FIKE HALON 1301 SYSTEM CONTAINERS AND VALVES

9-24-83

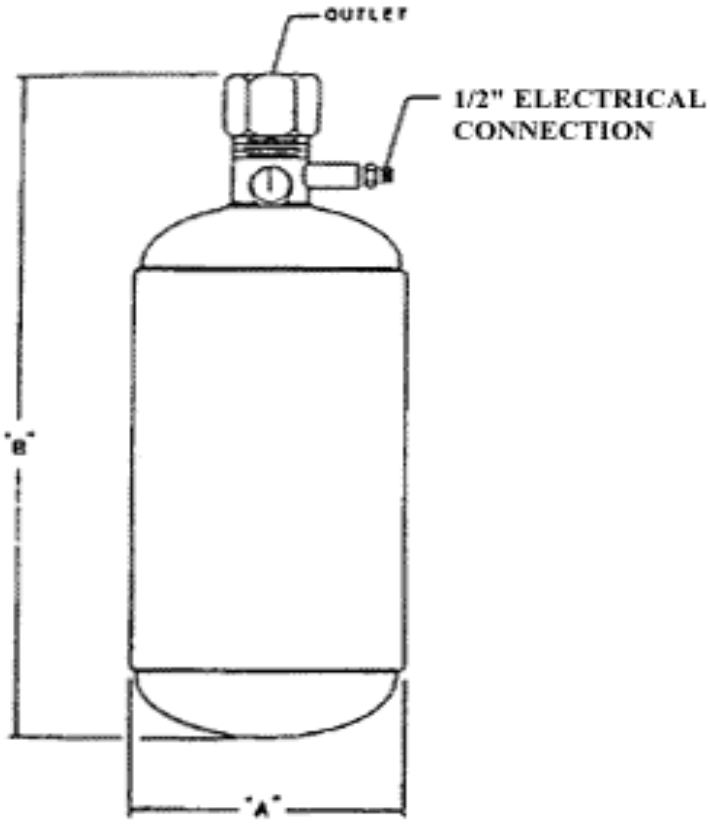


Figure I.2-A

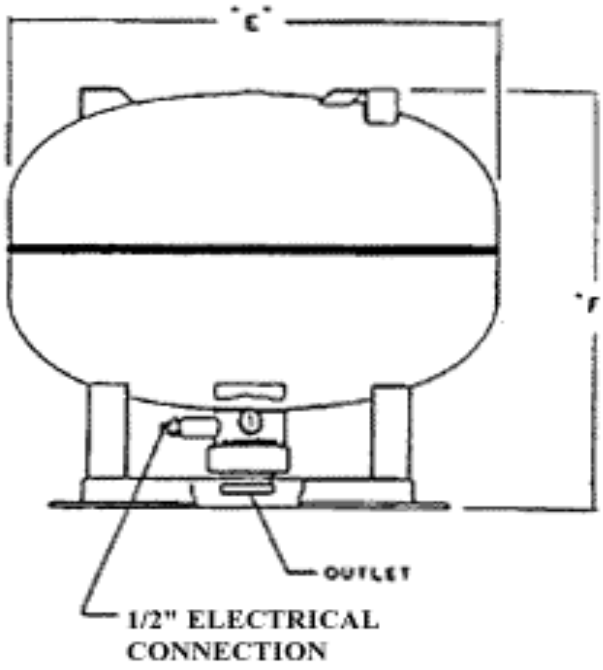
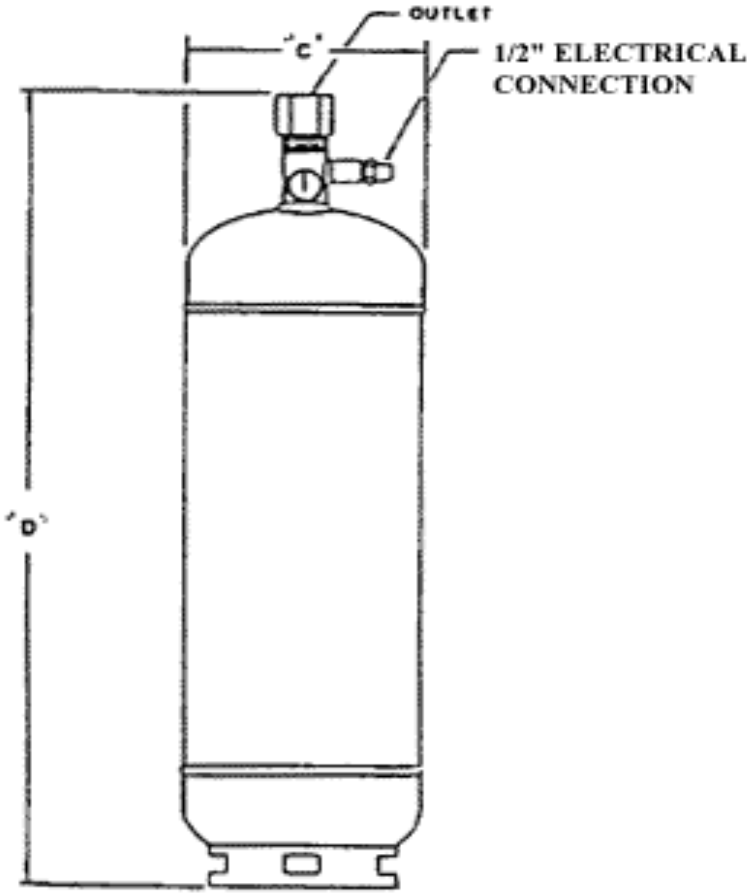
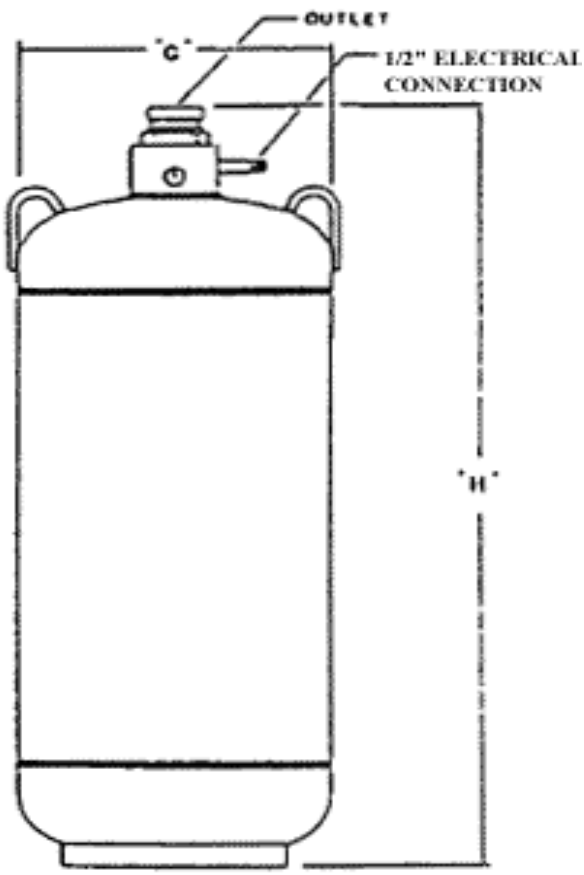


Figure I.2-B





U.L. EX2828
7/10/88

III.6 CONTAINER ELECTRICAL CONNECTIONS

Electrical conduit may be connected to the container in one of two ways (See Figure III.6)

Method # l is preferred for 125 lb. and 215 lb. spherical style containers so that the junction box is easily accessed. Method #2 is desirable for all other container styles because it simplifies maintenance and service functions when removing the initiator. Care should be taken when installing the junction boxes and conduit to insure that the retainer nut does not move on 1" and 2 1/2" style valves (See Figure6.)

