

IOM-ARV-0814

ATMOSPHERIC RELIEF VALVE

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

GRAHAM CORPORATION

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SECTION I - GENERAL INFORMATION

1.1 Introduction

The Graham Viking Relief valve is principally utilized on surface condensers to relieve the steam which can be admitted to a turbine or engine under maximum possible full throttle conditions. Sizing and ratings are per HEI requirements. 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 a "dead weight" valve, as such there is no spring or set pressure. In operation, the valve remains tight under vacuum and opens automatically above atmospheric pressure.

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." (per HEI requirements) See Table I.

The Graham Viking relief valve will relieve the maximum capacity as stated by HEI at a relieving pressure of approximately 4 PSIG for all valves up to 18" and a relief pressure of approximately 7 PSIG for the remaining valves.

Consideration needs to be given to ΔP in the piping (inlet + outlet) to insure the accumulated pressure ($10 \text{ PSIG} + \Delta P$) does not exceed the design pressure of the condenser being protected.

An external water seal connection is provided for a seal around the seal disc on each valve as required by HEI. 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. Seal water flow rate should be supplied at approximately 0.25 gpm regardless of valve size. A small amount of overflow should be present at all times when the unit is in operation.

IMPORTANT:

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.

When shut down, the seal water should be shut off and the valve disk raised to drain the valve. The valve disk should be lowered and the seal water restored prior to restarting the condenser.

If the unit is installed in an outdoor location where temperatures could be below freezing, proper precautions need to be installed to prevent freezing of the seal water.

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 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 (0.25 gal/min is recommended), 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.

2.3 Lifting

Lifting lugs are provided on all Viking Relief Valves. Handling and lifting of the unit should only be done at these lift points. **DO NOT** for any reason attempt to lift or otherwise move the unit from any point other than the lifting lugs. Damage to the unit will result.

Lift points on the unit are indicated by the ISO international lift point symbol (ANSI Z535.4 and ISO 3864-2 Safety Label) shown below.



Note: All Viking Relief Valves are to remain in the upright position. This is indicated by the flow arrow on the name plate tag (shown below). Tipping of the unit on its side at any time during shipping, handling or installation will result in damage.



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. The "O" ring groove and seal disk should be inspected to insure there is no damage of the machined surfaces.
2. Any dirt or debris should be removed from the valve and seal surfaces since the presence of this could cause the valve to not seal properly.
3. Cut a length of Buna-N O-ring material, one to two inches longer than the circumference of the O-ring groove.
4. Lightly grease O-ring groove and the Buna-N O-ring material with Moly-Duolube Style No. 77 or equivalent.
5. Beginning with one end, press the O-ring material into groove until the excess overlaps the starting point.
6. 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.
7. 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.



8. 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.
9. Remove any excess adhesive squeezed out of butt joint to prevent any high spots on surface of O-ring.
10. Inspect joint to make sure it is perfectly matched and there is no high area around the entire O-ring circumference.
11. Allow the adhesive to cure properly.
12. 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.

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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:	spares@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.

