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**Project 04NK13848**

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REPORT

on

SPRINKLERS, AUTOMATIC AND OPEN

Viking Corporation  
Hastings, MI

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G E N E R A LOBJECT:

The object of this investigation was to determine the \*compliance of the Viking Model M utilizing the 3.0 mm glass bulb \*manufactured by GmbH Job with the Standard For Automatic Sprinklers For Fire Protection Service, UL 199, applicable requirements.

PLAN:

The following tests were conducted to evaluate the Model M \*glass bulb sprinkler with the 3.0 mm bulb as standard, quick response, and extended coverage sprinklers.

Since the Model M glass bulb sprinkler is currently Listed with an 8 mm glass bulb, only the following tests were conducted to evaluate the 135°F quick response, upright and pendent, standard and large orifice sprinklers and are recorded in Test Record No. 1.

1. Examination of Samples
2. Thermal Shock
3. Leakage and Hydrostatic Strength
4. 30 Day Leakage
5. Water Hammer
6. Operation, Bath
7. Operation, Air-Oven
8. High Temperature Uncoated
9. Impact Resistance
10. Vibration
11. Operation, Hang-Up
12. Sensitivity
13. Strength of Heat Responsive Element
14. Assembly Load

The following tests were conducted on the VK606, 8.0 K-Factor Horizontal and Recessed Horizontal Sidewall Extended Coverage sprinklers. These sprinklers are identical to the currently Listed VK606, 8.0 K Horizontal and Recessed Horizontal Sidewall Extended Coverage sprinklers except for the modified deflector. The results for the following tests are recorded in Test Record No. 29.

1. Examination of Samples
2. Operation - Lodgment
3. Sensitivity-Room Heat for EC Sprinklers
4. Operation Cold - Soldering
5. Wall Wetting for EC Sprinklers
6. Fire Test for EC Sprinklers
7. Flow Endurance
8. Stress Corrosion Cracking - Brass Parts

D E S C R I P T I O NPRODUCT COVERED:

Models M, M-5 and A-1 sprinklers, utilizing the **3.0** mm glass \*bulb manufactured by Job GmbH for a maximum pressure of 175 psig for wet systems as follows:

<u>Model</u>	<u>Description</u>	<u>Rating, °F</u>
M	Standard, 1/2 in. orifice in the upright and pendent positions for use as a quick response sprinkler	135, 155, 175, 200, 286
M	Large, 17/32 in. orifice in the upright and pendent positions for use as a quick response sprinkler	135, 155, 175, 200, 286
M	Chrome or nickel plated to be installed as indicated by deflector, for use as a quick 1/2 in. orifice	135, 155, 175, 200, 286
M	Vertical and horizontal sidewall, 1/2 in. orifice, for use as a quick response sprinkler	135, 155, 175, 200, 286
M	Wax coated (corrosion resistant) for use as a standard sprinkler	135, 155, 175, 200, 286
M-5	Horizontal sidewall, 1/2 in. orifice, ordinary hazard quick response sprinkler	135, 155, 175, 200, 286

(Table Cont'd)

Model	Description	Rating, °F
M	Lead coated (corrosion resistant) for use as a quick response sprinkler 135,155,175,200,286	
M	Polyester coated (corrosion resistant) for use as a quick response sprinkler 135,155,175,200,286	
M	Teflon coated (corrosion resistant) for use as a quick response sprinkler 135,155,175,200,286	
M	Extended coverage horizontal sidewall 1/2 and 17/32 in. orifice sizes, for area coverages, flow rates, and installations outlined on Page 3A	155
M	Extended coverage pendent 1/2 and 17/32 in. orifice sizes, for area coverages, flow rates, and installations outlined on Page 3A	155, 175
M	Recessed pendent for use as a quick response sprinkler utilizing the F-1 escutcheon	135, 155
M	Extended coverage recessed pendent, 1/2 and 17/32 in. orifice, sizes for area coverages, flow rates, and installation, outlined on Page 3A.	135, 155, 175
M	Quick response extended coverage horizontal sidewall, 1/2 and 17/32 in. orifice, for room sizes and flow rates outlined on Page 3B	135, 155
M	Quick response extended coverage pendent, and recessed pendent 1/2 and 17/32 in. orifice, for room sizes and flow rates outlined on Page 3B	135, 155
A-1	Concealed for use as a quick-response sprinkler, 1/2 in. orifice	155
M	Extended Coverage recessed horizontal sidewall 17/32 in. orifice size, for area coverages, flow rates, and installations as outlined on Page 3A	155, 175
M	Quick Response extended coverage recessed horizontal sidewall 17/32 in. orifice size, for area coverages, flow rates, and installations as outlined on Page 3B	135, 155, 175