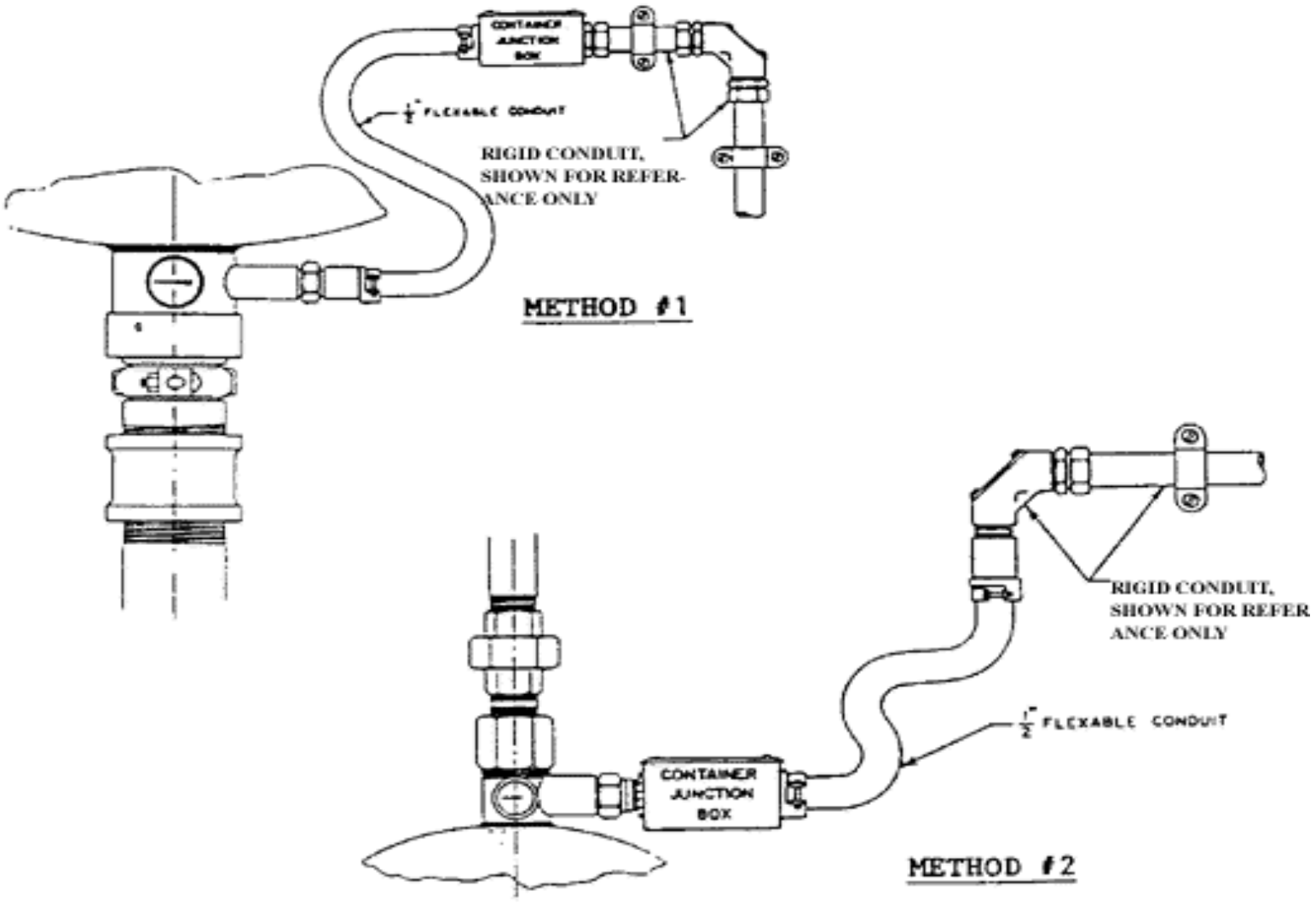


FIGURE III.6

The container must have an agent release module, which is supplied. The agent release module is mounted in the container junction box by means of an adhesive strip located on the back of the module. Do not mount the A.R.M. to the junction box lid.

System wiring will vary from system to system and depending on the type of control system used. Consult system plans and the appropriate control manuals for specific system wiring information.

III.6.1 INITIATOR INSTALLATION

Read and understand this section before attempting to install initiators.

All system components must be installed, and the electrical and control systems thoroughly checked out by a factory trained technician as outlined in Section IV before proceeding with the initiator installation.

WARNING:

Initiators are small pyrotechnic devices that can cause bodily injury and equipment damage if improperly handled. Read and understand this entire section before installing initiators. Accidental activation will not occur when the procedures in this section are followed.

Initiators employed in the Fike System are widely used in industrial applications and must be respected for their extremely fast response and the possibility of accidental detonation. When initiators are handled properly, accidental detonation will not occur.

Safety procedures which should be observed when handling initiators are as follows:

A. Control panel must be disabled prior to servicing.
B. Initiators must remain shunted at all times until installed into a thoroughly checked-out Fike System.
C. When handling or installing initiators, approved eye protection must be worn.
D. Never handle, or have in your possession, more than one initiator at any given time.
E. Do not handle these devices when wearing static producing clothes or shoes.
F. Do not expose initiators to high heat sources as this may greatly affect the service life.
G. Do not check initiator continuity with any type of ohm meter or other device.
H. If an initiator is suspected of being defective, return it to the factory or Fike distributor for proper disposal.
I. Two types of initiator assemblies are used. One type is used for 1" and 2 1/2" discharge valves. The other type is used in 3" discharge valves. Each type has it's own thread size and should only be used for the valve size intended.
J. Do not install initiators if ground faults are present in the system.
K. Do not install initiators if voltage is present on conduit or equipment.
L. Do not install initiator if radio transmitters are being used in nearby areas.
M. Connect initiator leads only after the assembly has been installed in the container discharge valve.

After the electrical and control systems have been checked out, proceed with the initiator installation step by step as follows:

Step 1: Move the "armed/disabled" switch on the control panel to the "disabled" position.

Step 2: Wait a minimum of 10 minutes to allow capacitors in initiator modules to dissipate their electrical charge.

Step 3: Unwrap initiator leads and screw the threaded portion of the assembly into the retainer nut (or initiator boss on 3" valves) and tighten to approximately 40 inch pounds (See Figure III.6.1).

Step 4: Pass leads through hole in electrical box or conduit if they were removed and reinstall.

Step 5: With shunt intact, strip about 1/2" of insulation on each lead about 2 inches back from the shunt.

Step 6: Insert stripped sections of initiator leads under center screw terminals (no polarity requirement) located on the agent release module and tighten screw terminals (See Figure III.1.10-B for pictorial clarification).

Step 7: Repeat steps 3 thru 6 for all containers in the system.

Step 8: Clip shunts off of all initiator leads and close all electrical boxes.

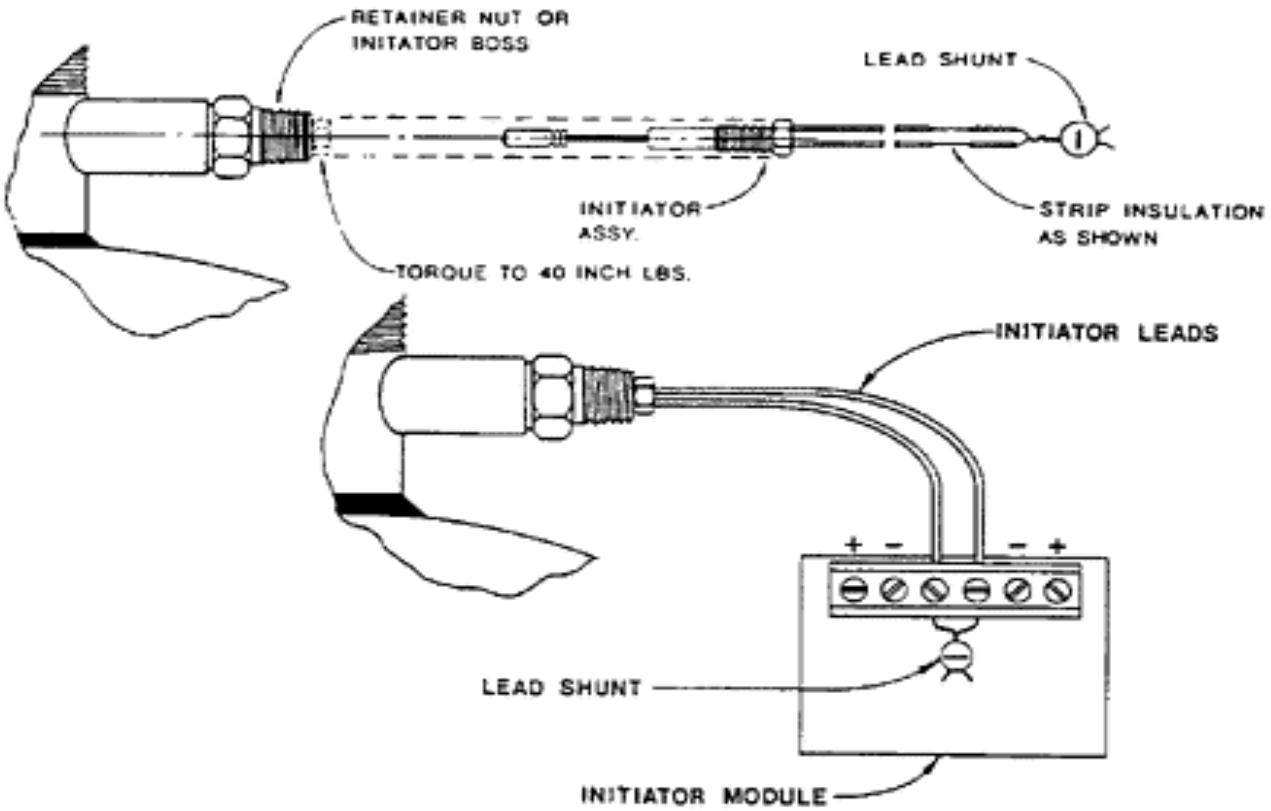


FIGURE III.1.10-B

Step 9: Check control panel for any trouble indication other than the one caused by the "armed/disabled" switch being in the "disable" condition.

Step 10: If no other trouble conditions exist, move the "armed/disabled" switch to the "armed" position and reset the control panel.

The Containers Are Now Armed!

WARNING:

Do not "ARM" the system if a ground fault indication is present.

