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CONTRACT SERVICES REPORT

SPRINKLER HEAD DEPLOYMENT TESTS IN FLEXIBLE SPRINKLER HOSES FOR USE IN COMMERCIAL SUSPENDED CEILINGS

Prepared For:

**FlexHead Industries Inc.
56 Lowland Street
Holliston, MA 01746**

Project Identifier: 3024642

Class: 1637

Date: September 20, 2005

Authorized by:


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**SPRINKLER HEAD DEPLOYMENT TESTS IN FLEXIBLE SPRINKLER HOSES
FOR USE IN COMMERCIAL SUSPENDED CEILINGS**

From
FlexHead Industries Inc.
56 Lowland Street
Holliston, MA 01746

I INTRODUCTION

- 1.1 FlexHead Industries Inc. requested an examination to test and observe the effect of the discharge forces on a FlexHead hose and ceiling bracket system, installed in a typical intermediate suspended ceiling grid system during the discharge and the subsequent operation of an automatic sprinkler in a commercial suspended ceiling.
- 1.2 This Report may be reproduced only in its entirety and without modification.

II DESCRIPTION

- 2.1 Sprinkler head discharge tests were conducted at the FM Global Research Campus, West Glocester, RI in the "Enclosure Laboratory". The dimensions are as follows:
- 19 ft 4 in. x 20 ft 0 in. x 10 ft 0 in. (5.89 x 6.09 x 3.05 m)
 - Wood framed room with 1/2 in. (12.7 mm) gypsum on the interior and exterior walls.
 - 7 ft 6 in. (2.28 m) from floor to suspended ceiling.
 - 2 ft 6 in. (0.76 m) concealed space, from suspended ceiling to wood supports.
- 2.2 The following items/materials were used in these tests:
- 2.2.1 **Flexible Hose Model #2072:** FlexHead Industries, Inc. 6 ft (1.8 m) long hose assembly as Approved for use in suspended ceilings by FM and Listed by UL. This 6 ft (1.8 m) long flexible sprinkler hose is a one piece assembly with a 1/2 in. NPT threaded connection at the outlet. The hose is welded to a stainless steel nipple and the 1 in. inlet nipple. This hose model has a rated working pressure of 175 psi (1205 kPa). The FlexHead Model #2072 represents the longest approved length of flexible hose per FM approval standard 1637 "Flexible Sprinkler Hose with Fittings" and would represent the worst case scenario in terms of discharge forces caused by sprinkler head activation.

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2.2.2 **Bracket MP24BKT:** FlexHead Industries, Inc. ceiling bracket for use in suspended ceilings is Approved by FM and Listed by UL for the flexible hose Model #2072.

2.2.3 **Model V2708 Automatic Sprinkler**
Victaulic Company of America, Pendant, 3 mm Bulb Type, K5.6, 1/2" NPT, Chrome Plated, 155° F (68°C)

2.2.4 **Suspended Ceiling:**

Ceiling Tiles: USG Ceiling, Eclipse™ 76575, USG Interiors, Inc. Chicago, IL 60606. Acoustical panels, White, Square Edge, Eclipse ClimaPlus, measuring 3/4 in. x 2 ft x 2 ft nominal. Acoustical Properties: NRC .70 in accordance with ASTM C423-99a. CAC minimum 35 in accordance with ASTM E1414-00.

T-Grid Material:

- Hdg Base White. Chicago Metallic manufactured in accordance to ASTM C635.
- 4 in. (102 mm) Tee: Number 213-01H
- 2 ft (0.6 m) Runner: Number 229-01H
- 12 ft (3.6 m) Runner: Number 211-01H

This suspended ceiling represents a common commercial intermediate grid configuration manufactured to ASTM C635 and installed per ASTM C636 found in commercial applications.

2.2.5 **Lights and Air Diffusers**
2 ft x 4 ft (0.6 x 1.2 m) Lights and 2 ft x 2 ft (0.6 x 0.6 m) Air Diffusers were placed in the T-grid ceiling but were not operational as they would not affect the outcome of the testing.

