

**IOM-ARV-0203**

# **ATMOSPHERIC RELIEF VALVE**

## **INSTALLATION, OPERATION AND MAINTENANCE MANUAL**

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## SECTION I - GENERAL INFORMATION

### **1.1 Introduction**

The Graham Viking Relief valve is principally utilized on surface condensers to relieve all the steam which can be admitted to a turbine or engine under maximum possible full throttle conditions. They are produced in three basic designs: horizontal, vertical and angle.

The weight of the Viking fabricated valves is considerably less than that of the usual cast iron construction. As an example, the Viking valve weight for valves 10" and larger have a weight of 50% to 80% less than a comparable cast iron valve. Below 8", the fabricated Viking valves and cast iron valves have similar weights. Because the Viking fabricated valve is much lighter, it is more easily handled and installed. The standardized construction for all three configurations permits us to stock component parts for the valve, which can be assembled into a complete valve within a short time.

### **1.2 Proper Selection & Operation**

The Viking valve is sized to pass the rated capacity of steam at a pressure not exceeding 10 PSIG as outlined by HEI Standards for Steam Surface Condensers. The valves are normally sized based upon the capacities "for protection." See Table I.

An external water seal connection is provided for a seal around the seal disc on each valve. The gauge glass supplied will help to visually observe the water seal level. The overflow connection provides for adequate drainage and maintains a seal height. In operation, this water seal insures proper sealing against air in-leakage. The valve is equipped with a manual hand wheel to allow the valve to be checked and maintained. **Manual hand wheel and lifting mechanism is not intended for use as a vacuum breaker. Damage to the valve will result if manual operation of the hand wheel is attempted while the inlet side of the valve is under a vacuum.**

### **1.3 Mechanical Description & Design Features**

Refer to drawings S-3237-1, S-3238-1 and S-3239-1 for a cross-sectional view with part numbers and dimensions.

The Viking valve is unique in that the seal disc, part number 11, is supported from the valve seal and seat facing, part number 4, and is not in any way connected to the body of the valves. This construction assures that the seal shaft, part number 3, will function properly and will not be affected by any stresses in the valve body due to loads from external piping. The hand wheel, part number 9, is horizontally located in all three configurations. The hand wheel can also be furnished with a chain operated wheel to allow the valve to be opened even when it is located beyond the reach of the operator. The assembly of the valve is such that the guide bushings, part number 2, for the seal shaft are perfectly aligned and are not subject to stresses that may be present on the valve body. The seal facing and seat, part number 4, are stainless steel to prevent rusting of these critical parts. The seal is Buna-N with a confined O-ring design (refer to part

## *Graham Corporation*

number 10). The lift shaft, part number 7, incorporates a solid cored Teflon shaft bushing, part number 8, for ease of operation in manually lifting the seal disc (part number 11). In general, the construction of the valve is quite simple and foolproof. There is no need for adjustment on the valve. The Viking valve is shipped only after it is carefully inspected and tested for smooth operation.

## **SECTION II - INSTALLATION**

### **2.1 *Initial Inspection***

Inspect all protective covers for shipping damage . . . if damage is evident, inspect for internal contamination and replace protective covers if the unit is going to be stored. If the valve is damaged, notify the carrier immediately and then contact Graham Corporation.

### **2.2 *Installation***

The installation of the Viking relief valve is very simple. It requires only that the valve is installed in the correct position, that the hand wheel is free to operate without obstruction from other piping or equipment, that a water seal is piped to the valve, the overflow connection is piped to a drain point and that it is installed for accessible inspection. The outlet body can be rotated around the bolt circle for piping flexibility. **WARNING: Exhaust piping from the Viking relief valve must be attached and routed to a safe area where personnel cannot be affected.**

External reactions from piping, etc. should be eliminated from the valve. These relief valves need NOT be installed directly on the condenser, but may be placed on the turbine exhaust hood or in the turbine exhaust piping. After installation, the action and seal disc should be tested and visually inspected.

## SECTION III - MAINTENANCE

Our experience has shown that there is minimal maintenance required on the Viking atmospheric relief valve. Periodic testing (opening and closing with the hand wheel) of the valve is required along with visual inspection of the inner works. Visual inspection of the liquid level in the gauge glass should be routinely observed. The frequency of inspections and tests will depend upon the installation and local conditions but they should be performed at least once a year and more often if there are unusual circumstances such as corrosive atmosphere, after an upset condition, or other situations that could possibly damage the valve.

