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Heat and Smoke Release of a Ceiling-Installed Speaker

Indicative testing conducted in accordance with the test methodology described in UL 2043, Fire test for heat and visible smoke release for discrete products and their accessories installed in air-handling spaces

Conducted For:

TRIAD SPEAKERS, INC.
15835 NE Cameron Blvd
Portland, OR 97230

WFCi Report #12051

Test Date: March 26, 2012

Report Issued: April 13, 2012

ACCREDITED
TL-180

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INTRODUCTION

This report summarizes the heat and smoke release testing of the Triad InCeiling Silver SealedRound speaker performed by Western Fire Center, Inc. (WFCi) for Triad Speakers, Inc. The speaker sample was tested in accordance with UL 2043, *Fire test for heat and visible smoke release for discrete products and their accessories installed in air-handling spaces*. The purpose of this test was to evaluate the heat and smoke release of the Triad speaker when subjected to a 60 kW gas burner for 10 min as described in UL 2043.

SUMMARY OF TEST METHOD

Testing was performed using the WFCi's hood calorimeter which allows for a variety of large and full-scale testing that records significant amount of data such as heat release, smoke release, and heat of combustion from a material. The hood calorimeter is consistent in design and operation with UL 2043. In this test series, the sample was tested under the hood calorimeter to obtain heat and smoke release data, which were recorded by a data acquisition computer at a rate of 1 Hz.

The sample holder consisted of a steel frame surrounded by ceramic board, dimensions and overall setup is shown in Figure 1. A 12" × 12" gas burner was placed 8" off the ground, directly below the speaker, which was positioned face-down within a ceramic board with a circular hole cut in the center to allow installation of the sample. Two metal braces were positioned under the speaker face to prevent the speaker from falling during the test.

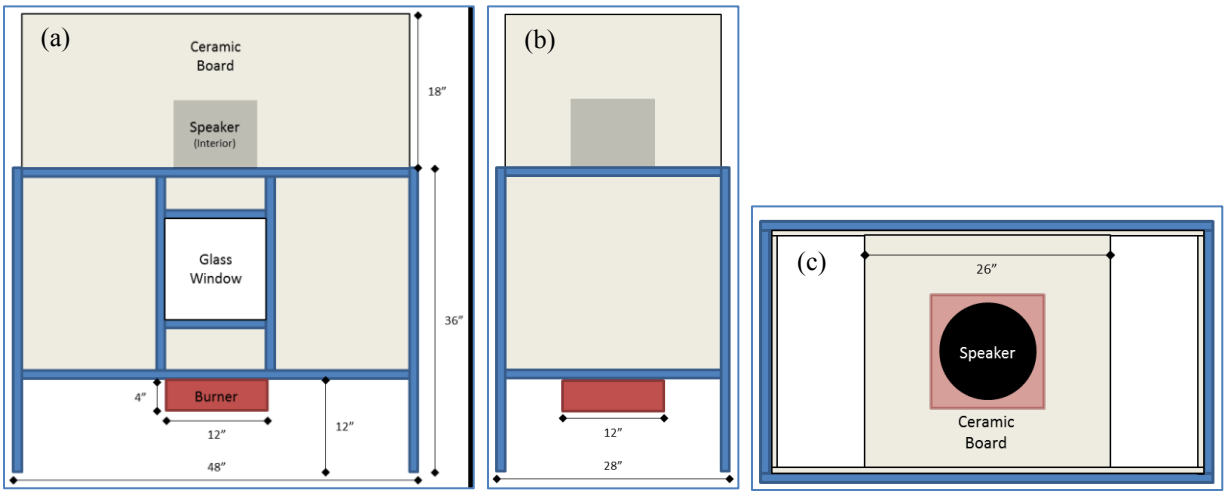

Figure 1. Sample holder for speaker test showing (a) front view, (b) side view, and (c) top view.

