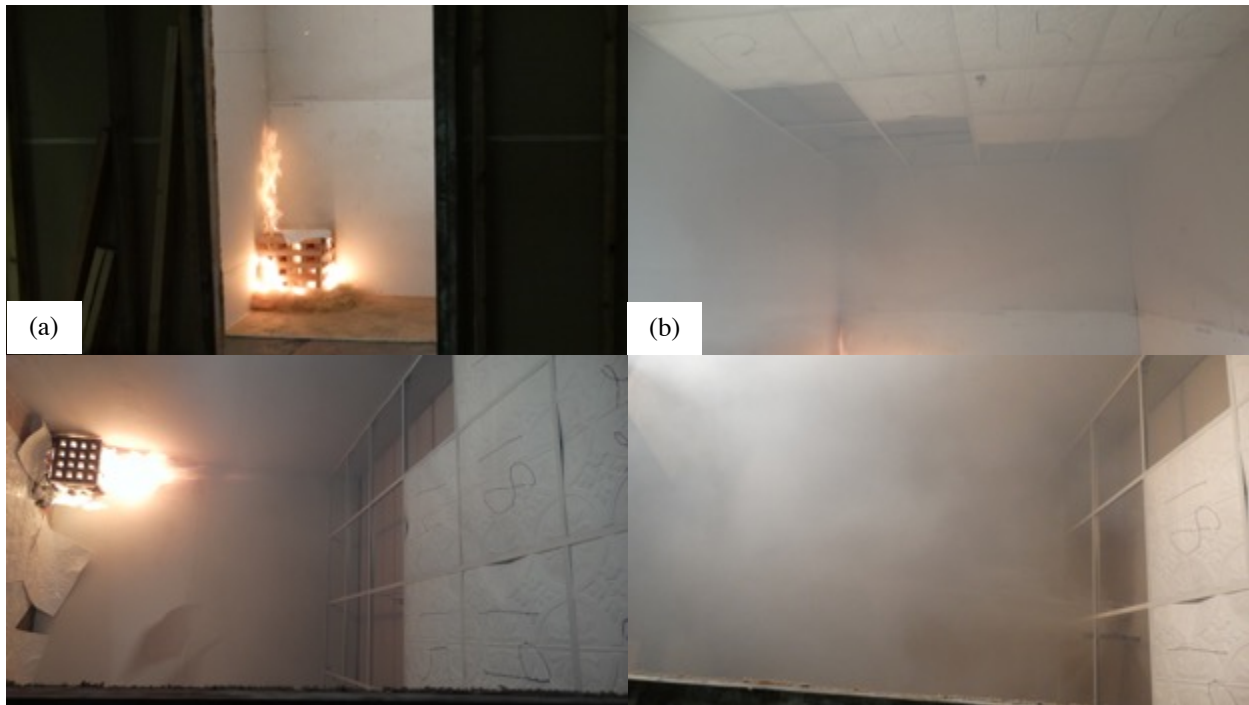


Figure 4. Test 1 showing (a) crib ignition – 19 s, (b) fallen tiles – 69 s, (c) continued fallen tiles – 89 s, and (d) activated sprinkler – 99 s.

Temperature Data

Figure 5 shows the various TCs recorded above the burner, at the ceiling, and in the ceiling cavity. The TCs above the burner (TC1-3) showed varying temperatures ranging between 200°C and 800°C before the ceiling cavity sprinkler activated cooling the room. The ceiling TC (TC4) initially rose to 100°C, but the ceiling cavity TC (TC5) soon (within 15 s) surpassed the ceiling TC once tiles started falling. The ceiling cavity TC reached approximately 200°C when the sprinkler activated.

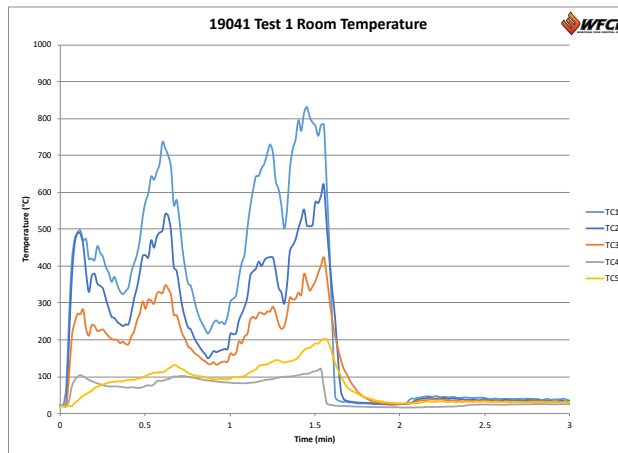


Figure 5. Test 1 temperature data.