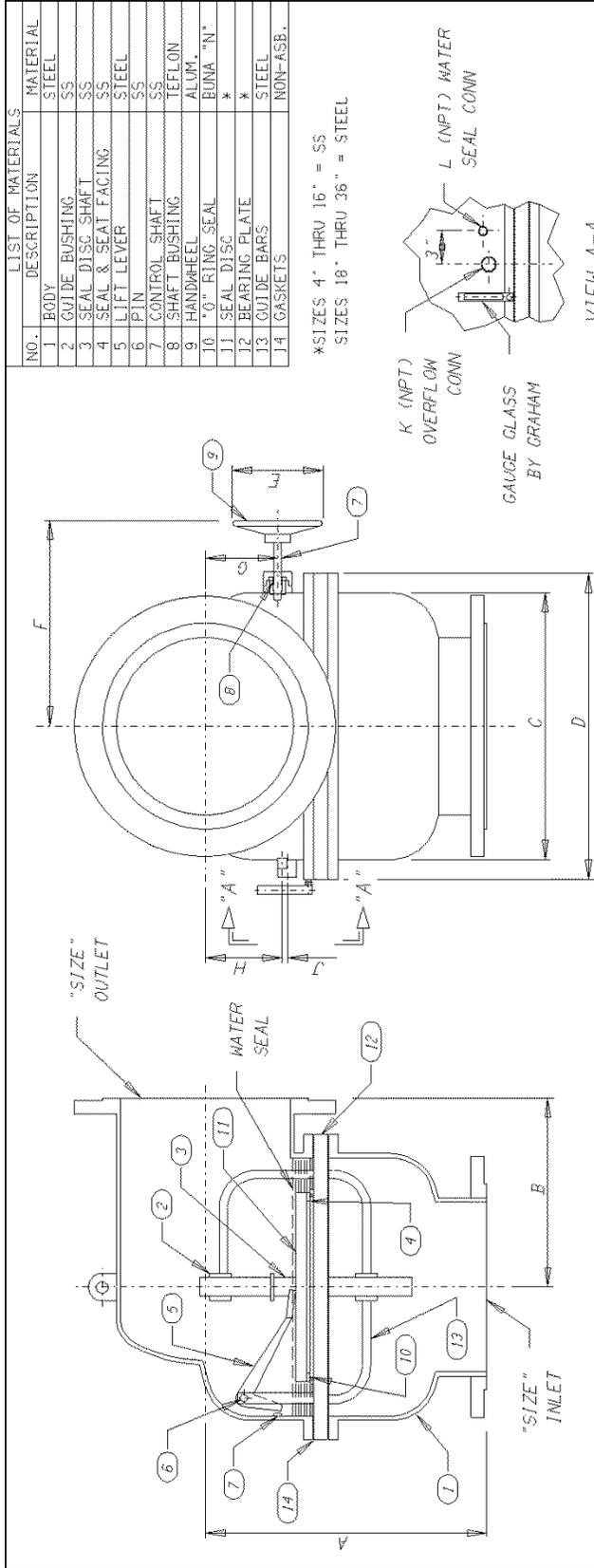
SECTION V - TABLES AND DRAWINGS

Table I- ATMOSPHERIC RELIEF VALVE SIZES, Inches

SIZE	MAXIMUM RELIEF FLOW (pounds per hour) *
6	7,500
8	20,000
10	30,000
12	45,000
14	62,000
16	82,000
18	120,000
20	170,000
24	250,000
30	380,000
36	550,000

Sizes with flows listed are for reference only**

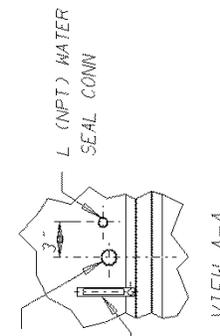
* - If it is desired to operate the turbine temporarily non-condensing at its maximum non-condensing capacity, it is suggested that in lieu of an atmospheric relief valve being sized for this flow, a relief valve for protection be provided and a separate gate or butterfly valve be provided for additional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



LIST OF MATERIALS

NO.	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	*
13	GUIDE BARS	STEEL
14	GASKETS	NON-ASB.

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



VALVE INFORMATION: Δ

- THE VALVE STARTS TO OPEN ABOVE ATMOSPHERIC PRESSURE AND IS DESIGNED TO PASS ITS MAXIMUM FLOW AT NO GREATER THAN 0.7 kg/cm² (10 PSI).
 - VALVE CAPACITY IS PER LATEST EDITION OF HEI STANDARDS FOR STEAM SURFACE CONDENSERS.
 - DO NOT USE HAND WHEEL AS A VACUUM BREAKER. DAMAGE WILL RESULT. AND ROUTED TO A SAFE AREA.
 - EXHAUST PIPING FROM VALVE MUST BE ATTACHED
 - SEAL WATER FLOW RATE: 0.25 GPM MIN, 0.5 GPM MAX.
- SUBJECT TO ANY EXISTING RIGHTS OF THIRD PARTIES, THIS DOCUMENT AND THE INFORMATION THEREIN IS THE PROPERTY OF GRAHAM CORPORATION & MUST NOT BE COPIED, IN WHOLE OR PART, OR USED FOR MANUFACTURE OR OTHERWISE DISCLOSED WITHOUT THE PRIOR WRITTEN CONSENT OF GRAHAM CORPORATION
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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 3/8	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	12 1/4	14 1/2	3/4	1 1/2	3/4	2300
36	56 5/8	32	48	51 3/4	14	34 3/4	16 1/16	17 3/4	3/4	1 1/2	3/4	3200

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 "B". Δ

GRAHAM CORPORATION 20 FLORENCE AVE. BATAVIA, NEW YORK	
GRAHAM VIKING (R.F.) ANGLE ATMOSPHERIC RELIEF VALVE	
DATE: 01/13	SCALE: NONE
REV: 0	MADE: CHKD
REV: 1	DATE: 11-68
REV: 1	OMG. NO. S-3239-1

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- NOTES -