INSTRUCTION BOOKLET

CHLORINE INSTITUTE RECOVERY VESSEL FOR 100 LB AND 150 LB CHLORINE CYLINDERS

Edition 2

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The Chlorine Institute, Inc. 1300 Wilson Boulevard, Arlington, VA 22209

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1. INTRODUCTION

Leaks in chlorine cylinders rarely occur. When they do occur, however, prompt corrective action is required by competent personnel with special equipment. The Chlorine Institute Recovery Vessel and the Chlorine Institute Emergency Kit A are two different types of such specialized equipment that can assist in the mitigation of any chlorine release from cylinders. The Recovery Vessel is an alternative to the Chlorine Institute's Kit A and does address some of Kit A's limitations.

1.1 SCOPE

This instruction manual provides information on the design and use of the Chlorine Institute Recovery Vessel.

1.2 CHLORINE INSTITUTE STEWARDSHIP PROGRAM

The Chlorine Institute, Inc. exists to support the chlor-alkali industry and serve the public by fostering continuous improvements to safety and the protection of human health and the environment connected with the production, distribution and use of chlorine, sodium and potassium hydroxides, and sodium hypochlorite; and the distribution and use of hydrogen chloride. This support extends to giving continued attention to the security of chlorine handling operations.

Chlorine Institute members are committed to adopting CI's safety and stewardship initiatives, including pamphlets, checklists, and incident sharing, that will assist members in achieving measurable improvement. For more information on the Institute's stewardship program, visit CI's website at www.chlorineinstitute.org.

1.3 DISCLAIMER

The information in this pamphlet is drawn from sources believed to be reliable. The Institute and its members, jointly and severally, make no guarantee and assume no liability in connection with any of this information. Moreover, it should not be assumed that every acceptable procedure is included or that special circumstances may not warrant modified or additional procedure. The user should be aware that changing technology or regulations may require a change in the recommendations herein. Appropriate steps should be taken to insure that the information is current when used. These recommendations should not be confused with federal, state, provincial, municipal or insurance requirements, or with national safety codes.

1.4 APPROVAL

The Institute's Emergency Preparedness Issue Team approved the Second Edition of this instruction booklet on March 24, 2009.

1.5 REVISIONS

Suggestions for revision should be directed to the Secretary of the Institute.

1.5.1 Significant Revisions

This Instruction Booklet was reviewed for consistency with current practices and regulations. It was updated where necessary. A significant change from the previous edition is that DOT has authorized the use of the Recovery Vessel and shippers are no longer required to file an exemption.

1.6 REPRODUCTION

2. GENERAL

The Chlorine Institute Recovery Vessel is designed for use with the standard DOT 3A480 or 3AA480, 100 and 150 pound capacity cylinders in chlorine service only. The cylinders have outside diameters between 8 ¼ and 10 ¾ inches and overall height from 39 ½ to 59 inches. The vessel is designed for use with all configurations of standard chlorine cylinders. The empty weight of the Recovery Vessel is approximately 300 pounds. The weight of the vessel with a full 150 pound cylinder is approximately 525 to 575 pounds.

2.1 REGULATORY STATUS

This Recovery Vessel is not specified by the U.S. Department of Transportation (DOT) but its use is authorized under 49 CFR 173.3.

2.2 TRAINING & SAFETY

Drivers and other personnel, who load, unload or transport the Recovery Vessel must be trained in its use. Training must include the use of respiratory equipment and, all other safety equipment. Knowledge of the properties of chlorine is a must.

Personnel safety is of primary importance. Emergency response should only be performed by authorized personnel who are trained in the procedures and are equipped with suitable respiratory and personal protective equipment.

2.3 RESPIRATORY EQUIPMENT

The Institute recommends that responders to chlorine gas leaks wear Level B Equipment. Responders to chlorine liquid leaks wear Enhanced Level B equipment. See CI Pamphlet 65 for further details.

2.4 CHLORINE CYLINDER INSPECTION

Daily inspection of full cylinders is recommended whether or not they are connected to unloading lines. Through these means a leak usually can be detected in an early stage when it can be corrected or controlled by appropriate procedures.

2.5 LEAK DETECTION

As soon as there is any indication of the presence of chlorine in the air, authorized, trained personnel equipped with suitable personal protective equipment should investigate promptly. All other persons should be kept away from the affected area.