Heat Release Data

Figure 6 shows the heat release data obtained from the hood calorimeter during the test. As the wood crib and excelsior started burning, the heat release gradually increased to approximately 100 kW before the cavity sprinkler activated at 1 m 30 s. The total heat release reached approximately 5500 kJ when the sprinkler activated.

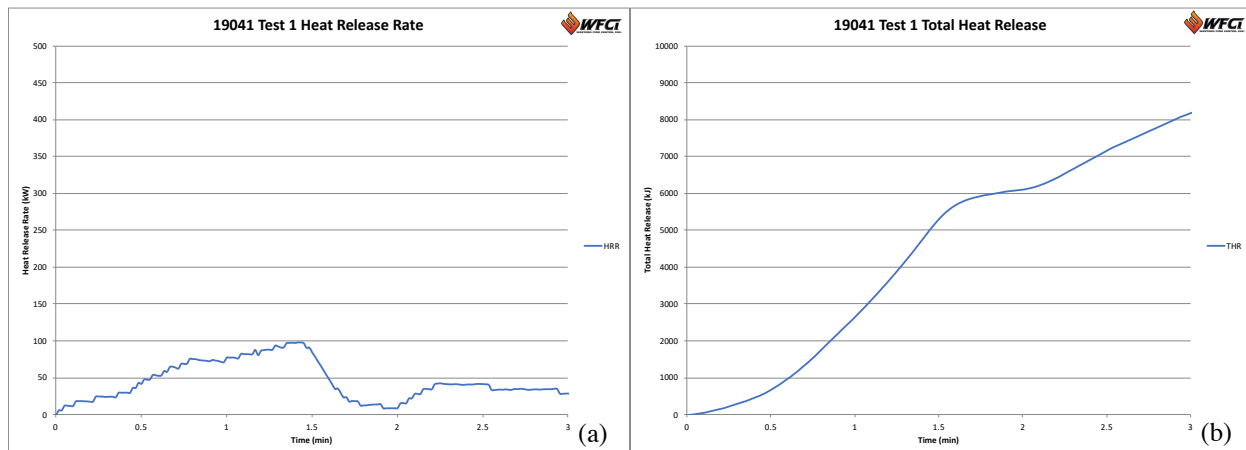


Figure 6. Test 1 data for heat release (a) rate and (b) total for the test.

Qualitative Discussion

The first ceiling tile directly above the wood crib (#1) fell within 5 s after igniting the burner and it fell directly on the crib (Figure 7), which started to melt and burn during the test. Other ceiling

tiles fell in the vicinity of the crib, but they did not flame significantly. Some melting did occur to those that fell closest to the crib (~1'). Two-thirds of the tiles had fallen during the test before the cavity sprinkler activated.



Figure 7. Test 1 post-test images showing (a-b) remaining ceiling tiles, (c) fallen tiles, and (d) removed crib.

SUMMARY

Overall, this modified UBC 26-3 test on the ceiling tile grid appeared to have met the desired result of showing that the tiles would fall from the ceiling, allowing for the sprinkler in the cavity to activate at 1 m 30 s. No flames extended to the extremities of the test area, nor was smoke development excessive.

SIGNATURES

Reviewed and Approved by,

A handwritten signature in black ink that reads "Mike White". The signature is written in a cursive style with a large initial "M".

Mike White

Laboratory Manager

Testing Performed by,

A handwritten signature in black ink that reads "Brent M. Pickett". The signature is written in a cursive style with a large initial "B".

Brent M. Pickett, Ph.D.

Technical Director

**WESTERN FIRE CENTER AUTHORIZES THE CLIENT NAMED HEREIN TO
REPRODUCE THIS REPORT ONLY IF REPRODUCED IN ITS ENTIRETY**

The test specimen identification is as provided by the client and WFCi accepts no responsibilities for any inaccuracies therein. WFCi did not select the specimen and has not verified the composition, manufacturing techniques or quality assurance procedures.