## SECTION IV - REPAIR INSTRUCTIONS AND REPLACEMENT ORDERS

### *4.1 Repair Instructions*

Normally, the only repair required in the field is the replacement of part number 10, O-ring. The procedure is as follows:

1. Cut a length of Buna-N O-ring material, one to two inches longer than the circumference of the O-ring groove.
2. Lightly grease O-ring groove and the Buna-N O-ring material with Moly-Duolube Style No. 77 or equivalent.
3. Beginning with one end, press the O-ring material into groove until the excess overlaps the starting point.
4. Trim O-ring material so that 1/4 inch of material overlaps the starting end. Note: Cut O-ring material directly across full diameter and perpendicular to length to form a matched butt joint as shown in Figure A.
5. Using finger tips, press O-ring material down into the groove around the entire sealing diameter to smooth out any high spots. The O-ring should appear to be an equal distance above the groove around the entire sealing diameter.



6. Place a small amount of adhesive (3M Weather-Strip Part Number 4799 or equivalent) on butt end of O-ring. Push 1/4 inch overlap section down and back until the ends can be butted together. Press into the groove and release; compression from the 1/4 inch overlap will make a tight seal.
7. Remove any excess adhesive squeezed out of butt joint to prevent any high spots on surface of O-ring.
8. Inspect joint to make sure it is perfectly matched and there is no high area around the entire O-ring circumference.
9. Allow the adhesive to cure properly.
10. If possible, perform vacuum test on bottom half of valve to insure the proper seal of the O-ring. As a minimum, a hydrostatic test should be performed by filling upper half with water.

## **4.2 Replacement Orders**

Graham's standard design incorporates a flanged body that permits the replacement of all internal and external parts. The selection of materials and the thickness of the respective parts are designed to withstand many years of trouble-free service. The only spare parts recommended are an O-ring seal, part number 10, and gaskets, part number 14. Prices for the replacement parts will be furnished upon request.

When it is necessary to obtain spare parts, please address your communication to:

GRAHAM CORPORATION  
20 Florence Avenue  
Batavia, New York 14020

Telephone: 585 / 343-2216  
Spare Parts: 800 / 828-8150  
Fax: 585 / 343-1097  
E-MAIL: [equipment@graham-mfg.com](mailto:equipment@graham-mfg.com)  
WEBSITE: <http://www.graham-mfg.com>

**IMPORTANT** - The following information should be given in order to identify the spare parts required:

1. Serial number of unit (stamped on nameplate),
2. Name or description of part required,
3. Method of shipment (i.e. freight, express, etc.).

*Graham Corporation presents the information in this manual as good engineering practice. We cannot be held responsible for any damage to equipment that may result from mal-operation nor for any personal injuries should they occur during normal or abnormal operation.*