The test begins with ignition of the 60 kW gas burner, which continues to impinge on the ceiling-mounted speaker for 10 min. After this 10 min period, the sample is allowed to self-extinguish until all visible signs of combustion cease. Qualitative observations are recorded throughout the testing period. Acceptance will be judged as follows (UL 2043):

9 Acceptance Criteria

9.1 Each product specimen shall have the following properties when tested as described herein:

a) The peak rate of heat release (HRR_C) measured during each test shall be 100 kW or less.

b) The peak normalized optical density measured during each test shall be 0.50 or less.

c) The average normalized optical density (10 min test duration) shall be 0.15 or less.

SAMPLE DESCRIPTION

The speaker was received by WFCi on March 20, 2012 and tested in an as-received condition, with dimensions 8" high and 10 ¼" diameter (Figure 2). The sample was labeled as 'Triad InCeiling Silver SealedRound'.

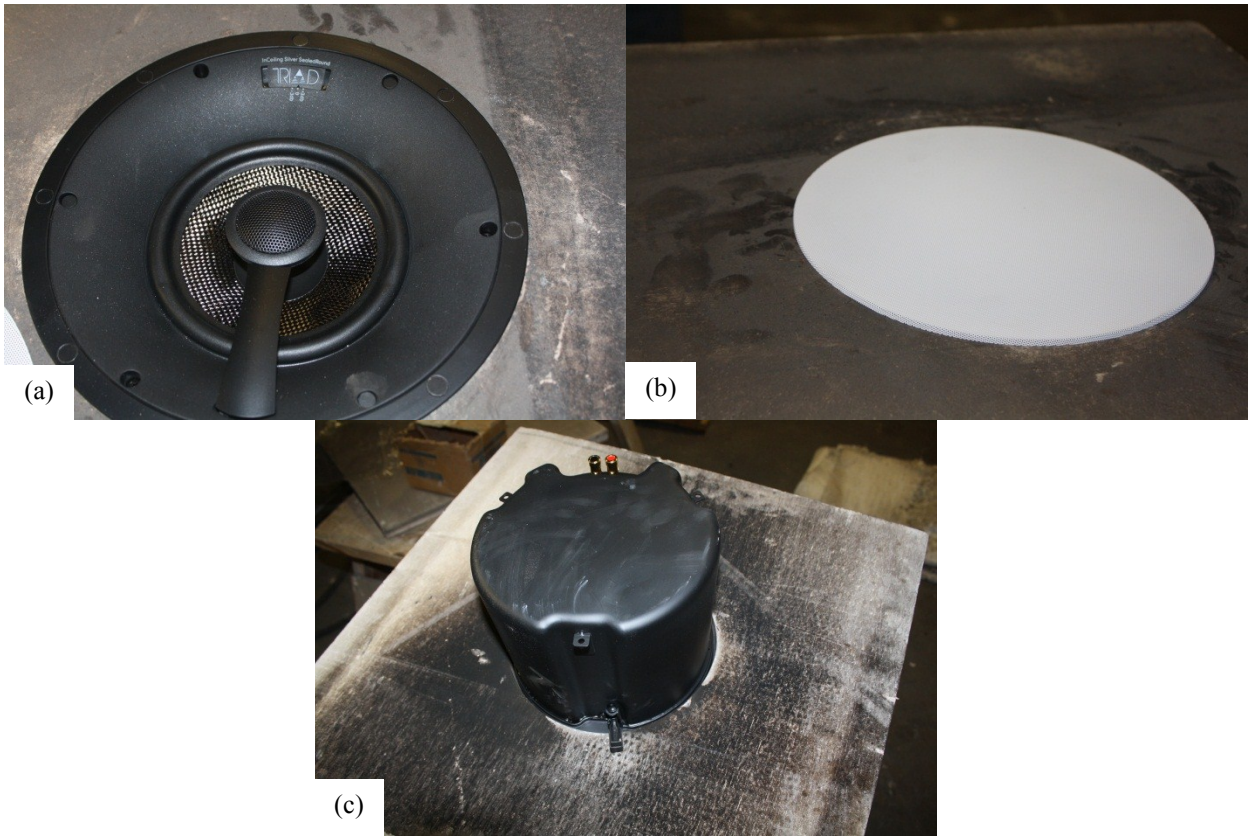

Figure 2. Sample before testing showing (a) speaker interior, (b) mesh grill, and (c) back side.

