APPROVAL REPORT

MODEL WF-WCO, FLEXIBLE SPRINKLER HOSE WITH FITTINGS FOR CLEAN ROOMS

Prepared For:

CLEANPAK International
11241 S. E. Highway 212
Clackamas, OR 97015

J.I. 3014309
Class 1637
June 17, 2002

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FM APPROVALS
3014309

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I INTRODUCTION

1.1 CLEANPAK International requested an examination for possible FM Approval of their flexible sprinkler hose with fittings for providing a connection to automatic sprinklers in clean rooms. The following models are listed below:

Model	Hose lengths
WF-WCO (weld free model)	4 and 6 ft (1.2 and 1.8 m)

1.2 This Report may be freely reproduced only in its entirely and without modification.

1.3 **Standards**:

Title	Class Number	Date
Approval Standard for Flexible Sprinkler Hose with Fittings	1637	May 2000

1.4 **Listings:** The product will appear in the Approval Guide as follows:

Flexible Sprinkler Hose with Fittings for Clean Rooms

Model	NPT	Hose Assembly length ft (m)	Equivalent length of 1 in. schedule 40 pipe ft (m)
WF-WCO-N-50-C304L	½ in.	4 ft (1.2 m)	15.4 ft (4.7 m)
WF-WCO-N-50-C316L	½ in.	4 ft (1.2 m)	15.4 ft (4.7 m)
WF-WCO-A-50-C304L	½ in.	4 ft (1.2 m)	15.4 ft (4.7 m)
WF-WCO-A-50-C316L	½ in.	4 ft (1.2 m)	15.4 ft (4.7 m)
WF-WCO-N-72-C304L	½ in.	6 ft (1.8 m)	21.4 ft (6.5 m)
WF-WCO-N-72-C316L	½ in.	6 ft (1.8 m)	21.4 ft (6.5 m)
WF-WCO-A-72-C304L	½ in.	6 ft (1.8 m)	21.4 ft (6.5 m)
WF-WCO-A-72-C316L	½ in.	6 ft (1.8 m)	21.4 ft (6.5 m)

Cleanpak Model WF WCO: 1 in. nominal dia. flexible sprinkler hose for providing a connection to automatic sprinklers in clean rooms. The WCO Series is constructed of extruded seamless vacuum-formed white tube of open-pitch convoluted PTFE, protected by stainless steel braid. Available with and without armor covering. Approval is limited for use in clean room ceilings manufactured by CLEANPAK International.

WF = Weld Free N = No Armor covering A = Armor covering
50 = Live length in inches between collars 72 = Live length in inches between collars
C304L/C316L = Stainless Steel alloy for the couplers on the ends of the hose.

II DESCRIPTION

2.1 The WF WCO model has a nominal I.D. of 1.2 inch and a nominal O.D. of 1.5 in. The WF-WCO flexible hoses consists of a 1.25 inch (31.8 mm) nominal diameter PTFE corrugated hose with stainless steel wire braid jacket crimped to a barb on a 1.25 inch (31.8 mm) nominal diameter stainless steel nipple with male thread at the inlet and a 1 in. (25.4 mm) nominal diameter stainless steel nipple with ½ in. NPT female thread (suitable for connection to a ½ in. nominal diameter automatic sprinkler) crimped to the outlet end of the hose. Attached to the outlet nipple is an aluminum collar with two button head cap screws for attaching the product to the clean room ceiling bracket.

2.2 This model has a rated working pressure of 175 psi (1205 kPa).

2.3 This examination is being conducted for the reasons stated below:

- The test method that is used to determine head loss was changed.
- Several bends are placed on the hose during the current test method to determine the maximum friction loss value.

2.4 Refer to the Reports listed below for further information regarding the currently Approved models.

Job Identification	Report Date	Project Description
0Z4A4.AH	October 20, 1995	Flexible Sprinkler Hose with Fittings for Clean Rooms
3003152	September 23, 1999	Flexible Sprinkler Hose with Fittings for Clean Rooms. Model Cleanpak WF WCO Flexible Sprinkler Assembly

III EXAMINATION AND TESTS

3.1 Samples, as detailed below, were submitted for examination and testing. The samples were considered to be representative of the product line and were examined, tested, and compared to the manufacturer's drawings. All data remains on file at FM Approvals along with other documents and correspondence applicable to this program.

3.2 Tests were conducted on 4 and 6 ft (1.2 and 1.8 m) lengths of flexible hose.

3.3 FRICTION LOSS TEST

In order to determine the friction loss of the flexible hose, flow measurements of a sprinkler with a nominal discharge coefficient (K-factor) of 5.6 gal/min/(psi)$^{1/2}$ were taken at 10 psi (69 kPa) increments from 15 to 175 psi (103 to 1205 kPa). The test was repeated with the sprinkler mounted to each of the flexible hoses being evaluated. The model listed below was tested with the sprinkler attached to the hose, and the hose extended straight or bent at its maximum bend radius to achieve the maximum friction loss. The average discharge coefficient values were then used to calculate the theoretical length of nominal 1 in. diameter schedule 40 sprinkler pipe. Each model has an orifice size of 1/2 in. The results are listed below:

Model	Hose and fitting length ft (m)	Tested position	Equivalent length of 1 in. schedule 40 pipe ft (m)
WF-WCO-N-50-C304L	4 ft (1.2 m)	Straight	11.3 ft (3.4 m)
WF-WCO-N-50-C304L	4 ft (1.2 m)	Bent at its maximum bend radius	15.4 ft (4.7 m)
WF-WCO-N-72-C304L	6 ft (1.8 m)	Straight	13.7 ft (4.2 m)
WF-WCO-N-72-C304L	6 ft (1.8 m)	Bent at its maximum bend radius	21.4 ft (6.5 m)

IV MARKINGS

Stamped onto the inlet collar is the following pertinent information:

- CLEANPAK
- The Model Number
- Lot Number
- Maximum Working Pressure: MWP 175 PSI
- The FM Approval Mark

V REMARKS

The models must be installed in accordance with the manufacturer's installation instructions.

VI FACILITIES AND PROCEDURES AUDIT

6.1 The flexible sprinkler hose models described in this Report are manufactured at the following location. This site has been audited, and is included in the FM Approvals Facilities and Procedures Audit program.

6.2 This manufacturing site is subject to follow-up audit inspections. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this Report.

VII MANUFACTURER'S RESPONSIBILITIES

7.1 Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation Section of this Report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.

7.2 Limitations

7.2.1 These models are only Approved for providing a connection between water supply piping to automatic sprinklers in clean rooms.

7.2.2 These models are not Approved for use in commercial suspended ceilings.

VIII DOCUMENTATION

The drawings have not changed and are described in the Approval Reports stated in Section 2.5.

IX CONCLUSION

The models described in this Report meet FM Approval requirements. Approval is effective when the Approval Agreement is signed by CLEANPAK International and received by FM Approvals.

TESTS AND EXAMINATION BY: P.J. Conroy

PROJECT DATA RECORD: 3014309

ORIGINAL TEST DATA: 3003152

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