When a leak is suspected, it is recommended that ammonia vapors be used to find the source. When ammonia vapor is directed at a leak, a white cloud will form. To produce ammonia vapor, a plastic squeeze bottle containing commercial, 26° Baumé or stronger, aqua ammonia (ammonium hydroxide solution) should be used.

A weaker solution such as household ammonia may not be concentrated enough to detect minor leaks. If a wash bottle is used, the dip tube inside the bottle should be cut off so that squeezing the bottle directs only the vapor, and not liquid, from the nozzle. To prevent corrosion, liquid aqua ammonia should not come into contact with any metal parts.

2.6 ASSISTANCE

Chlorine emergencies should be handled only by trained personnel. If assistance is required, promptly notify your supplier. If the supplier cannot be reached or respond immediately, then summon help by activating CHLOREP, The Chlorine Emergency Plan. Use the appropriate telephone number for the U.S. or Canada. CHLOREP can also be activated by calling CHEMTREC in the U.S.

1-800-424-9300 or CANUTEC in Canada 1-613-996-6666.

3. USING A RECOVERY VESSEL

If the leak is on the side or on the bottom of the chlorine cylinder, place the cylinder in the horizontal position with the leak in the uppermost position (vapor space). If the leak is in the valve or valve threads, leave the cylinder in the upright position until ready to place in the Recovery Vessel.

Refer to Drawing 188 and the schematic showing the hinged closure. Take the Recovery Vessel to an area in close proximity to the leaking cylinder and perform the following preparatory work.

a. Alternately loosen the T-bolts that retain the hinged lid until they are just snug.

b. Remove the valve protective cap from the vent valve on the Recovery Vessel.

c. Remove the outlet cap and open the vent valve on the Recovery Vessel.

d. Move the Recovery Vessel into position directly in front of the chlorine cylinder and loosen the T-bolts. Swing the T-bolts from the lugs of the hinged closure. Open the hinged closure. Inspect the O-ring gasket (Part RV-9) to make sure it is installed properly. Inspect the seating surface on the Recovery Vessel.

e. Position the bottom of the chlorine cylinder on the slide rails on the inside of the Recovery Vessel.

f. Slide the entire chlorine cylinder, bottom first, into the Recovery Vessel.

g. Again inspect the O-ring gasket and seating surfaces. Remove any foreign substances that might have gotten on the O-ring or seating surface. Close the hinged cover by positioning the lid evenly on the mating sealing surface to assure proper sealing.

h. Swing the T-bolts into position and alternately tighten the bolts snugly until the lid is secure.

i. Close the vent valve and install the outlet cap on the valve. Check for leaks with ammonia vapor. Install the valve protective cap.

j. Check the hinged lid sealing joint for leaks with ammonia vapor. If white smoke indicates leaking chlorine, tighten the T-bolts again in an alternating manner. **WARNING:** *DO NOT OVER-TIGHTEN.* If tightening the T-bolts won't stop the leak, do the following:

- Follow the instruction for removing a cylinder from the Recovery Vessel.
- Clean sealing surfaces and install a new O-ring.
- Repeat earlier procedure for putting a cylinder in a Recovery Vessel.

k. Consult with the chlorine cylinder supplier immediately and arrange for ultimate disposal.

l. The Recovery Vessel with a full cylinder of chlorine will weigh approximately 525 to 575 lbs.

4. SHIPPING

When the Recovery Vessel is shipped containing a damaged or leaking chlorine cylinder, a bill of lading with the appropriate description as specified in 49 CFR 172.202 must accompany the shipment.

The Recovery Vessel must be marked and labeled as prescribed for a chlorine cylinder.

The Recovery Vessel must be secured in a motor vehicle in accord with the requirements of 49 CFR 393.100 through 393.106.

The loaded Recovery Vessel must be delivered to the consignor or the consignee as soon as practical.

5. HANDLING OF CHLORINE REMAINING IN THE RECOVERY VESSEL

The containment of leaks by this emergency device is only an interim measure:

THE CHLORINE CYLINDER MUST BE EMPTIED AS SOON AS POSSIBLE.