Every three months:

Check the pressure gauge of each container. If the pressure is less than 350 PSIG at 70ºF, the container should be removed, weighed, and recharged as necessary. The container pressure will vary directly with temperature. In the range of 55º F to 85º F this change is approximately 3 PSI per degree. Refer to Table V.3 "Container Pressure versus Temperature."

TEMP	º F	-40	-30	-20	-10-	0	10
	º C	-40	-38.4	-28.9	-23.3	-17.8	-12.2
NOMINAL PRESSURE PSIG		136	149	163	178	194	212
TEMP	º F	20	30	40	50	60	70
	º C	-6.7	-1.1	4.4	10.0	15.6	21.1
NOMINAL PRESSURE PSIG		232	253	276	302	330	360
TEMP	º F	80	90	100	110	120	130
	º C	26.7	32.2	37.8	43.3	48.9	54.4
NOMINAL PRESSURE PSIG		393	430	470	513	560	612

TABLE V.3

Every six months:

The containers should be removed and weighed to verify the correct Halon 1301 weight stamped on the label. If the weight shortage is greater than 5% of the correct weight the container must be recharged.

NOTE:

If the container has a liquid level indicator installed, this verification can be made without the need for cylinder removal.

When removing the container for weighing, the control system must be in the "disabled" position and the initiators shunted and removed.

Reinstall the containers and initiators according to the Procedures in the system installation section of this manual.

V.3.1. VALVE RECONDITIONING

After the container has been discharged, the valve will need to be reconditioned using the appropriate reload kit.

If the container was not discharged, and a leaky valve needs to be reconditioned, the contents of the container should be emptied or transferred to another container before reconditioning the valve.

WARNING:

Container contents are under high pressure, therefore, never attempt to rebuild the valve until the contents are emptied and the pressure gauge reads 0 PSIG.

> Care should be taken when handling valve components to avoid damage of any kind. Be careful not to bend, poke, or otherwise distort the valve rupture discs as their service may adversely be affected.

V.3.1.1 **1" IN VALVE** (5 lb., 10 lb., 20 lb., 35 lb., 60 lb., and 100 lb. containers)

To recondition the 1" valve refer to Figure V.3.1.1 for pictorial clarification and identification of valve parts and the following steps:

Step 1: Remove the 1 inch adapter nut.

Step 2: Remove the 1 inch outlet assembly and "O" ring.

(Note: This part may be returned for credit.)

Step 3: Remove the retainer nut.

Step 4: Remove the detonator housing assembly and teflon washer.(Note: This part may be returned for credit, discard teflon washer.)

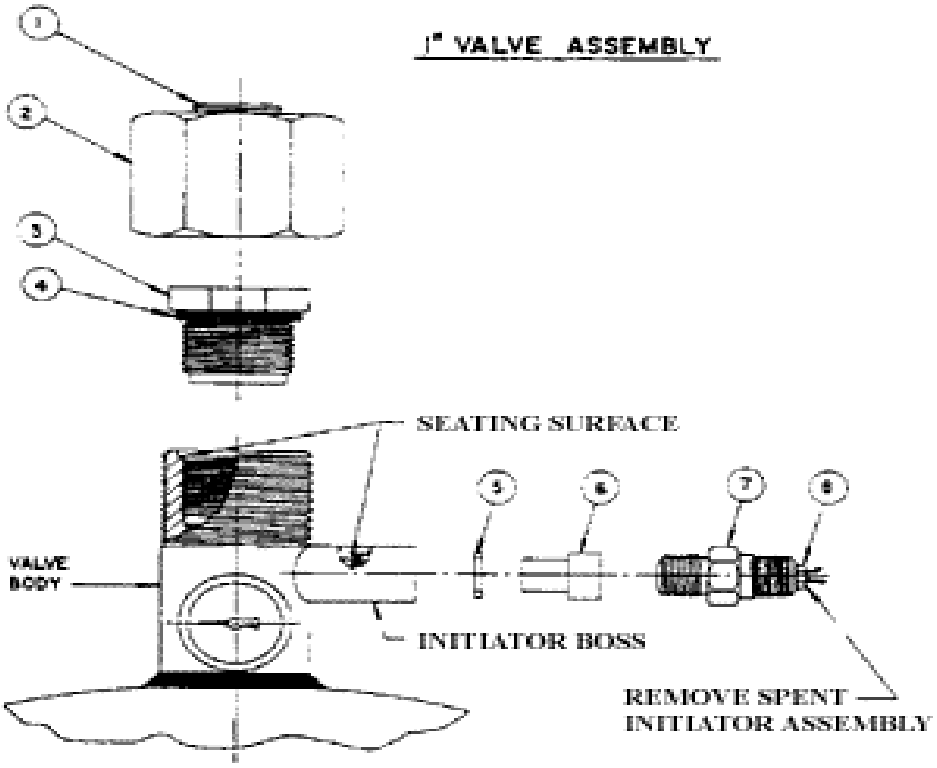


FIGURE V.3.1.1

ITEM NO	DESCRIPTION	REPLACEMENT PART
1	BAFFLE PLUG	
2	ADAPTER NUT	
3	OUTLET ASSEMBLY	X
4	"O" RING	X
5	TEFLON WASHER	X
6	DETONATOR HOUSING ASSEMBLY	X
7	RETAINER NUT	
8	INITIATOR ASSEMBLY (70-1058)	X

Step 5: Clean all debris from teflon washer and "O" ring seating surfaces with fine emery cloth. Surfaces must be dirt and rust free. Clean all threads and blow out all valve areas with an air gun.

Step 6: Place new teflon washer on new detonator housing assembly and reinstall in valve initiator boss.

Step 7: Reinstall retainer nut and torque to 90-150 inch pounds. Do Not Over tighten!

Step 8: Apply a light film of Dow Corning silicone sealer (or equal) to "O" - ring seating surface.

Step 9: Install new "O"-ring on outlet assembly. Install outlet assembly and tighten until assembly bottoms out.

Step 10: Remove and replace valve core in the brass fill valve located on the side of the discharge valve.

Step 11: Reinstall the adapter nut and baffle plug.

The container is now ready for recharging.

V.3.2.2 **2 1/2" VALVE** (70-041, 125 lb., and 70-077, 215 lb. containers)

To recondition the 2 1/2" valve, refer to Figure V.3.1.2 for pictorial clarification and identification of valve parts and the following steps:

Step 1: Remove grooved coupling and baffle plate from valve outlet.

Step 2: Remove holddown nut using left-hand spanner wrench (available from Fike).

Step 3: Remove holddown ring, "O"-ring, and rupture disc. Discard rupture disc and "O"-ring.

Step 4: Remove detonator housing and teflon washer. Discard washer. (Note: Detonator housing may be returned for credit).

Step 5: Clean all debris from teflon washer and "O"-ring seating surfaces with fine emery cloth. Surfaces must be dirt and rust free. Clean all threads and blow out all valve areas with an air gun.

Step 6: Place new teflon washer on new detonator housing assembly and reinstall in valve initiator boss.

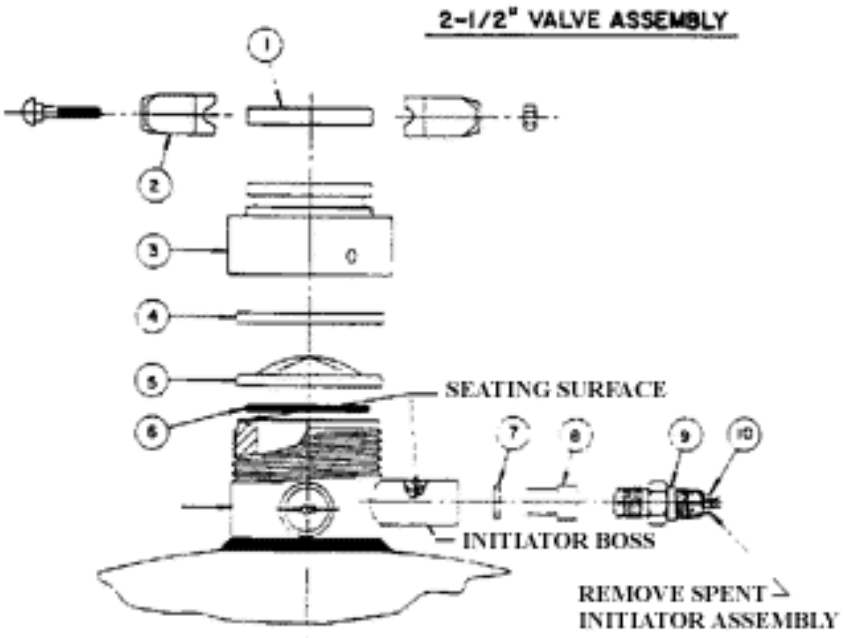


FIGURE V.3.1.2

ITEM NO	DESCRIPTION	REPLACEMENT PART
1	BAFFLE PLATE	
2	VICTAULIC COUPLING	
3	HOLDDOWN NUT	
4	HOLDDOWN RING	
5	RUPTURE DISC	X
6	"O" RING	X
7	TEFLON WASHER	X
8	DETONATOR HOUSING ASSEMBLY	X
9	RETAINER NUT	
10	INITIATOR ASSEMBLY (70-1058)	X

Step 7: Reinstall retainer nut and torque to 90 - 150 inch pounds. Do not over tighten!