<u>SIN</u>	<u>OLD MODEL</u>	<u>STYLE</u>	<u>K-FACTOR</u>	<u>RESPONSE TYPE</u>
VK100	M	Upright	5.6	SR
VK200	M	Upright	8.0	SR
VK001	M	Upright	2.8	SR
VK002	M	Upright	4.2	SR
VK102	M	Pendent	5.6	SR
VK202	M	Pendent	8.0	SR
VK003	M	Pendent	2.8	SR
VK004	M	Pendent	4.2	SR
VK104	M	HSW	5.6	OR
VK116	M-5	HSW	5.6	SR
VK015	M	HSW	2.8	SR
VK104	M	HSW	5.6	SR
VK106	M	VSW	5.6	SR
VK118	M	Conventional	5.6	SR
VK120	M	Conventional	8.0	SR
VK124	M High Pressure	Pendent	5.6	SR
VK021	M High Pressure	Upright	2.8	SR
VK122	M High Pressure	Upright	5.6	SR
VK023	M High Pressure	Pendent	2.8	SR
VK536	M	Pendent	11.5	SR
VK300	M	Upright	5.6	QR
VK325	M	Upright	2.8	QR
VK327	M	Upright	4.2	QR
VK350	M	Upright	8.0	QR
VK302	M	Pendent	5.6	QR
VK329	M	Pendent	2.8	QR
VK331	M	Pendent	4.2	QR
VK352	M	Pendent	8.0	QR
VK333	M	HSW	2.8	QR
VK304	M	HSW	5.6	QR
VK442	M-5	HSW	5.6	QR
VK306	M	VSW	5.6	QR
VK310	M	Conventional	5.6	QR
VK354	M	Conventional	8.0	QR
VK130	N-2	Upright	5.6	SR
VK132	N-2	Pendent	5.6	SR
VK606	M	HSW	8.0	QR

STANDARD RESPONSE - (SR) - EXTENDED COVERAGE SPRINKLERS - LIGHT HAZARD

SIN	Type	Max Width (A) Ft	Max Length (B) Ft	Min Flow GPM	Nom K-Factor	Distance Below Ceiling In.	System Operating Pressure, psig	Temp Rating, °F
VK625*#	Conc. Pendent	20	20	40	5.6	-	175	165
VK627*#, +	Conc. Pendent	20	20	40	8.0	-	175	165
VK186	Dry Pendent	20	20	40	5.6	-	175	155,175
VK605**	HSW, Rec. HSW	16	20	32	5.6	6 to 12	250	155
VK600	Pendent	20	20	40	5.6	-	175	155,175
VK604	Pendent, Rec. Pendent	20	20	40	5.6	-	250	155,175**
VK602	Pendent, Rec. Pendent	20	20	40	8.0	-	175	155,175
VK608	Pendent, Rec. Pendent	20	20	40	11.2	-	175	155
VK188	Rec. Dry HSW	16	20	32	5.6	4 to 6	175	155,175
VK186	Rec. Dry Pendent	20	20	40	5.6	-	175	155,175
VK196*	Dry Concealed Pendent	18	18	33	5.6	-	175	155
VK196*	Dry Concealed Pendent	20	20	40	5.6	-	175	155

\*Utilizes 135°F coverplate.

#Utilizes 165°F coverplate.

\*\*Utilizes E-1 escutcheon only.

+Available with 1/2 or 3/4 in. N.P.T.