**SECTION V - TABLES AND DRAWINGS**

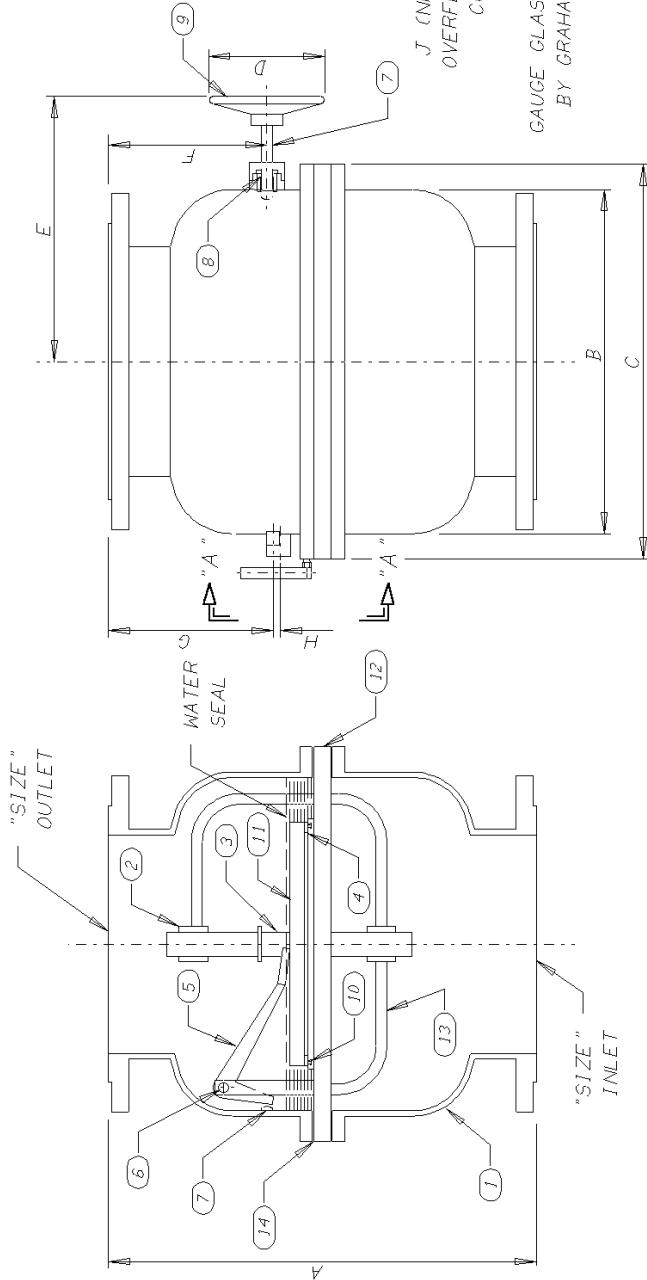
*Table I- ATMOSPHERIC RELIEF VALVE SIZES, Inches*

<b>STEAM RATING, PPH</b>	<b>FOR PROTECTION *</b>
0 - 7,500	6
7,501 - 11,800	8
11,801 - 17,000	8
17,001 - 20,000	8
20,001 - 23,100	10
23,101 - 30,200	10
30,201 - 38,200	12
38,201 - 45,000	12
45,001 - 47,200	14
47,201 - 62,000	14
62,001 - 68,000	16
68,001 - 82,000	16
82,001 - 106,000	18
106,001 - 120,000	18
120,001 - 170,000	20
170,001 - 250,000	24
250,001 - 380,000	30
380,001 - 550,000	36

\* - If it is desired to operate the turbine temporarily non-condensing at its maximum non-condensing capacity, it is suggested that in lieu of an atmospheric relief valve being sized for this flow, a relief valve for protection be provided and a separate gate or butterfly valve be provided for additional flow for non-condensing operation.

LIST OF MATERIALS	
NO.	MATERIAL
1	STEEL
2	SS
3	SS
4	SS
5	SS
6	SS
7	SS
8	TEFLON
9	ALUM.
10	BUNA "N"
11	*
12	*
13	STEEL
14	NON-ASB.

\*SIZES 4" THRU 16" = SS  
SIZES 18" THRU 36" = STEEL



NOTE:  
FLANGES ON 4" THRU 24" VALVES ARE 150# (RF) ASME B16.5.  
FLANGES ON 30" & 36" VALVES ARE 150# (RF) ASME B16.47 SERIES "A".

TABLE OF DIMENSIONS ALL IN INCHES

SIZE	A	B	C	D	E	F	G	H	J	K	EST WGT (LBS)		
4	16	7/8	10	3/4	13	3/4	6	10	1/4	5	7/8	140	
5	17	5/8	10	3/4	13	3/4	6	10	1/4	6	1/4	150	
6	19	1/2	12	3/4	15	3/4	6	11	1/4	7	3/16	190	
8	22	1/4	16	19	8	15	3/4	8	3/4	8	3/8	290	
10	26	5/8	18	21	8	16	3/4	10	3/16	10	3/8	390	
12	28	1/4	20	23	1/2	8	17	3/4	10	5/16	10	7/8	560
14	30	5/8	24	27	1/2	8	19	3/4	11	7/16	11	7/8	700
16	29	7/8	24	27	1/2	8	19	3/4	11	1/2	11	1/2	760
18	39	1/2	28	31	1/2	10	24	1/4	15	5/16	15	3/8	820
20	39	1/4	28	31	1/2	10	24	1/4	15	3/16	15	1/4	970
24	43	1/8	32	35	1/2	14	26	3/4	16	7/16	17	1/8	1320
30	59	40	43	3/4	14	30	3/4	22	1/2	24	3/4	3/4	2230
36	68	1/8	48	51	3/4	14	34	3/4	27	9/16	29	1/4	3500