Step 8: Apply a thin film of Dow Corning silicone vacuum grease (or equal) to "O"-ring groove and place new "O"-ring into groove.

Step 9: Install new rupture disc, convex side up, and place holddown ring centered over rupture disc.

Step 10: Reinstall holddown nut and torque to 60 foot pounds or use the following method: Spin holddown nut on by hand and tighten hand tight. Further tighten with right hand spanner wrench 1/3 turn minimum. (Wrench available through Fike).

Step 11: Remove and replace valve core in the brass fill valve located on the side of the discharge valve.

Step 12: Reinstall the grooved coupling and baffle plate.

The container is now ready for recharging.

V.3.1.3 **3" VALVE** (70-087, 215 lb., 375 lb., 650 lb., and 1000lb. Containers)

To recondition the 3" valve, refer to Figure V.3.1.3 for pictorial clarification and identification of valve parts and the following steps:

Step 1: Remove grooved coupling and baffle plate.

Step 2: Remove holddown nut using a left or right handed spanner wrench (available through Fike).

Step 3: Remove the valve assembly containing the two rupture discs.

Step 4: Remove siphon tube assembly and "O"-rings.

Step 5: Clean all debris from "O"-ring grooves and flat seating surface in bottom of valve body using fine emery cloth. Surface must be dirt and rust free. Clean all threads and blow out all valve areas with an air gun.

Step 6: Apply a thin coating of Dow Corning silicone vacuum grease (or equal) to "O"-ring grooves and flat seating surface in valve body.

Step 7: Place new "O"-rings in grooves and reinstall siphon tube assembly making sure it rests squarely on the flat seating surface.

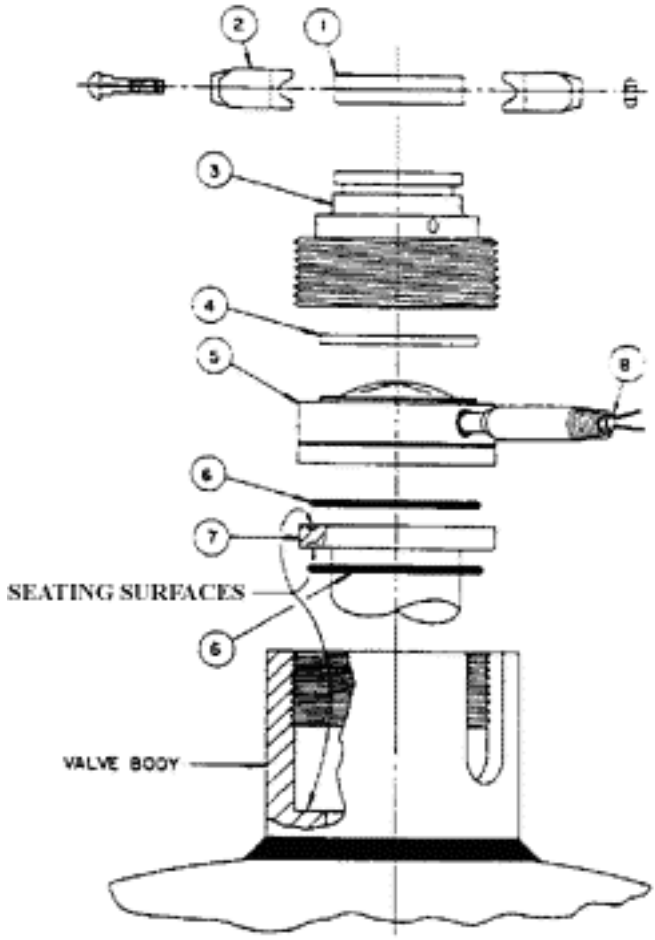


FIGURE V.3.1.3

ITEM NO	DESCRIPTION	REPLACEMENT PART
1	BAFFLE PLATE	
2	VICTAULIC COUPLING	
3	HOLDDOWN NUT	
4	HOLDDOWN RING	
5	VALVE ASSEMBLY	X
6	"O" RING	X
7	SIPHON TUE ASSEMBLY	
8	INITIATOR ASSEMBLY (70-1336)	X

Step 8: Apply a thin coating of Dow Corning Silicone Vacuum grease (or equal) to top "O"-ring and siphon tube assembly.

Step 9: Install new valve assembly with bulged rupture disc pointing up. Initiator boss on valve assembly must point through slot on valve body.

Step 10: Center holddown ring on top of the rupture disc on valve assembly. Spin holddown nut on until hand tight. Tighten nut with left or right hand spanner wrench until nut no longer turns.

Step 11: Remove and replace valve core in brass fill valve located on the side of the discharge valve.

Step 12: Reinstall the grooved coupling and baffle plate

The container is now ready for recharge.

V. 4 **INITIATORS**

WARNING:

Initiators are small pyrotechnic devices that can cause bodily injury and equipment damage if improperly handled. Refer to Section III.6.1 for proper handling of initiators.

Before checking or servicing initiators, move the "armed/disabled" switch on the system control panel to the "disabled" position. Allow ten minutes for the capacitors the initiator modules to dissipate their charge.

Every six months:

Check initiator leads and wiring to initiator modules for corrosion. Also, check for loose or broken wires.

Every Five Years:

Replace initiators. Refer to Section III.6.1 for initiator installation.

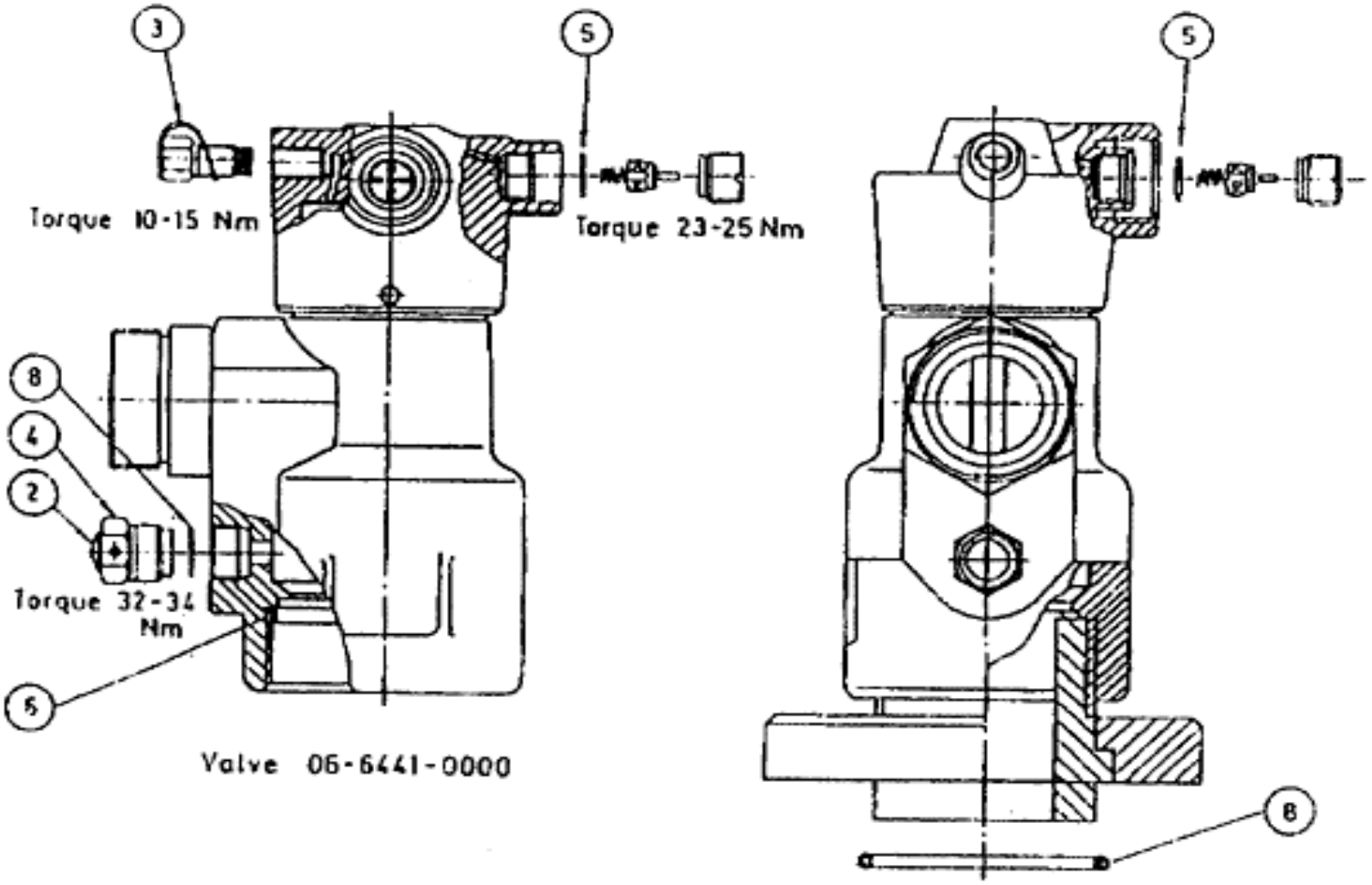
V.5 **CONTAINER TEST AND INSPECTION**

Halon 1301 containers shall not be recharged without a retest if more than five years have elapsed since the last test. The retest consists of a complete external and internal visual inspection in accordance with the Code of Federal Regulations, Title 49, Section 173.34(e)(10). The C.F.R. requirements also refer you to the Compressed Gas Association Pamphlet C-6, Section 3.