(A)-Dimension of wall on which sprinkler is installed.

(B)-Dimension perpendicular to wall on which sprinkler is installed.

**QUICK RESPONSE (QR) - EXTENDED COVERAGE SPRINKLERS - LIGHT HAZARD****Sloped Ceilings**

<b>SIN</b>	<b>Type</b>	<b>Max Width (A) Ft</b>	<b>Max Length (B) Ft</b>	<b>Min Flow GPM</b>	<b>Nom K-Factor</b>	<b>Maximum Ceiling Incline In./Ft</b>	<b>Distance Below Ceiling In.</b>	<b>Temp Rating, °F</b>
VK605+	HSW, Rec. HSW	16	16	26	5.6	4/12	4 to 6	155
VK605+	HSW, Rec. HSW	16	18	29	5.6	4/12	4 to 6	155
VK605+	HSW, Rec. HSW	16	20	32	5.6	4/12	4 to 6	135,175
VK612+	HSW, Rec. HSW	16	16	26	5.6	4/12	4 to 6	155
VK612+	HSW, Rec. HSW	16	18	29	5.6	4/12	4 to 6	155
VK612+	HSW, Rec. HSW	16	20	32	5.6	4/12	4 to 6	135,175

+For use below smooth, flat, sloped ceilings with pitches between 2/12 to 4/12 (in./in.) at the minimum flow rates specified. The calculation to determine the design area in accordance with NFPA 13 shall not be credited for the quick response feature and not be debited for installation with slopes with pitches greater than 2/12 (in./in.).

**Smooth Horizontal Ceilings (Pitches Not Greater Than 2/12 in./in.)**

<b>SIN</b>	<b>Type</b>	<b>Max Width (A) Ft</b>	<b>Max Length (B) Ft</b>	<b>Min Flow GPM</b>	<b>System Working Pressure, psig</b>	<b>Nom K-Factor</b>	<b>Distance Below Ceiling In.</b>	<b>Temp Rating, °F</b>
VK625*#	Conc. Pendent	16	16	26	175	5.6	-	165
VK625*#	Conc. Pendent	18	18	33	175	5.6	-	165
VK627*#,++	Conc. Pendent	16	16	26	175	8.0	-	165



VK627*#, ++	Conc. Pendent	18	18	33	175	8.0	-	165
VK188	Dry HSW	16	16	26	175	5.6	4 to 6	155,175
VK188	Dry HSW	16	18	29	175	5.6	4 to 6	155,175
VK188	Dry HSW	16	20	32	175	5.6	4 to 6	155,175
VK186	Dry Pendent, Rec. Pendent	16	16	26	175	5.6	-	155,175
VK186	Dry Pendent, Rec. Pendent	18	18	33	175	5.6	-	155,175
VK605	HSW, Rec. HSW	16	16	26	175	5.6	6 to 12	155
VK612	HSW, Rec. HSW	16	16	26	250	5.6	6 to 12	155
VK605	HSW, Rec. HSW	16	18	29	175	5.6	6 to 12	155
VK612	HSW, Rec. HSW	16	18	29	250	5.6	6 to 12	155
VK605	HSW, Rec. HSW	16	20	32	175	5.6	6 to 12	135,175
VK612	HSW, Rec. HSW	16	20	32	250	5.6	6 to 12	135,175
VK606	HSW, Rec. HSW	16	16	26	175	8.0	4 to 12	135,155,175
VK606	HSW, Rec. HSW	16	18	29	175	8.0	4 to 12	135,155,175
VK606	HSW, Rec. HSW	16	20	32	175	8.0	4 to 12	135,155,175
VK606	HSW, Rec. HSW	16	22	36	175	8.0	4 to 6	135,155,175
VK606	HSW, Rec. HSW	16	22	38	175	8.0	6 to 12	135,155,175