TEST RESULTS

Testing of the speaker sample took place on March 26, 2012 by WFCi personnel. Table 1 shows qualitative observations during the speaker test. Heat and smoke release as well as camera and video images were recorded throughout the test.

Test Date & Time: 03/26/12, 01:45 PM

Test Apparatus: Hood calorimeter with UL 2043 test assembly

Laboratory Conditions: 18°C, 32% RH

Table 1. Observations for speaker test.

Test Time (mm:ss)		**Event**
00:00		Start test – ignition of gas burner
00:30		Darkening face on bottom mesh grill
03:00		Black face on bottom grill
04:30		Black ring on grill due to dripping plastic of speaker interior (Figure 3a)
05:45		Spot drips forming on grill (Figure 3a)
08:10		Bubbles from spot drips
10:00		Cut fuel – No signs of flaming or glowing
10:20		Some plastic dripping onto burner (Figure 3b)
12:00		Terminate test – no signs of smoking

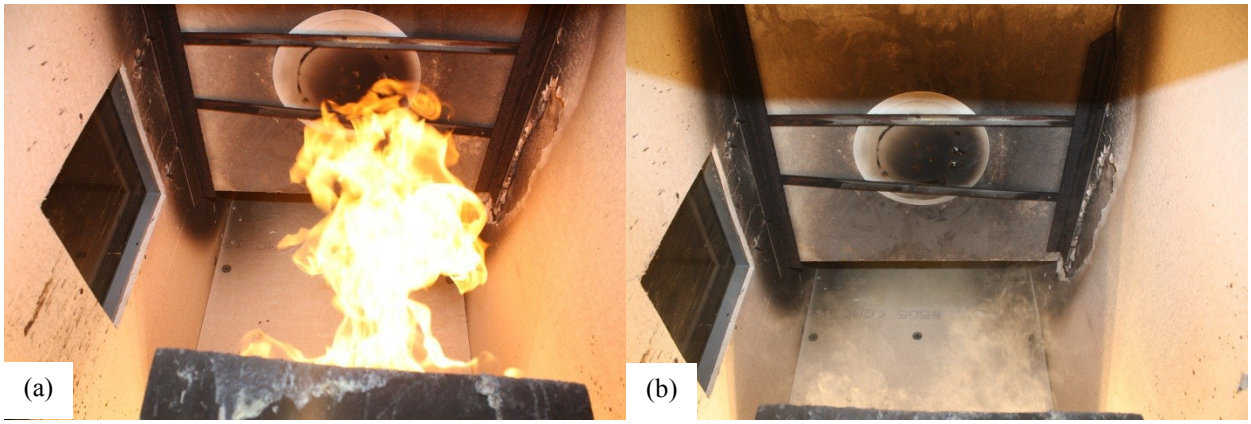

Figure 3. Sample during test showing (a) black ring and spot drips from grill bottom and (b) plastic drips after flaming period.

No visible combustion was observed from the speaker assembly, only melting of small amounts of plastic in the speaker interior. The composite cone appeared relatively unharmed, though it is assumed that some of the interior resin could have been affected (melted) due to the prolonged heat source.