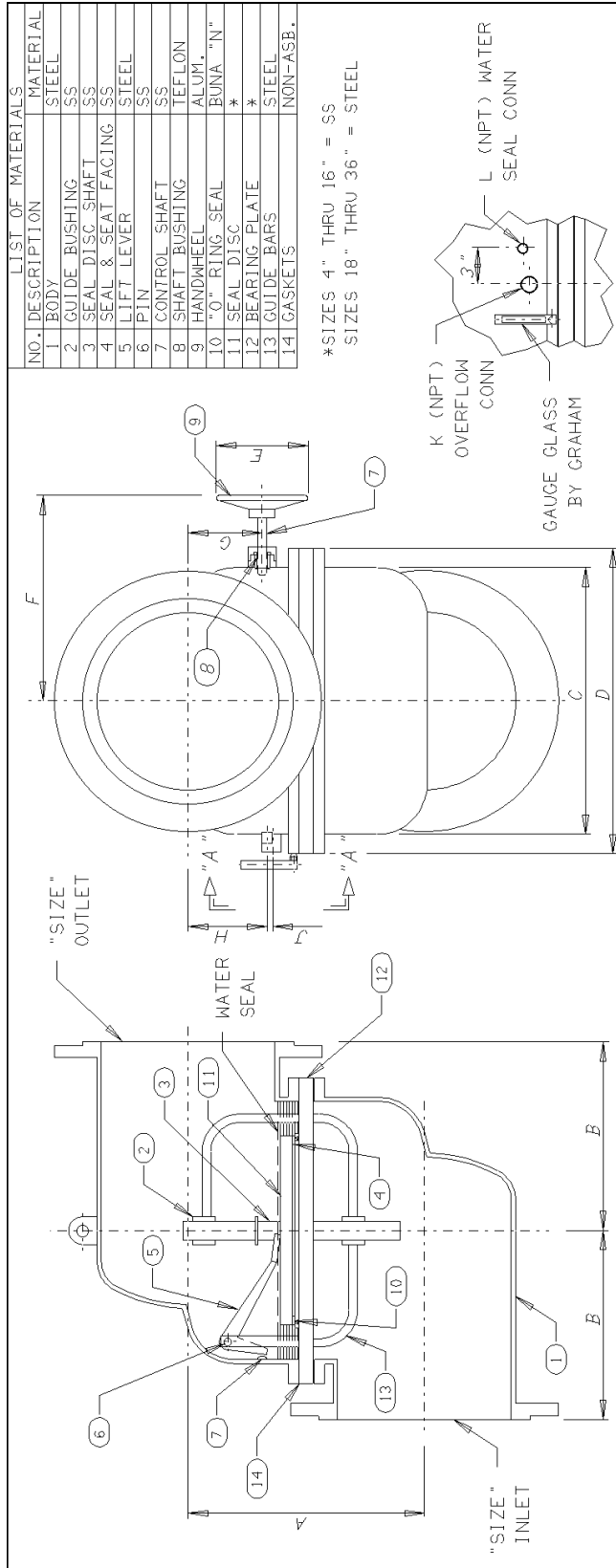
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BATAVIA, N. Y.



**GRAHAM CORPORATION**  
20 FLORENCE AVE. BATAVIA, NEW YORK

**GRAHAM VIKING (R.F.)**  
**VERTICAL ATMOSPHERIC RELIEF VALVE**

REV	DESCRIPTION	MADE	CHK'D	DATE	SCALE	MADE	CHK'D	DATE	DWG. NO.	REV
0	ORIGINAL ISSUE								S-3237-1	0



NOTE:  
 FLANGES ON 4" THRU 24" VALVES ARE 150# (RF) ASME B16.5.  
 FLANGES ON 30" & 36" VALVES ARE 150# (RF) ASME B16.47 SERIES "A".