VK600	Pendent	20	20	40	175	5.6	-	135
VK602	Pendent	20	20	40	175	8.0	-	135
VK600	Pendent, Rec. Pendent	16	16	26	175	5.6	-	135,155,175
VK604	Pendent, Rec. Pendent	16	16	26	250	5.6	-	135,155,175
VK600	Pendent, Rec. Pendent	18	18	33	175	5.6	-	135,155,175
VK604	Pendent, Rec. Pendent	18	18	33	250	5.6	-	135,155,175
VK604	Pendent, Rec. Pendent	20	20	40	250	5.6	-	135,175
VK602	Pendent, Rec. Pendent	16	16	26	175	8.0	-	135,155,175
VK602	Pendent, Rec. Pendent	18	18	33	175	8.0	-	135,155,175
VK608	Pendent, Rec. Pendent	16	16	30	175	11.2	-	135,155,175
VK608	Pendent, Rec. Pendent	18	18	33	175	11.2	-	135,155,175
VK608	Pendent, Rec. Pendent	20	20	40	175	11.2	-	135,175

VK196*	Dry Concealed Pendent	16	16	26	175	5.6	-	135, 155
VK196#	Dry Concealed Pendent	16	16	26	175	5.6	-	175
VK196*	Dry Concealed Pendent	18	18	33	175	5.6	-	135
VK196#	Dry Concealed Pendent	18	18	33	175	5.6	-	175
VK196*	Dry Concealed Pendent	20	20	40	175	5.6	-	135
VK196#	Dry Concealed Pendent	20	20	40	175	5.6	-	175

++Available with 1/2 or 3/4 in. N.P.T.

\*Utilizes 135 °F cover plate.

#Utilizes 165°F coverplate.

\*\*Model F1 escutcheon only.

(A)-Dimension of wall on which sprinkler is installed.

(B)-Dimension perpendicular to wall on which sprinkler is installed.

<u>Fig. No.</u>	<u>Model</u>	<u>Description</u>
1	M	Standard orifice, 1/2 in., pendent, quick response sprinkler
2	M	A. 1/2 in. frame with deflector
	M	B. Belleville spring, teflon coated
	M	C. Pip cap
	M	D. Compression screw
	M	E. Glass bulb, 2.8 mm
3	M	Standard orifice, 1/2 in., upright, quick response sprinkler
4	M	Large orifice, 17/32 in. frame with pendent deflector for use in quick response sprinkler
5	M	Large orifice, 17/32 in. frame with upright deflector for use in quick response sprinkler
6	M	Extended coverage sprinkler frame, horizontal sidewall type
7	A-1	1. Mounting bracket
	A-1	2. Memory metal clip
	A-1	3. Cover plate
	A-1	4. Sprinkler
8	A-1	Installation instructions
*9	M/M-5	Extended coverage horizontal sidewall extended coverage installation instructions

C O N C L U S I O N

Samples of the product covered by this Report have been found to comply with the requirements covering the category and the products were judged to be eligible for Listing and Follow-Up Service. The manufacturer is authorized to use the Laboratories' Mark on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Laboratories' Mark are considered as Listed by Underwriters Laboratories Inc.

\*TEST RECORD NOS. 1 THRU 13

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File Ex643  
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Project 91NK1369  
Project 91NK8921  
Project 91NK6712  
Project 91NK20429  
Project 97NK23564  
Project 97NK23619  
Project 97NK32051  
Project 98NK5103  
Project 98NK17623  
Project 98NK11873  
Project 99NK21033  
Project 99NK25817  
Project 99NK36385  
Project 99NK40795  
Project 00NK24313  
Project 00NK39796  
Project 00NK36004  
Project 00NK26085  
Project 01NK6252  
Project 01NK33  
Project 01NK09243  
Project 01NK46248  
Project 01NK14642  
Project 03NK09286  
Project 02NK14247  
Project 03NK08543  
Project 04NK15031  
Project 07NK06815  
Project 07NK13042  
Project 09CA37128

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REPORT  
on  
SPRINKLERS, AUTOMATIC AND OPEN

Viking Corp.  
Hastings, MI

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## GENERAL

\*

## PRODUCT COVERED:

Automatic sprinklers incorporating frangible 3, 5, and 3mm XS glass bulbs manufactured by Job GmbH and Norbulb, of the following models, types and temperature ratings.