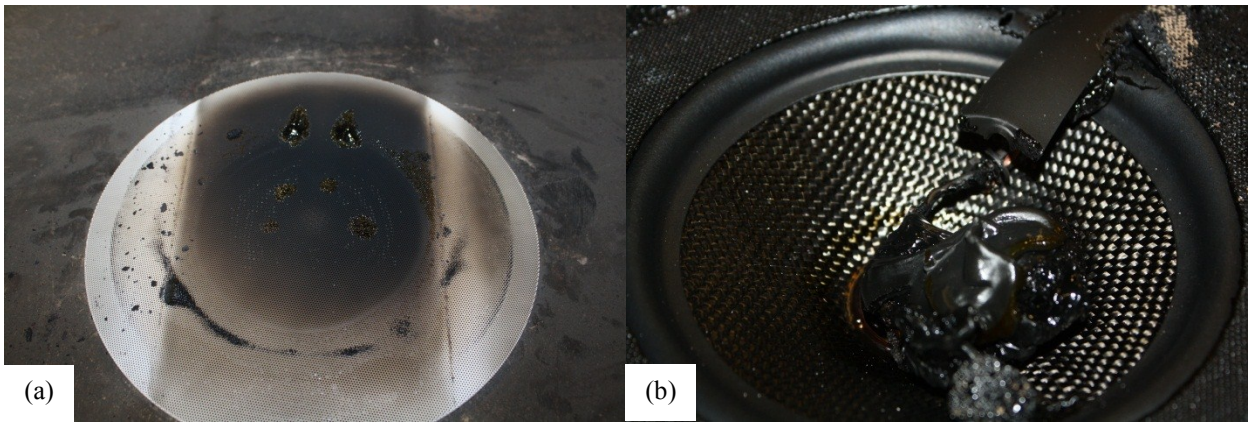

Figure 4. (a) Speaker mesh grill after test and (b) melted plastic and composite cone after test.

Heat Release Data

Hood measurements (e.g. flow rate, O_2 concentration) were used to determine the rate of heat release of the speaker assembly during the test, which was corrected (according to UL 2043) to account for the heat from the 60 kW gas burner. The corrected peak heat release was 21 kW (at 4 m, 40 s) with an average heat release of 3 kW throughout the 10 min test. The peak appears to be an aberration (Figure 5), but regardless, it is well below the 100 kW limit.

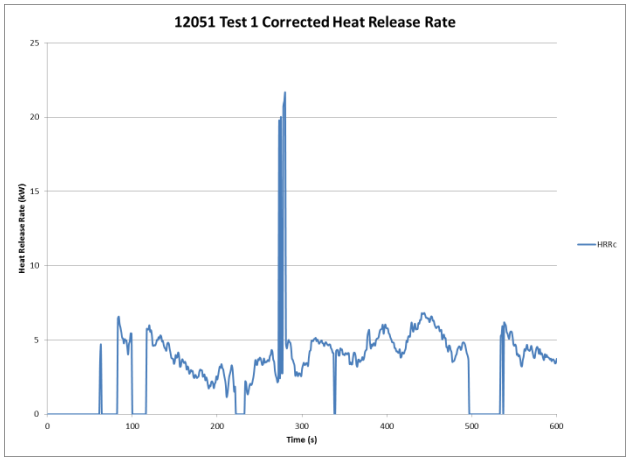

Figure 5. Corrected heat release for speaker test.

Smoke Release Data

The smoke release (rate and normalized optical density) was also determined according to UL 2043. The peak smoke release rate and normalized optical density were essentially zero (SRR < 0.01 m^2/s, $OD_N < 0.01$), lower than the 0.50 OD_N requirement, which continued throughout the test. The total smoke release for the 10 min test (integrated SRR curve) was 0.01 m^2. The average OD_N was very low ($< 1\times10^{-4}$), significantly lower than the 0.15 requirement.

SUMMARY

The Triad speaker system (InCeiling Silver SealedRound) as indicated passed the UL 2043 requirements for peak heat release below 100 kW, normalized optical density below 0.50, and average normalized optical density below 0.15.

SIGNATURES

Testing performed by,

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Technical Director

Reviewed and Approved by,

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Laboratory Manager