REMOVAL OF DAMAGED CYLINDER FROM THE RECOVERY VESSEL

WARNING: *DO NOT ATTEMPT TO OPEN THE HINGED CLOSURE UNTIL THE VESSEL HAS BEEN RELIEVED OF ALL INTERNAL PRESSURE. OPENING UNDER PRESSURE MAY RESULT IN INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.*

- Put on suitable personal protective equipment before attempting to open the Recovery Vessel.
- Before opening the hinged closure, remove the vent valve protective cap.
- Then remove the valve outlet cap.
- Open the vent valve and relieve the internal pressure into a suitable absorption system.
- Loosen the T-bolts alternately.
- Do not swing the bolts loose from the head lugs until it is certain that no pressure remains in the vessel. Continue to loosen the T-bolts. The presence or absence of pressure will become apparent and will indicate the rate at which opening can proceed.
- If evidence of chlorine remaining in the cylinder or recovery vessel is encountered, close the hinged closure and repeat the process of venting the contents.

6. MAINTENANCE AND INSPECTIONS

6.1 CLEANING

Before cleaning the used Recovery Vessel, personnel should be wearing appropriate personal protective equipment, including splash protection.

Remove the vent valve protective cap and the vent valve.

Wash inside of the Recovery Vessel with approximately 5% solution of caustic soda or soda ash to neutralize any chlorine residual.

After washing, rinse the Recovery Vessel with water until it is free of the cleaning solution. Dry it thoroughly so it does not corrode. Consider repainting or passivation of the vessel to minimize corrosion.

6.2 INSPECTIONS

After any use, thoroughly inspect the interior and exterior surfaces of the Recovery Vessel, and repair any damage which may have occurred to the paint finish or markings. The vessel is of welded construction and contains few removable parts. Welded repairs to the Recovery Vessel must be accomplished in accordance with 49 CFR 173.3.

Apply a non-reactive thread sealant to a new or reconditioned chlorine ton container valve and insert it in the threaded opening on the side of the Recovery Vessel.

Apply a non-reactive lubricant to the valve protective cap before screwing it into the half coupling.

Carefully inspect the sealing gasket surface for nicks, cuts or gouges and repair if necessary. Replace the O-ring gasket after each use and after each hydrostatic test. Apply a light coating of non-reactive lubricant to the gasket surface.

6.3 GASKET REPLACEMENT

Remove all foreign material from the O-ring gasket groove and seating surface before the O-ring is installed. The O-ring should be coated with a non-reactive lubricant before it is placed in position.

The O-ring is intentionally smaller than the groove diameter and must be stretched to effect a "snap-fit" when properly positioned. It is recommended that the O-ring be inserted into the groove at one 90 degree quadrant; then work the O-ring into the groove of the other three quadrants. Care should be taken not to "roll" the O-ring.

6.4 BOLTS

Lubricate the bolts periodically with a non-reactive lubricant in accordance with the frequency and severity of the service involved. Silicone lubricant can be used. Inspect the head bolts periodically for thread wear.

Over-tightening can cause excessive thread wear and should be avoided.

6.5 PAINTING

If the Recovery Vessel is to be painted, do so with the head in the closed position to prevent paint from being applied to the sealing surfaces. Paint on these surfaces may impede proper sealing. It is recommended that the seating surfaces and O-ring gasket be coated with non-reactive lubricant before closing for painting. The bolt threads should be masked while painting.

If complete painting of the Recovery Vessel is required, the following procedure is recommended:

a. Surface preparation in accordance with SSPCSP-10, near white blast clean;

b. 1st coat - 3 mils of inorganic zinc primer;

c. 2nd coat - 5 mils of gray high build epoxy; and

d. Finish coat - 2 mils of white aliphatic urethane.

7. TESTING

The Recovery Vessel must be tested in accordance with 49 CFR 173.3 (d) (9).

8. PARTS LIST

CHLORINE INSTITUTE RECOVERY VESSEL

PART NUMBER	DESCRIPTION	QUANTITY
RV-1	Recovery Vessel Proper	1
RV-2	Valve Protective Cap	1
RV-3	Ton Container Valve*	1
RV-4	Valve Outlet Cap*	1
RV-5	Hinge Bushing	2
RV-6	Hinge Bolt Washer	2
RV-7	Hinge Bolt	2
RV-8	Hinge Bolt Nut	2
RV-9	O-Ring, Viton™ E*	1
RV-10	Head Bolt*	6
RV-11	Head Bolt Washer*	6
RV-12	Tapped Swing Nut*	6
RV-13	Wrench (for valve)*, 3/8 inch sq. box, 1 ¼ inch x 7 ¼ inch	1
RV-14	Wrench (for hinged closure nuts)*, straight open end, 1 ¼ inch x 15 ½ inch	1
RV-15	Instruction Booklet*	1
RV-16	Bill of Lading Blank*	1
RV-17	Pouch, Spare Parts	1

* *Spare parts recommended.*

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Emergency Contacts

Chlorine Supplier: _____

Address: _____

Phone: _____

CHEMTREC* **800-424-9300**

CANUTEC** **613-996-6666**

Nearest Chlorine Producer or Packager: _____

Address: _____

Phone: _____

Police Department: _____ Phone: _____

Fire Department: _____ Phone: _____

First Aid: _____ Phone: _____

* In the UNITED STATES, summon help through CHEMTREC, the Chemical Transportation Emergency Center at the American Chemistry Council in Arlington, VA.