Sprinklers rated 360°F utilize the 5 mm glass bulb only.

	<u>SIN #</u>	<u>DESCRIPTION</u>
USL, CNL,	VK001, VK002, VK003, VK004, VK100, VK102, VK118, VK120, VK200, VK202, VK550, VK560	2.8, 4.2, 5.6, and 8.0 K. Standard Response Upright, Pendent, Conventional, Concealed and Intermediate
USL, CNL,	VK300, VK302, VK310, VK325, VK327, VK329, VK331, VK350, VK352, VK354, VK556, VK566	2.8, 4.2, 5.6 and 8.0 K. Quick Response Upright, Pendent, Conventional, Concealed and Intermediate
USL, CNL	VK104	5.6 K. Standard Response Horizontal Side Wall
USL, CNL	VK304, VK305, VK333	2.8 and 5.6 K. Quick Response Horizontal Sidewall
USL, CNL	VK600, VK602, VK604, VK605, VK606, VK610, VK612, VK614, VK616	5.6 and 8.0 K. Quick Response and Standard Response Extended Coverage
USL, CNL	VK015, VK021, VK023, VK116, VK122, VK124, VK315, VK317, VK319, VK340, VK342, VK344, VK558	2.8 and 5.6 K. High Pressure Quick Response and Standard Response
USL, CNL	VK130, VK132	5.6 K. Stainless Steel
USL, CNL	VK550, VK556, VK560, VK566	5.6 and 8.0 K. Upright Intermediate Level Standard and Quick Response
USL, CNL	VK338, VK339	5.6 K. Stainless Steel Quick Response

(Table Cont'd)

\*

<u>SIN #</u>	<u>DESCRIPTION</u>	<u>REMARKS</u>
USL, CNL	VK910	5.6 K SR Pendent
All Models	Chrome plated, Bright Brass and Nickel plated quick response.	Ratings - 135, 155, 175, 200 and 286°F, installation indicated by deflector.
All Models	Wax coated. Standard Response Only.	Ratings - 135, 155, 175, 200 and 286°F+.
All Models	Lead coated.	Ratings - 135, 155, 175, 200 and 286°F. Installation, pendent and upright.
All Models	IVC Poly 99 Polyester coated.	Ratings - 135, 155, 175, 200 and 286°F. Installation indicated by deflector.
All Models	IVC Poly 99 Polyester coated. Quick Response.	Ratings - 135, 155, 175, 200 and 286°F. Installation, upright and pendent only.
All Models	Teflon coated.	Ratings - 135, 155, 175, 200 and 286°F. Installation as indicated by deflector.
All Models	Teflon coated quick response.	Ratings - 135, 155, 175, 200 and 286°F. Installation, upright and pendent only.
All Models	IVC Poly 99 Polyester coated quick response corrosion resistant in all colors.	Ratings - 135, 155, 175, 200 and 286°F. Installation as indicated by deflector.
VK910		Ratings-135,155,175,200,286, 360°F

+ - Uses 200°F wax for installation where ambient temperature does not exceed 150°F.

**OBJECT:**

The object of this investigation was to determine compliance of the sprinklers with Underwriters Laboratories Inc., Standard for Automatic Sprinklers for Fire Protection Service, UL 199-1981.



\*

GENERAL:

The Viking Model M bulb type sprinklers consist of a brass frame, copper pip-cap, teflon covered belville spring, and a heat responsive element. The heat responsive element consists of a glass bulb filled with a temperature sensitive liquid. Sprinkler frames are color coded in accordance with the requirements of UL 199 and NFPA 13. In addition the bulb color code reported under "Ratings" applies.

The Model M intermediate level glass bulb sprinkler may utilize the Model B-1 sprinkler guard (upright) and the Model C-1 sprinkler guard (pendent).