Cylinders continuously in service without discharging shall be given a complete external visual inspection every five years. The cylinder does not need to be emptied for this inspection.

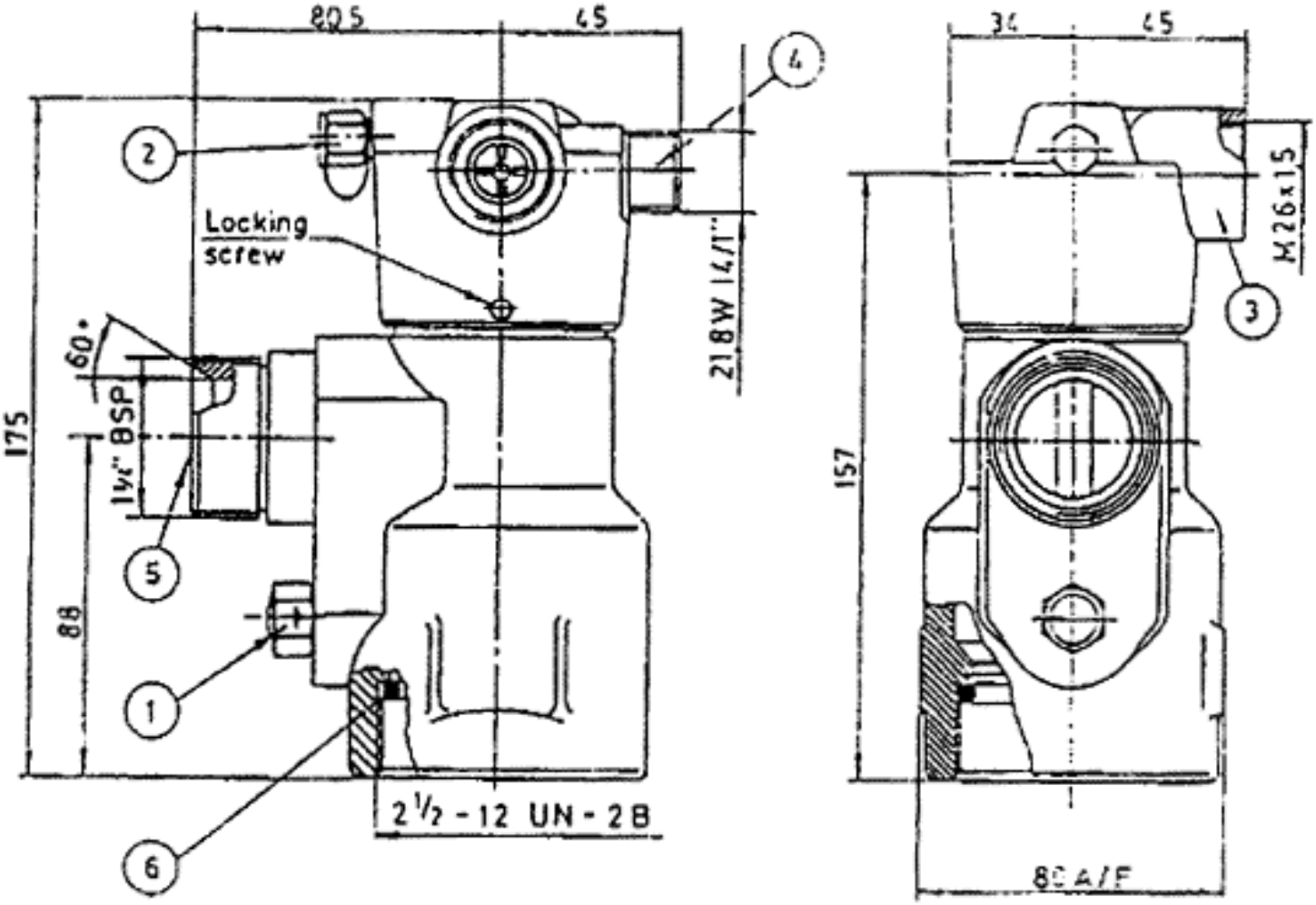
All visual inspections must be performed according to the regulations of C.F.R. Title 49, and C.G.A.

Pamphlet C-6, Section 3. All inspections are to be done by C.G.A./D.O.T. approved inspectors only.



GINGE FIRE EXTINGUISHING SYSTEMS
KERR: MADE BY DATE: BV 1985-09- 03
APP BY /DATE: POJ 1985-09-03
DATE OF ISSUE" 1985-09-03
REV: C
CODE NO 06-6441-0000

Pneumatic Halon Valve.



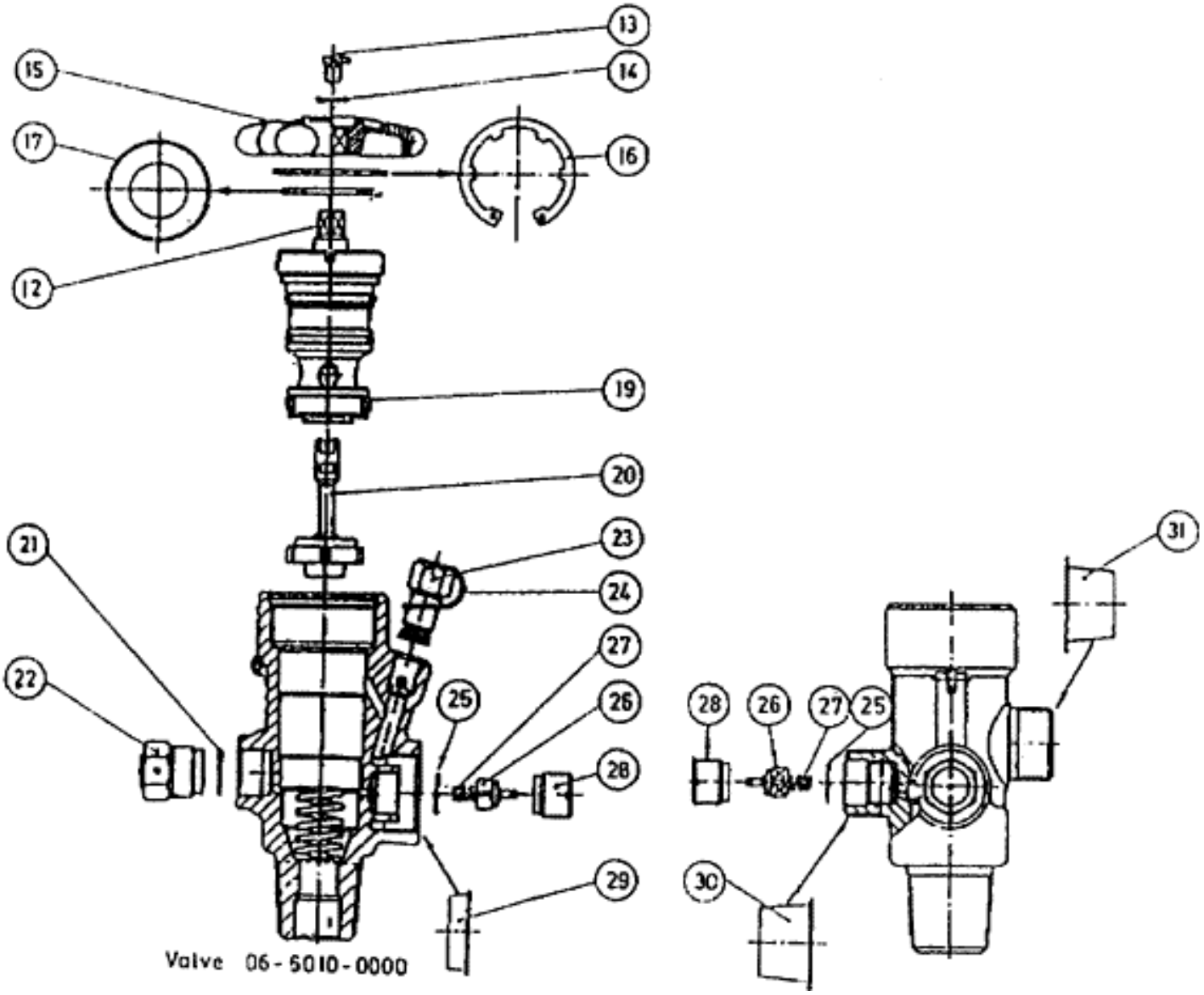
Valve for H1301 High Pressure Cylinder.

The Valve is pneumatically operated by the Actuator.

Pressure for activation: 10 bar at cylinder pressure of 100 bar.