(toll free) **800-424-9300**

** In CANADA, summon help through CANUTEC, the Canadian Transport Emergency Centre in Ottawa.

CANADA, All provinces (call collect) **613-996-6666**

Spare parts note:

Stock two (2) extra "O" rings for each closure
Replace "O" ring after exposure to chlorine
Replace "O" ring after shelf life expiration

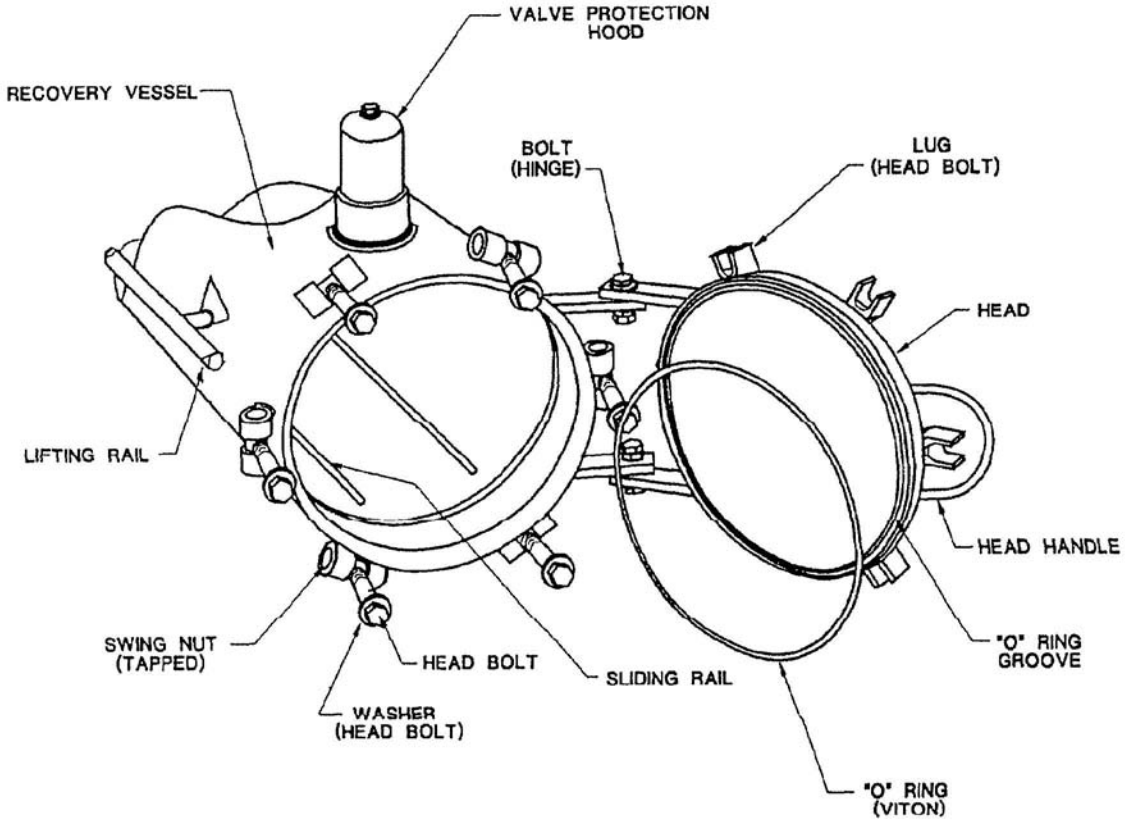
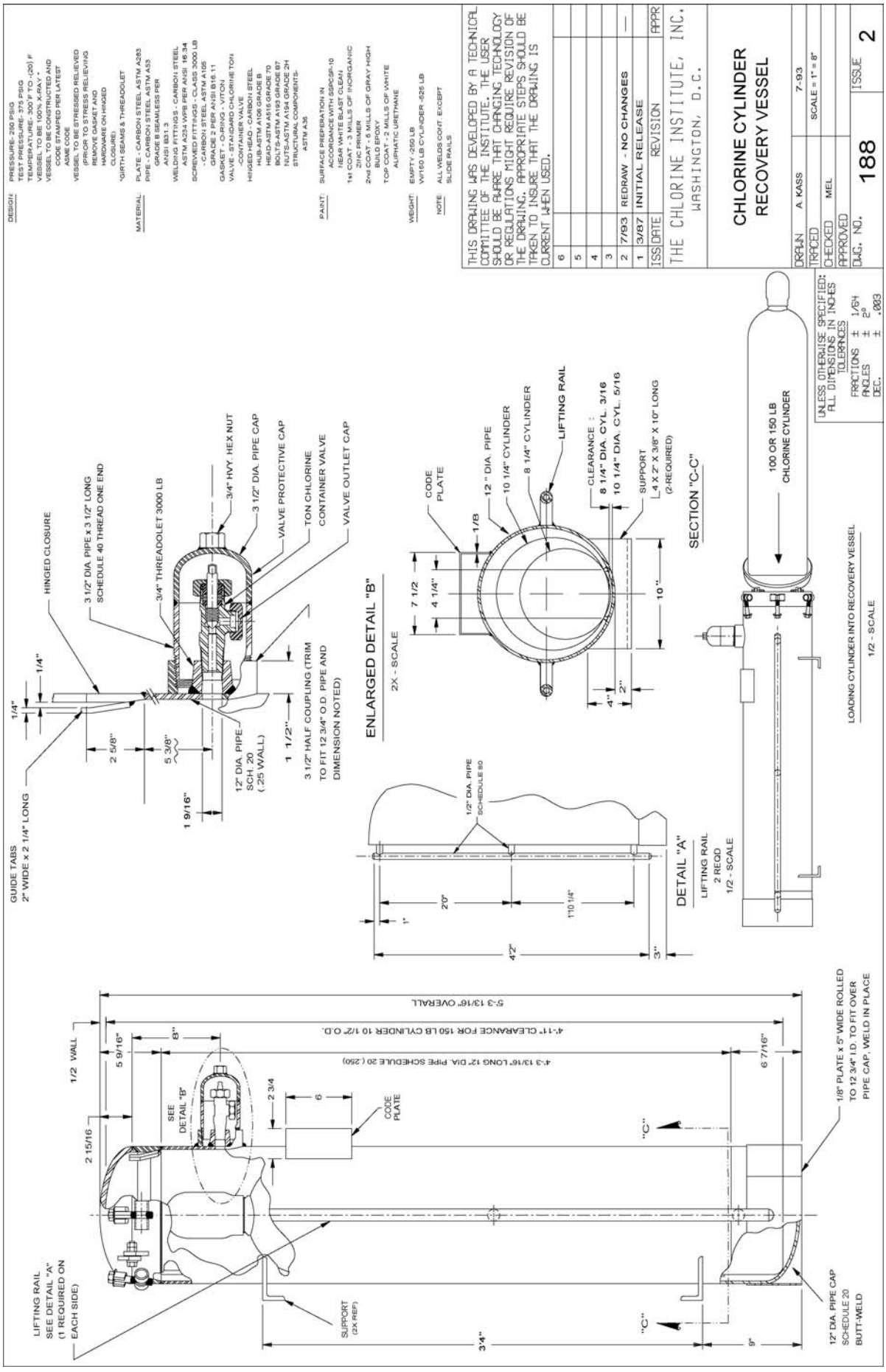