The Model A-1 concealed sprinkler utilizes a mounting base and cover plate constructed of UNS-G10080 steel. The cover plate is equipped with a "memory metal" clip constructed of ternary CuZnAl alloy that fastens to the deflector. Upon operation the memory metal expands enabling the cover plate to drop away from the sprinkler (See Figs. 1 and 2). Also, the cover plate may be factory painted using an alkyde paint manufactured by Automotive Finishes Inc. to a thickness not exceeding 0.008 in. thick.

RATINGS:

<u>Rating</u> Deg F	<u>Color Identification</u>	
	<u>Frame</u>	<u>Bulb</u>
135	Uncolored	Orange
155	Uncolored	Red
175	White	Yellow
200	White	Green
286	Blue	Blue
360	Red	Mauve
500	Orange	Black

USE:

These sprinklers are intended for use with automatic sprinkler equipment as covered by the Standard of the National Fire Protection Association for the Installation of Sprinkler System, NFPA 13.

MARKING:

The manufacturer's name, Viking, and issue designation are cast on the sprinkler frame. The year of manufacture is cast in the sprinkler frame and the temperature rating is stamped on the sprinkler deflector. The Listing Mark is stamped on the deflector. The words "Do Not Paint" shall be stamped on the cover plate for concealed sprinklers.

## FOR ENGINEERING CONSIDERATIONS ONLY:

Table 1

<u>SIN</u>	<u>OLD MODEL</u>	<u>STYLE</u>	<u>K-FACTOR</u>	<u>RESPONSE TYPE</u>
VK100	M	Upright	5.6	SR
VK200	M	Upright	8.0	SR
VK001	M	Upright	2.8	SR
VK002	M	Upright	4.2	SR
VK102	M	Pendent	5.6	SR
VK202	M	Pendent	8.0	SR
VK003	M	Pendent	2.8	SR
VK004	M	Pendent	4.2	SR
VK104	M	HSW	5.6	OR
VK116	M-5	HSW	5.6	SR
VK015	M	HSW	2.8	SR
VK104	M	HSW	5.6	SR
VK106	M	VSW	5.6	SR
VK118	M	Conventional	5.6	SR
VK120	M	Conventional	8.0	SR
VK124	M High Pressure	Pendent	5.6	SR
VK021	M High Pressure	Upright	2.8	SR
VK122	M High Pressure	<b>Pendent</b>	5.6	SR
VK023	M High Pressure	Pendent	2.8	SR
VK536	M	Pendent	11.5	SR
VK300	M	Upright	5.6	QR
VK325	M	Upright	2.8	QR
VK327	M	Upright	4.2	QR
VK350	M	Upright	8.0	QR
VK302	M	Pendent	5.6	QR
VK329	M	Pendent	2.8	QR
VK331	M	Pendent	4.2	QR
VK352	M	Pendent	8.0	QR
VK333	M	HSW	2.8	QR
VK304	M	HSW	5.6	QR
VK442	M-5	HSW	5.6	QR
VK306	M	VSW	5.6	QR
VK310	M	Conventional	5.6	QR
VK354	M	Conventional	8.0	QR
VK130	N-2	Upright	5.6	SR
VK132	N-2	Pendent	5.6	SR

## TEST RECORD INDEX

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VK102, VK202, VK302 and VK352 concealed pendent sprinklers	25
Viking sprinklers utilizing Inconel Springs and incorporating Norbulb glass bulbs, die cast frames, as alternate materials.	26
SIN VKXXX sprinklers utilizing an alternate anaerobic adhesive	27
SIN VK100 Sprinkler with alternate Sand Cast Frame	28

**Table Continued**

<u>Description</u>	<u>Test Record</u>
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Models VK100, VK102, VK104, VK118, VK124, VK300, VK302, VK304, VK310, VK315, VK317, VK600, and VK614, 5.6K-Factor, upright, pendent and horizontal sidewall sprinklers with an alternate QM Alloy frame.	33

## C O N C L U S I O N

Samples of the products covered by this Report have been found to comply with requirements covering the class and the products are judged to be eligible for Listing and Follow-Up Service. The manufacturer is authorized to use the Laboratories' Mark on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Laboratories' Mark are considered as Listed by Underwriters Laboratories Inc.

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