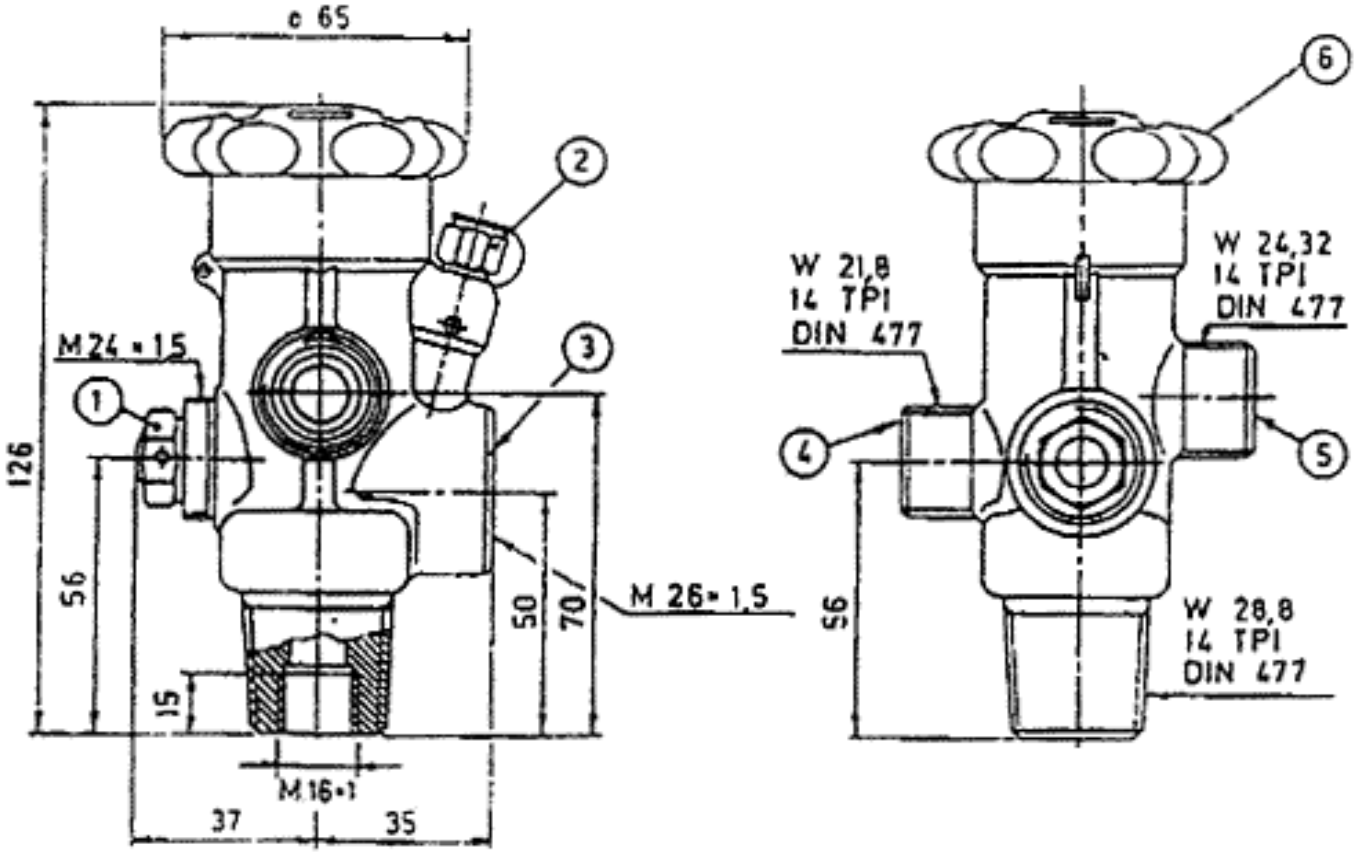
1. Bursting Disc. 190 bar.
2. Bleeder Valve with-Indicator for pressure operated release.
3. Connection for Actuators.
4. Connection for Pressure Gauge and Pressure Switch.
5. Outlet.
6. O-ring, 059.92 x 03.53

Material: Mainly Brass.
Working Pressure: 100 bar.
Test Pressure: 150 bar.
Weight: 3.7 kg



GINGE FIRE EXTINGUISHING SYSTEMS
KERR: MADE BY DATE: BV 1985-09- 03
APP BY /DATE: POJ 1985-09-03
DATE OF ISSUE" 1985-09-03
REV: C
CODE NO 06-6441-0000

Pneumatic Halon Valve.



Valve for H1301 High Pressure Cylinder.

The Valve is pneumatically operated by the Actuator.

Pressure for activation: 10 bar at cylinder pressure of 100 bar.

1. Bursting Disc. 190 bar.
2. Bleeder Valve with-Indicator for pressure operated release.
3. Connection for Actuators.

4. Connection for Pressure Gauge and Pressure Switch.
5. Outlet.
6. Handwheel: Colour: gray

Material: Mainly Brass.
Working Pressure: 150 bar.
Test Pressure: 250 bar.
Weight: 1.2 kg

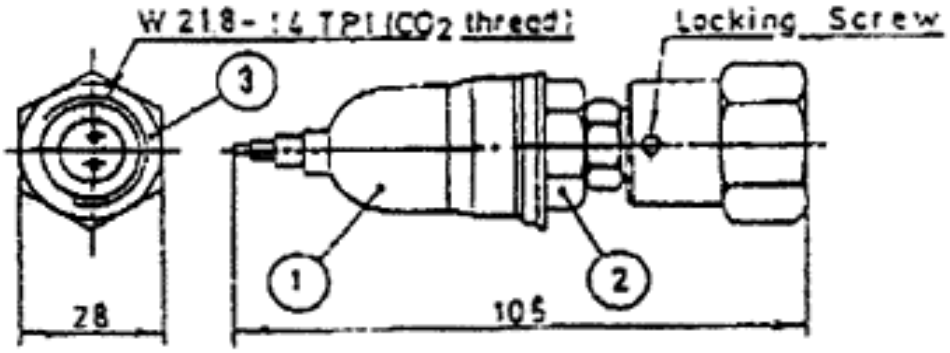
GINGE
FIRE EXTINGUISHING SYSTEMS
KERR

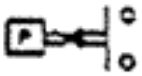
PRESSURE SWITCH FOR 42 BARS SYSTEMS.

DATA SHEET

Code no. 06-7021-3000

Made by/Date	App. by/Date	Date of issue	Rev	Page
BV 1984-06-26	KGC 1984-06-26	1984-06-26	C	1 of 1





The switch shown non-pressurized, normally closed 30 bar

1. **Rubber Protection cap.**
2. **pressure switch = ax, 42 v DC/AC - 100 VA (IP 65).**
3. **Copper gasket: 015.0 x 019.3 x 1.0.**

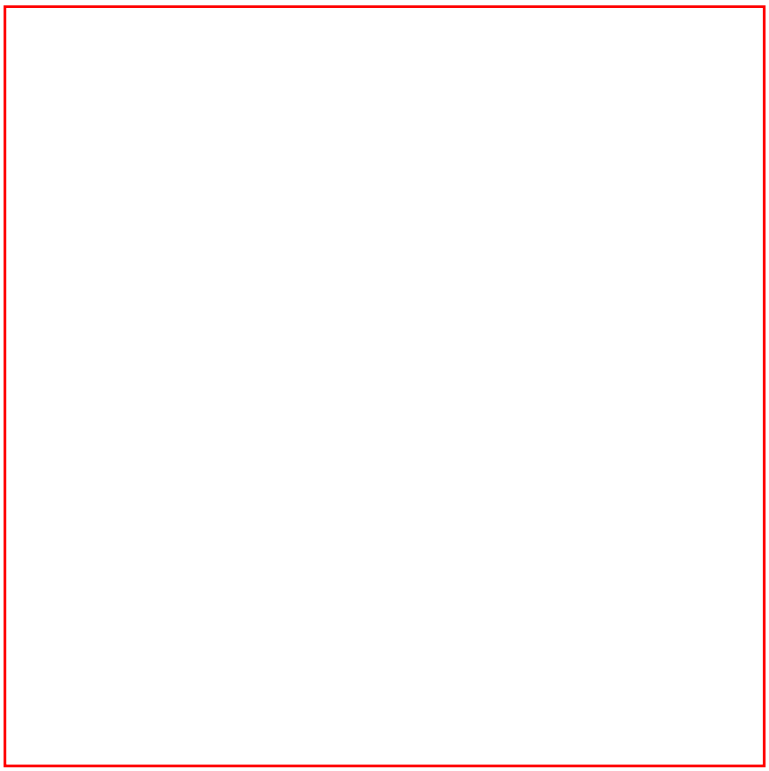
Material: Mainly brass for each. parts.
Weight: 0.225 kg.