2.2.6 **Hard Piping**

Branch Line Piping: 1 in. Schedule 40 manufactured by Mittal Canada, Inc. The pipe was marked as follows: ASTM A53.F.A. 1 in. S40 21 ft 0 in. FM 2005-03-22

Main Piping: 2 in. Schedule 40 manufactured by Mittal Canada, Inc. The pipe was marked as follows: ASTM A53.F.A. 2 in. S40 21 ft 0 in. FM 2005-05-20

2.3 FlexHead Industries, Inc. hired contractors for the following services:

- Fire Suppression Systems of New England from Pawtucket, RI installed the branch line and main hard piping with hangers as identified in Section 2.2.6 pursuant to NFPA 13 requirements. The piping was fed to the space above the suspended ceiling. Flexible hoses were then connected from the hard piping to sprinklers below the suspended ceiling in accordance with the manufacturer's installation instructions.
- Central Ceiling Contracting, Inc. installed the suspended ceiling to ASTM C636 and also installed lighting and air diffusers identified in Section 2.2.4 and 2.2.5.
- DP Productions of Hempstead, NH were contracted to video the room during all the tests.

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III SPRINKLER HEAD DEPLOYMENT TEST

- 3.1 Sprinkler head discharge tests were conducted in a 19 ft 4 in. x 20 ft 0 in. (5.89 x 6.09 m) room with a commercial tile suspended ceiling at a height of 7 ft 6 in. (2.28 m). Four sprinklers were equally spaced in the ceiling and were connected to FlexHead flexible hoses mounted on hose brackets. These tests were conducted on August 24, 2005 at FM Global.
- 3.2 This test and conditions were developed by FlexHead Industries, Inc. to document the effect of any force created by a sprinkler head discharge on the maximum Approved length FlexHead hose, which is currently 6 ft (1.8 m) long, and bracket system attached to an intermediate suspended ceiling grid system, having a configuration with wire spacing every 4ft (1.2 m). The ceiling grid was manufactured per ASTM C635 and installed per ASTM C636.
- 3.3 In order to demonstrate a suspended grid system's ability to support the flexible sprinkler connection in an extreme condition, all ceiling tiles (with the exception of the perimeter tiles and the tiles at the sprinkler heads), diffusers and lights were removed from the grid system in Test Nos. 4, 5 & 6 listed below. It is well known that the strength of a suspended ceiling system is greatly diminished by removing the ceiling tiles. This was done to create an extreme condition that would not be normal in the field.
- 3.4 The inlet end of the flexible hoses were screwed into the hard piping, as four hose assemblies were placed in the suspended ceiling. Victaulic Model V2708 sprinklers were screwed into the outlet of the flexible hoses. Each hose was attached to a Bracket MP24BKT and attached to the T-grid pursuant to manufacturer's installation instructions.
- 3.5 The piping system was pressurized to 175 psi (1205 kPa) for each test. The sprinklers were activated by a Bunsen burner flame. After the activation the water pressure dropped and was immediately raised to 175 psi (1205 kPa) for the test duration.

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3.6 The following tests were conducted:

Test No.	Sprinkler Head Activated	Ceiling Tile Configuration	Remarks
1	A	All ceiling tiles in place.	Very little movement of the flexible hose and no movement of the bracket.
2	A	All ceiling tiles in place.	Very little movement of the flexible hose and no movement of the bracket.
3	A and B	All ceiling tiles in place.	Very little movement of the flexible hose and no movement of the bracket.
4 and 5	B	All interior ceiling tiles, lights and air diffusers were removed except the tiles at the sprinkler head and perimeter of room.	Very little movement of the flexible hose and no movement of the bracket.
6	A and B	All interior ceiling tiles, lights and air diffusers were removed except the tiles at the sprinkler head and perimeter of room.	Very little movement of the flexible hose and no movement of the bracket.

3.7 At the conclusion of each test, the pressure was shut off and the sprinkler head replaced with another Model V2708 head.

IV EXAMINATION

The flexible sprinkler hose used during this series of tests were examined and found to represent the design which is Approved by FM Approvals for use in commercial suspended ceilings in a 175 psi (1205 kPa) fire protection system.

V REMARKS

- 5.1 The tests conducted at FM Global in the "Enclosure Laboratory" as described in this Report, were witnessed by a representative of FM Approvals.
- 5.2 All data remains on file at FM Approvals along with other documents and correspondence applicable to this program.
- 5.3 The flexible sprinkler hose described within the scope of this Report was installed in accordance with the manufacturer's instructions.

VI CONCLUSION

- 6.1 Based on these tests stated above, the activation and discharge of a sprinkler head caused very little movement in this system. As the sprinkler head was activated, very little movement in this system is seen during the tests performed with a complete ceiling system as well as during the tests performed with a partial ceiling system. There was no detrimental effect on the ceiling system. The hose remained attached to the bracket; and the bracket remained attached to the ceiling grid keeping the sprinkler head in the desired position during the head activation
- 6.2 This Report documents those tests and is not an Approval Report. The test series described is not considered by FM Approvals as a substitute for an Approval examination. It should be noted that the flexible sprinkler hose Model # 2072 is Approved by FM Approvals for use in fire protection systems. The bracket MP24BKT is Approved for use with a FlexHead flexible hose in a ceiling grid system.