TABLE OF DIMENSIONS ALL IN INCHES

SIZE	A	B	C	D	E	F	G	H	J	K	L	EST WGT (LBS)
4	10 3/8	8 3/4	10 3/4	13 3/4	6	10 1/4	2 5/8	2 3/8	1/2	3/4	3/8	150
5	9 7/8	8 3/4	10 3/4	13 3/4	6	10 1/4	2 3/8	2 1/8	1/2	3/4	3/8	160
6	11 5/8	10	12 3/4	15 3/4	6	11 1/4	3 1/4	3	1/2	3/4	3/8	285
8	13 1/2	11 3/4	16	19	8	15 3/4	3 13/16	4	1/4	3/4	3/8	390
10	16 5/8	13	18	21	8	16 3/4	5 3/16	5 3/8	3/8	3/4	3/8	455
12	18	14 1/4	20	23 1/2	8	17 3/4	5 3/16	5 3/4	3/8	3/4	3/8	650
14	19 5/8	17	24	27 1/2	8	19 3/4	5 15/16	6 3/8	1/2	3/4	3/8	825
16	20 7/8	17	24	27 1/2	8	19 3/4	6 9/16	7	1/2	3/4	3/8	855
18	27 1/2	20	28	31 1/2	10	24 1/4	9 5/16	9 3/8	1 1/8	3/4	3/8	990
20	26	20	28	31 1/2	10	24 1/4	8 9/16	8 5/8	1 1/8	3/4	3/8	1185
24	31 1/8	21	32	35 1/2	14	26 3/4	10 7/16	11 1/8	7/8	1	1/2	1620
30	38 1/2	27	40	43 3/4	14	30 3/4	12 1/4	14 1/2	3/4	1	1/2	2700
36	45 1/8	32	48	51 3/4	14	34 3/4	16 1/16	17 3/4	3/4	1	1/2	4250