Authorization Course Release panel 5444

P32

GINGE
MALSKITSE
HALON 1301 Flaske 67, 5L Med Ventil "

Type 06-95 $^{25}_{26}$-00
UDGAVE M-03



1. Halon valve type 06-6441-00
2. Dip-tube
3. Label
4. Protecting cab

Cylinder:

Material: Steel, Painted red
Test pressure:250 bar
Filling Pressure (20º C) : 42 bar
Approved by :TÜV (Dantest)
Certificates from standard: LRS or BV or DNV

Type	Liter	Liter	empty kg	filling Kg	A	B
06-9525	45, 0	51, 0	29	50	1108	1200
06-9525	67, 75	82, 6	43	75	1543	1625

Dimensional Sketch Halon 1301 Cylinder

67, 5 L with Valve type 06-95$^{(25)}_{(26)}$-00

EDITION - M03

Return to Table of Contents

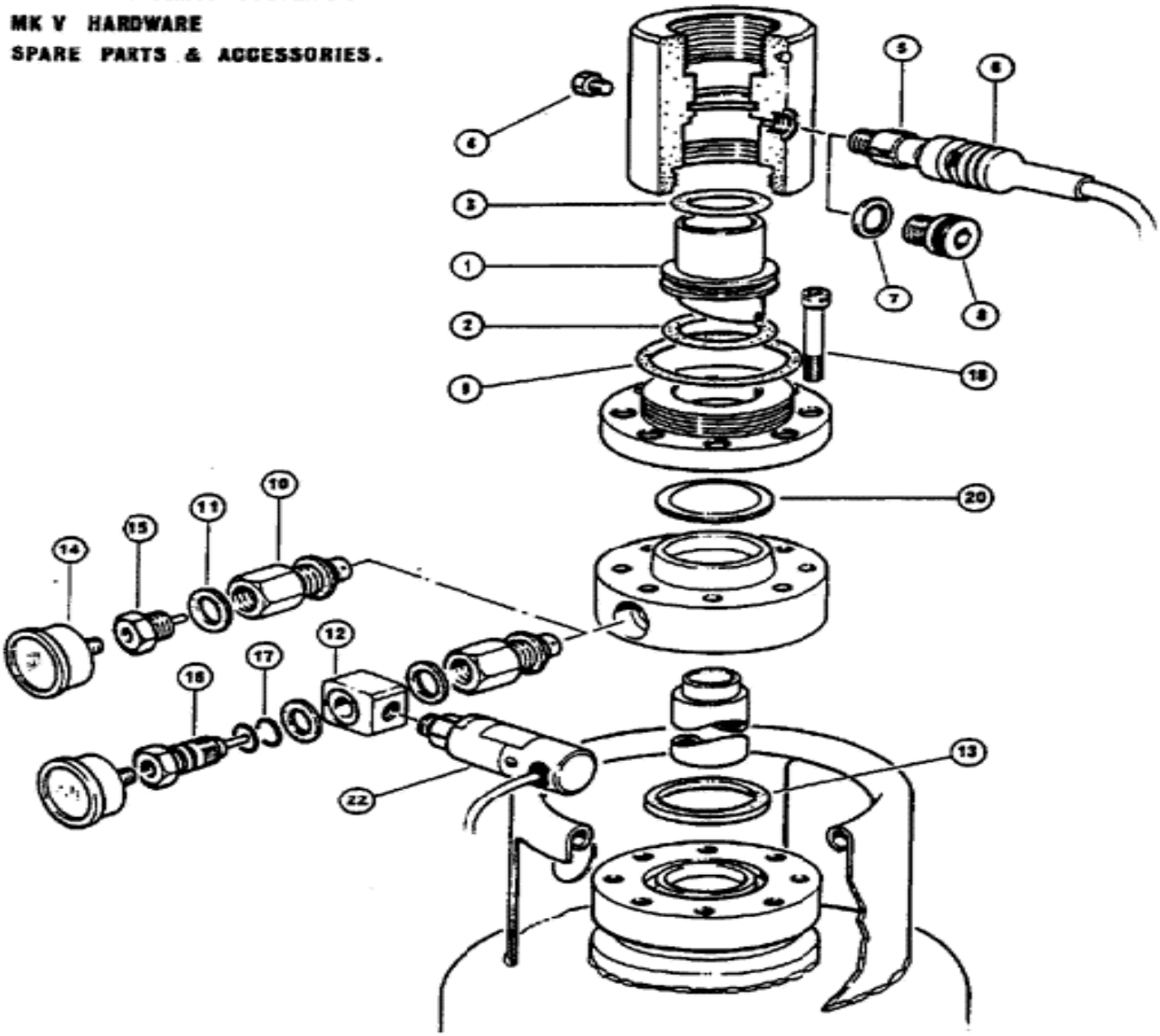
PYROTRONICS SERIES H
HALON 1301 SYSTEM CONTAINERS AND VALVES

INTRODUCTION

Pyr-A-Lon 1301 Engineered Systems are custom engineered fire suppression systems designed in accordance with NFP 12A. Pyr-A-Lon 1301 Engineered Systems are listed by Underwriters Laboratories, Inc. and

HALON SYSTEMS

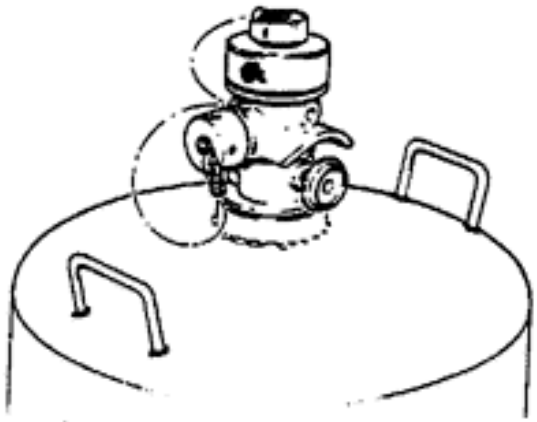
INDUSTRIAL HALON SYSTEMS.
MK V HARDWARE
SPARE PARTS & ACCESSORIES.



EXPLODED VIEW SHOWING CYLINDER COMPONENTS DISCHARGE HEAD & ALTERNATIVE PRESSURE GAUGE ASSEMBLIES WITH & WITHOUT PRESSURE SWITCH.

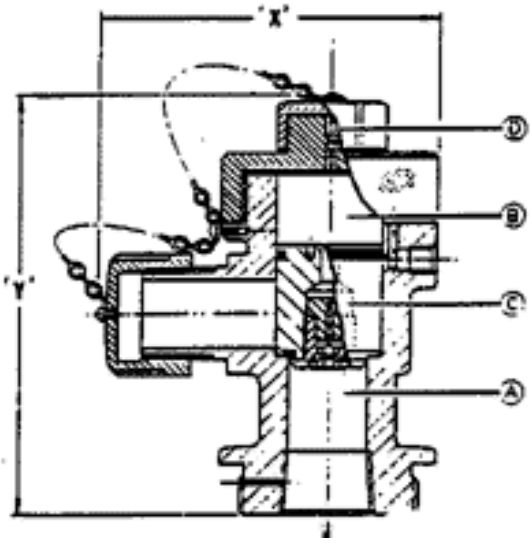
WORMALD
FIRE SYSTEMS

25mm AND 50mm 2500 kPa HALON HIGHFLOW VALVE AND CYLINDER ASSEMBLY



APPROXIMATE DIMENSIONS

	25mm	50mm
X	120	160
Y	150	200



VALVE AND CYLINDER ASSEMBLIES

The Wormald cylinder and valve assemblies provide the agent, cylinder and valve assembly for both Halon 1301 and 1211 total flooding fire suppression systems They may be used singly or manifolded together to provide the required quantity of agent.

HIGHFLOW VALVES

Wormald Highflow Halon Valves are supplied as an integral part of the Halon cylinder assembly. The 25mm valve is used on the 25 and 48kg capacity cylinders and has a 25mm male NPT threaded pipe outlet. The 50mm valve is used on the 65 and 106kg capacity cylinders and has a 50mm male NPT threaded pipe outlet. The 25mm and 50mm highflow valves am of the differential pressure piston type. They are attached to the cylinder with a 2½- 12UN-2B thread with an O-Ring seal. Valve components are brass, making the valve inherently corrosion resistant. The outlet port and actuation connections are readily accessible for ease of installation and servicing. The valve assembly includes a safety relief device, a pressure gauge, connections for various ancillary equipment and transport caps. A syphon tube is permanently fitted to the valve.

The following actuators are suitable for use with the Highflow Halon Valves and fit to a threaded 1¼" - 18 UNEF-2B connection:

A. **Pneumatic (Slave)**
B. **Electrical (24V DC Solenoid)**
C. **Manual-cable pull**

D. **Manual/Pneumatic**
E. **Multi-actuator**

Refer to separate actuators data sheet for details.

The fire extinguishing agents used are Halon 1301 and Halon 1211. Both are colourless, odourless, non conductive gases. Halon is stored in the cylinders as a liquid under nitrogen superpressure, at 2500 kPa. Cylinders can be part filled with the required Halon quantity.

OPERATION

Once a tank has been filled and pressurized. The valve is sealed by means of nitrogen overpressure introduced into Chamber B. This pressure propels the piston into the valve closed position and the pressure acting on the greater surface area of Chamber B than Chamber A produces a positive sealing force. A small bleed hole C through the piston ensures that the seal is maintained by equal pressure above and below the piston.

The valve is opened by venting the pressure from the upper chamber through the vent valve D. During this venting, a rubber ball in the bleed hole checks the gas flow from A to B and the tank pressure propels the piston into its upper position. Allowing maximum free passage to the flow.