TESTS WITNESSED BY: Paul Conroy of FM Approvals and
Peter MacDonald of FlexHead Industries, Inc.

TESTS CONDUCTED AT: FM Global on August 24, 2005

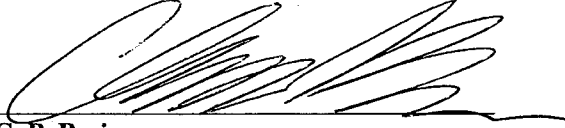
TESTS CONDUCTED BY: FM Global personnel

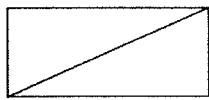
ATTACHED: Ceiling Plan

PROJECT DATA RECORD: Project Identifier: 3024642

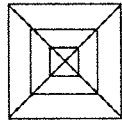
REPORT BY: **REVIEWED BY:**


P. J. Conroy
Engineer - Hydraulics Group

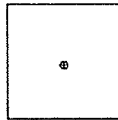

C. P. Bosio
Technical Team Manager - Hydraulics Group



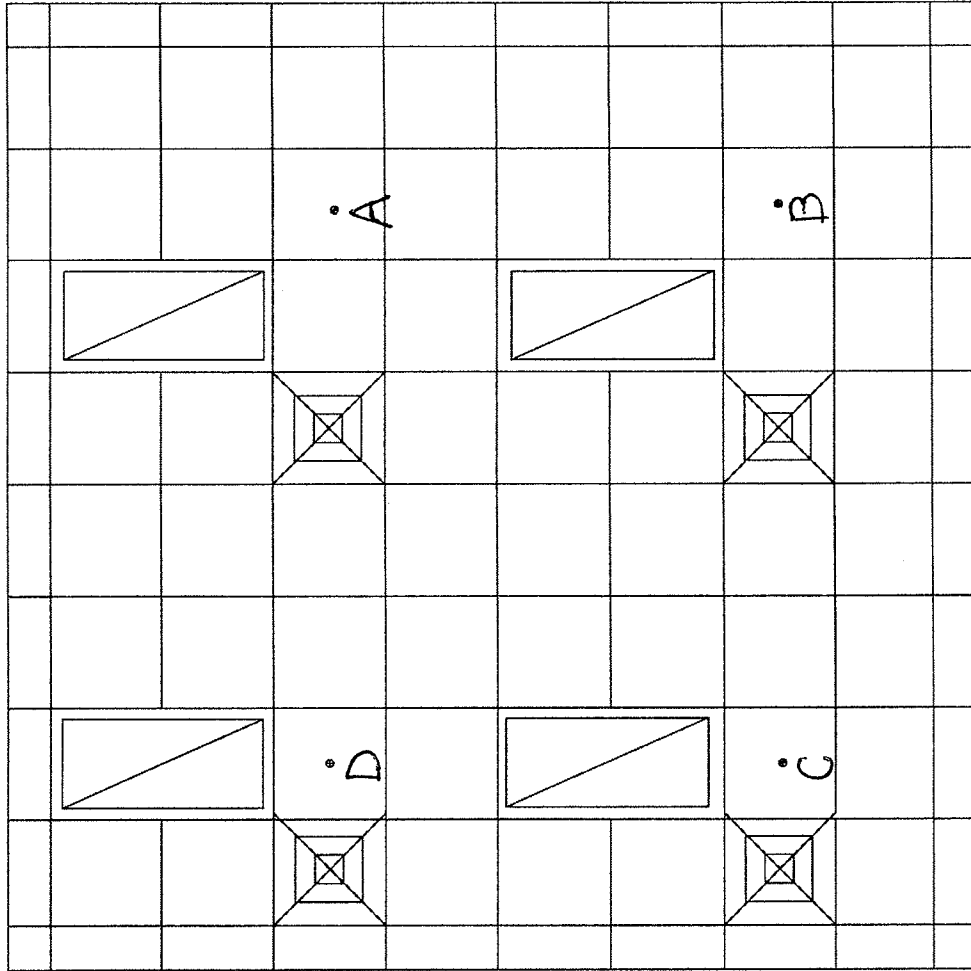
Light



Diffuser



Sprinkler



REV	DATE	DESCRIPTION

FlexHead Head Deployment Test
 Reflective Ceiling Plan



Flex
 508-893-6020
 Fax
 508-893-9596

Drawn By: JEF

JOB No:

SHEET 1 OF 1