VIEW A-A

\*SIZES 4" THRU 16" = SS  
 SIZES 18" THRU 36" = STEEL

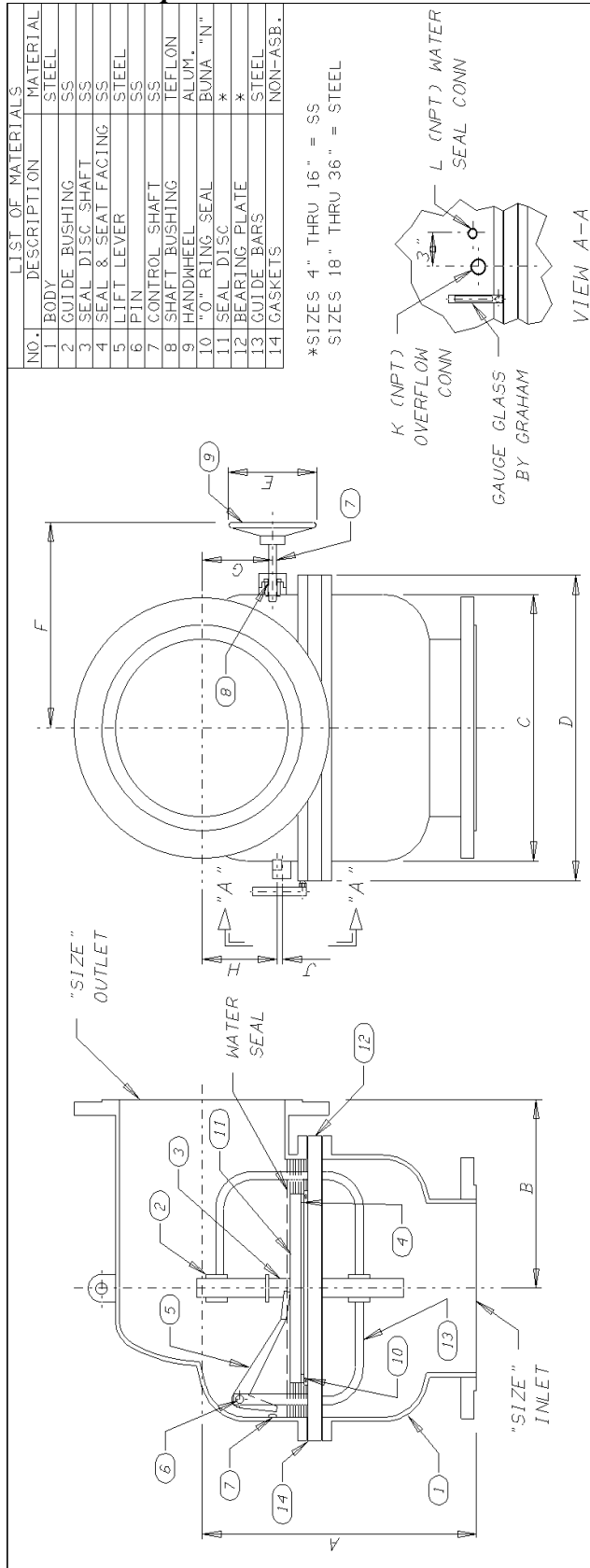
LIST OF MATERIALS

NO.	DESCRIPTION	MATERIAL
1	BODY	STEEL
2	GUIDE BUSHING	SS
3	SEAL DISC SHAFT	SS
4	SEAL & SEAT FACING	SS
5	LIFT LEVER	STEEL
6	PIN	SS
7	CONTROL SHAFT	SS
8	SHAFT BUSHING	TEFLON
9	HANDWHEEL	ALUM.
10	"O" RING SEAL	BUNA "N"
11	SEAL DISC	*
12	BEARING PLATE	STEEL
13	GUIDE BARS	STEEL
14	GASKETS	NON-ASB.

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 BATAVIA, N.Y.



GRAHAM CORPORATION 20 FLORENCE AVE. BATAVIA, NEW YORK		SCALE MADE		DATE		DWG. NO.		REV	
		---	---	---	---	---	---	---	---
GRAHAM VIKING (R.F.) HORIZONTAL ATMOSPHERIC RELIEF VALVE		MADE		DATE		CHKD		REV	
		---	---	---	---	---	---	---	---
0	ORIGINAL ISSUE	---	---	---	---	---	---	---	---
REV	DESCRIPTION	---	---	---	---	---	---	---	---



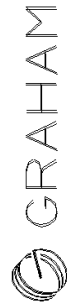
NOTE:  
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TABLE OF DIMENSIONS ALL IN INCHES

SIZE	A	B	C	D	E	F	G	H	J	K	L	EST WGT (LBS)
4	13 5/8	8 3/4	10 3/4	13 3/4	6	10 1/4	2 5/8	2 3/8	1/2	3/4	3/8	145
5	13 3/4	8 3/4	10 3/4	13 3/4	6	10 1/4	2 3/8	2 1/8	1/2	3/4	3/8	155
6	15 9/16	10	12 3/4	15 3/4	6	11 1/4	3 1/4	3	1/2	3/4	3/8	210
8	17 7/8	11 3/4	16	19	8	15 3/4	3 13/16	4	1/4	3/4	3/8	320
10	21 5/8	13	18	21	8	16 3/4	5 3/16	5 3/8	3/8	3/4	3/8	420
12	23 1/8	14 1/4	20	23 1/2	8	17 3/4	5 3/16	5 3/4	3/8	3/4	3/8	600
14	25 1/8	17	24	27 1/2	8	19 3/4	5 15/16	6 3/8	1/2	3/4	3/8	760
16	25 3/8	17	24	27 1/2	8	19 3/4	6 9/16	7	1/2	3/4	3/8	805
18	33 1/2	20	28	31 1/2	10	24 1/4	9 5/16	9 3/8	1 1/8	3/4	3/8	890
20	32 5/8	20	28	31 1/2	10	24 1/4	8 9/16	8 5/8	1 1/8	3/4	3/8	1080
24	37 1/8	21	32	35 1/2	14	26 3/4	10 7/16	11 1/8	7/8	1	1/2	1450
30	48 3/4	27	40	43 3/4	14	30 3/4	13 9/16	14 1/2	3/4	1	1/2	2460
36	56 5/8	32	48	51 3/4	14	34 3/4	16 1/16	17 3/4	3/4	1	1/2	3880

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 GRAHAM CORPORATION



GRAHAM CORPORATION 20 FLORENCE AVE., BATAVIA, NEW YORK	
GRAHAM VIKING (R.F.) ANGLE ATMOSPHERIC RELIEF VALVE	
REV 0	ORIGINAL ISSUE
SCALE	NONE
MADE	CHKD
DATE	DATE
DESCRIPTION	DMG. NO.
	S-3239-1
	REV 0

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**- NOTES -**