Figure 1
Hinged Closure
Chlorine Cylinder Recovery Vessel


DESIGN:
PRESSURE- 250 PSIG
TEST PRESSURE- 375 PSIG
TEMPERATURE- 300°F TO -20°) F
VESSEL TO BE 100% X-RAY *
VESSEL TO BE CONSTRUCTED AND CODE STAMPED PER LATEST ASME CODE
VESSEL TO BE STRESSED RELIEVED (PRIOR TO STRESS RELIEVING REMOVE GASKET AND HANDWHEEL ON HINGED CLOSURE)
*GIRTH SEAMS & THREADOLET
MATERIAL:
PLATE - CARBON STEEL ASTM A283
PIPE - CARBON STEEL ASTM A53 GRADE B SEAMLESS PER ANSI B36.10
WELDING FITTINGS - CARBON STEEL ASTM A234 WPB PER ANSI 16.34
SCREWED FITTINGS - CLASS 3000 LB - CARBON STEEL ASTM A105 GRADE 2 PER ANSI B16.11
GASKET - O-RING - VITON
VALVE - STAINDARD CHLORINE TON -CONTAINER VALVE
HINGED HEAD - CARBON STEEL
HEAD - ASTM A516 GRADE B
HINGE - ASTM A36 GRADE 70
BOLTS-ASTM A193 GRADE B7
NUTS-ASTM A194 GRADE 2H
STRUCTURAL COMPONENTS- ASTM A36
PAINT:
SURFACE PREPERATION IN ACCORDANCE WITH SSPC-SP10 NEAR WHITE BLAST CLEAN
1st COAT - 3 MILLS OF INORGANIC ZINC PRIMER
2nd COAT - 8 MILLS OF GRAY HIGH BUILD EPOXY
TOP COAT - 2 MILLS OF WHITE ALIPHATIC URETHANE
WEIGHT:
EMPTY -250 LB
W/150 LB CYLINDER -525 LB
NOTE:
ALL WELDS CONT. EXCEPT SLIDE RAILS
THIS DRAWING WAS DEVELOPED BY A TECHNICAL COMMITTEE OF THE INSTITUTE. THE USER SHOULD BE AWARE THAT CHANGING TECHNOLOGY OR REGULATIONS MIGHT REQUIRE REVISION OF THE DRAWING. APPROPRIATE STEPS SHOULD BE TAKEN TO INSURE THAT THE DRAWING IS CURRENT WHEN USED.
6
5
4
3
2 7/93 REDRAW - NO CHANGES —
1 3/87 INITIAL RELEASE
ISS DATE REVISION APPR
THE CHLORINE INSTITUTE, INC.
WASHINGTON, D.C.
CHLORINE CYLINDER
RECOVERY VESSEL
DRAWN A. KASS 7-93
TRACED SCALE = 1" = 8"
CHECKED MEL
APPROVED
DWG. NO. 188 ISSUE 2
UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS IN INCHES
TOLERANCES
FRACTIONS ± 1/64
ANGLES ± 2°
DEC. ± .003
GUIDE TABS 2" WIDE x 2 1/4" LONG
1/4"
HINGED CLOSURE
3 1/2" DIA. PIPE x 3 1/2" LONG SCHEDULE 40 THREAD ONE END
3/4" THREADOLET 3000 LB
3/4" HVY. HEX NUT
3 1/2" DIA. PIPE CAP
VALVE PROTECTIVE CAP
TON CHLORINE CONTAINER VALVE
VALVE OUTLET CAP
2 5/8"
5 3/8"
1 9/16"
12" DIA. PIPE SCH. 20 (.25 WALL)
1 1/2"
3 1/2" HALF COUPLING (TRIM TO FIT 12 3/4" O.D. PIPE AND DIMENSION NOTED)
ENLARGED DETAIL "B"
2X - SCALE
CODE PLATE
1/8
12 " DIA. PIPE
10 1/4" CYLINDER
8 1/4" CYLINDER
LIFTING RAIL
CLEARANCE : 8 1/4" DIA. CYL. 3/16
10 1/4" DIA. CYL. 5/16
SUPPORT 4 X 2" X 3/8" X 10" LONG (2-REQUIRED)
7 1/2
4 1/4"
10"
4"
2"
SECTION "C-C"
100 OR 150 LB CHLORINE CYLINDER
LOADING CYLINDER INTO RECOVERY VESSEL
1/2 - SCALE
1/2" DIA. PIPE SCHEDULE 80
DETAIL "A"
LIFTING RAIL 2 REQD
1/2 - SCALE
1'0"
2'0"
1'10 1/4"
1"
4'2"
3"
5'-3 13/16" OVERALL
4'-11" CLEARANCE FOR 150 LB CYLINDER 10 1/2" O.D.
4'-3 13/16" LONG 12" DIA. PIPE SCHEDULE 20 (.250)
1/2 WALL
5 9/16"
8"
2 15/16
SEE DETAIL "B"
2 3/4
6
CODE PLATE
"C"
6 7/16"
1/8" PLATE x 5" WIDE ROLLED TO 12 3/4" I.D. TO FIT OVER PIPE CAP, WELD IN PLACE
LIFTING RAIL SEE DETAIL "A" (1 REQUIRED ON EACH SIDE)
SUPPORT (2X REF)
3'4"
9"
12" DIA. PIPE CAP SCHEDULE 20 BUTT-WELD