DESIGN DATA

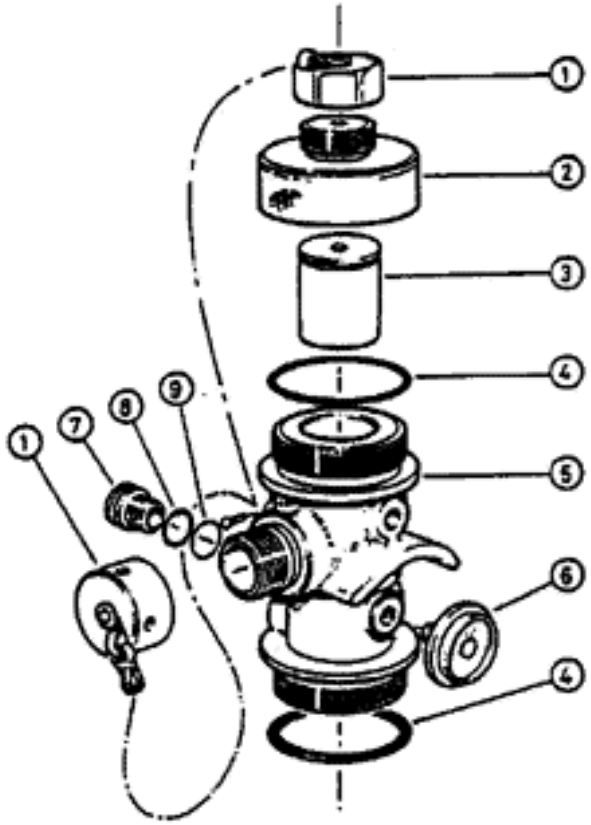
- **Agent: Halon 1301 or Halon 1211. Superpressurized with nitrogen.**
- **Working pressure: 2500 kPa at 21ºC. Maximum filling density of Halon 1301 1.065 kg/L.**
- **Design temperature:**
  - **20ºC to + 50ºC.**
- **Safety relief device: 5400 ± 300 kPa.**
- **Pressure drop:25mm Valve: 1.5m equivalent length of 25mm Schedule 40 pipe (includes outlet nipple).**
  50mm Valve: 7.3m equivalent length at 50mm Schedule 40 pipe (includes outlet nipple).

CYLINDERS

Wormald Highflow Halon cylinders are available in 25, 48, 65 and 106 kg capacities. They are of welded steel construction, and are designed, tested and inspected in accordance with Australian standard AS2470. Every cylinder is hydrostatically pressure tested to 6900 kPa, and carries a stamped plate with all cylinder details. Standard finish is yellow enamel # 356 to BS381C, however, zincsprayed and pointed, or galvanised finishes are available to order. Cylinders a complete with fitting handles and base skirt.

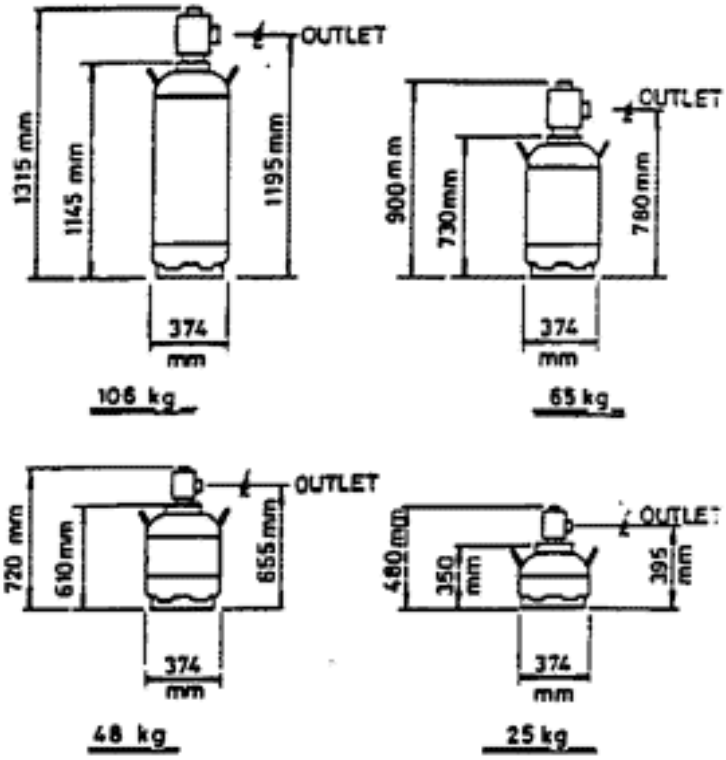
WORMALD
FIRE SYSTEMS

HIGHFLOW VALVE — EXPLODED VIEW



1. SHIPPING/SAFETY CAP ASSEMBLY
2. CAP
3. SPOOL ASSEMBLY
4. 'O' RINGS
5. VALVE BODY
6. GAUGE
7. SAFETY DISC NUT
8. SAFETY DISC GOLD PLATED BRASS
9. SAFETY DISC WASHER

CYLINDER DIMENSIONS



CYLINDER BRACKET

(For use with Unistrut type channel and threaded rod)

	NOMINAL CAPACITY			
CYLINDER SPECIFICATIONS	25kg	48kg	65kg	106KG

HALON 1301 CAPACITY WITH 1.065kg/L FILL DENSITY AT 21ºC (kg)	26.6	51.1	69.2	112.9
HALON 1211 CAPACITY WITH 1.3kg/L FILL DENSITY AT 21ºC (kg)	31	62	85	138
WATER CAPACITY (NOMINAL) (kg)	25	48	65	106
TEST PRESSURE (kPa)	6900	6900	6900	6900
SUPERPRESSURE (MAX) AT 21ºC (kPa)	2500	2500	2500	2500
NOMINAL TARE MASS (EMPTY) (kg)	28	45	55	79
VALVE OUTLET SIZE	1"NPT	1"NPT	2"NPT	2"NPT

PRODUCT : HALON CYLINDERS - MKII,MK III, Mk IV, MK V HIGHFLOW

SUBJECT : RELIEVING, SUPERPESSURE & DECANTING

ORIGINAL ISSUE DATE : MAY 1987

It should be general policy to try to upgrade all Halon Systems to the Ansul - style Highflow type where possible. The major selling point here is that the removal, emptying, testing, refilling and reinstatement of the old cylinders is a major operation, which will have to be repeated every five (5) years subsequent to the initial ten (10) year inspection, in accordance with AS2030 - 1985 requirements.

MkII - MkIV valves and cylinders particularly should be replaced and their design and technology is approaching obsolescence. Mk I cylinders will NOT be refilled.

There are two (2) methods of decanting the range of Wormald Halon cylinders. The method used - depends on the type of container the Halon is being emptied into, the equipment available, and the efficiency required of the transfer.

METHOD 1:

BANNED

METHOD 2:

The cylinder can be emptied without first relieving the Nitrogen superpressure. Depending on the cylinder type, it may have to be inverted to allow the superpressure to force the liquid Halon out.

This method may be used when the Halon receiving vessels are only on limited volume, and-the extra pressure in the cylinder being emptie ensures maximum Halon transfer. This method tends to transfer a higher percentage of the Halon than Method 1.

METHOD 2:

2.1 CYLINDER DECANTING WHILST SUPERPRESSURISED

With this method, the nitrogen superpressure is not bled of f prior to decanting the liquid Hallon.

2.1.1 MKII Cylinders

(a) Install the filling bonnet (as supplied by Wormald Manufacturing) onto the top of the cylinder, ensuring, it is fully screwed onto the neck ring, and the valve closed.

(b) Place cylinder into a clamping device.

(C) Connect draining hoses to bonnet outlet valve, and to-the receiving vessel.

(d) Using a socket wrench or spanner assembly in the filling bonnet, turn anti-clockwise to release seal-disc.

(e) By opening all line valves slowly, Halon will flow from the superpressurised cylinder into the receiving vessel.

2.1.2 MKIII. MKIV, MKV Cylinders

(a) Connect special draining adaptors to the filler valve after first removing the pressure gauge

assembly (MkIV and MkV) or Cap (MkIII). The built-in ball-check valve should prevent excessive leakage until draining adaptor is screwed fully home.

(b) Connect draining hoses and valve to draining adaptor and to the receiving vessel.

(c) Carefully invert cylinder, and clamp securely.

(d) By opening all line valves slowly, Halon will flow from the superpressurised cylinder into the receiving vessel.

2.1.3 Highflow Cy1inders

(a) Clamp cylinder securely.

(b) Connect filling/draining adaptors to outlet connection, ensuring valve on adaptor is closed.

(c) Valve can be actuated against this closed valve. by depressing Schrader Valve at the top of the Halon valve.

(d) Connect draining hoses to adaptor connection and receiving vessel.

(e) Open line valves and Halon will flow from sup superpressuris cylinder into receiving vessel.

After the above steps, there should be very little Halon left in cylinder.

NOTES:

(i) Where possible the easiest and most economical results are achieved when a 1/2 ton or 1 ton cylinder is used as the receiving vessel.

(ii) To assist in Halon transfer, where possible the receiving vessel should be kept cool and below the level of the cylinder being decanted.

(iii) If a brine task or chiller unit is available, the Halon should be pumped through this to further aid transfer.

(iv) Transport caps should always be fitted where possible.

(v) Always provide maximum ventilation to filling/decanting area - DO NOT SMOKE whilst performing these operations.