

## CR2000 AND CR5000 ADSORBERS

### Operating Instructions



#### General Description

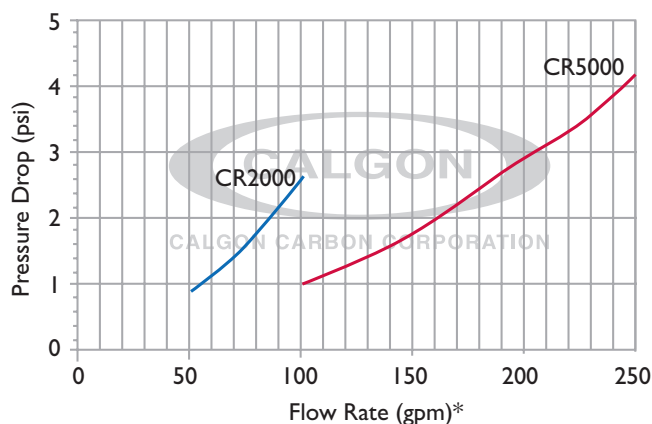
Calgon Carbon's CR2000 and CR5000 are pressure vessels designed to treat water using granular activated carbon (GAC). The vessels arrive filled with granular activated carbon for the removal of organic compounds from a variety of applications including: waste water streams, ground water remediation, pump tests, air stripper polishing, and pump and treat systems. The CR2000 is filled with 2,000 pounds\* of GAC and can treat up to 100 gpm. The CR5000 is filled with 5,000 pounds\* of GAC and can treat up to 250 gpm.

#### Adsorber Vessel Specifications

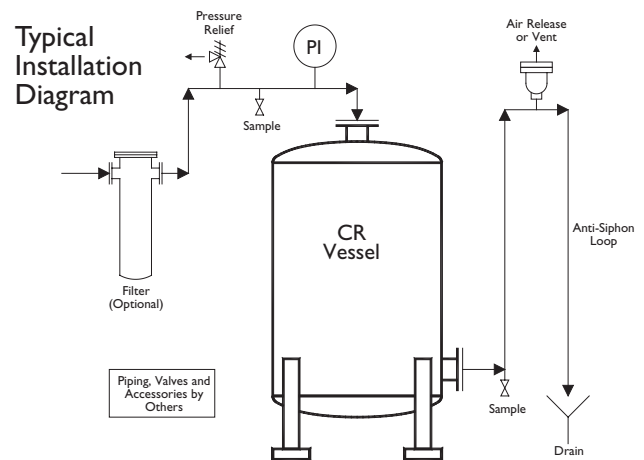
- Carbon steel pressure vessel
- Pressure rating 50 psig at 100°F (based on ASME design)
- Manway on top head for internal access and carbon fill
- Skid support / fork truck channels
- Lifting Lugs
- Internal epoxy lining
- Splash plate inlet distributor
- PVC pipe underdrain with PPL water collection nozzles, nozzle count is one per square foot of cross sectional area
- Exterior epoxy paint finish
- Stainless steel carbon discharge piping fitted with a bronze ball valve
- 150 pound ANSI flanged inlet and outlet connections
- Typical carbon fill by weight:
  - CR2000: 2,000 lbs \*
  - CR5000: 5,000 lbs \*

\*Approximate weight. May be less depending on type and density of carbon

#### Pressure Drop 8x30 GAC, 60°F



\*For pressure drop using GAC sized at 12 x 40, multiply pressure drop by 1.6



### Equipment and Systems

Visit our website at [www.calgoncarbon.com](http://www.calgoncarbon.com), or call 800-422-7266 to learn more about our complete range of products and services, and obtain local contact information.

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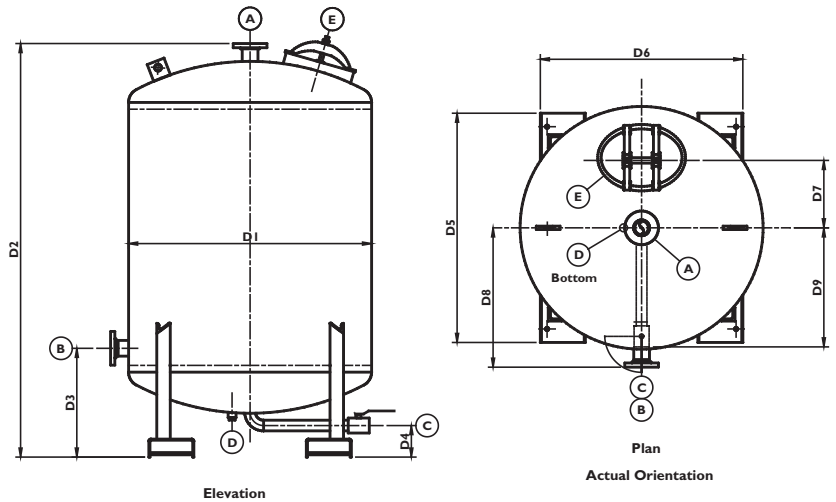
## Operating Instructions

CR2000 Nozzle Schedule

Mark	Size	Rating	Service
A	3"	150Lb. FLG.	Inlet
B	3"	150Lb. FLG.	Outlet
C	2"	N.P.T.	Carbon Outlet (w/Valve)
D	1"	N.P.T.	Drain
E	14"x18"	-	Elliptical Manway

CR5000 Nozzle Schedule

Mark	Size	Rating	Service
A	4"	150Lb. FLG.	Inlet
B	4"	150Lb. FLG.	Outlet
C	3"	N.P.T.	Carbon Outlet (w/Valve)
D	1"	N.P.T.	Drain
E	14"x18"	-	Elliptical Manway



Model	D1	D2	D3	D4	D5	D6	D7	D8	D9	Empty	Weight	
											Shipping w/GAC	Operating
CR2000	54"	92"	24"	7"	51"	45"	15"	31"	26.5"	1,500 Lbs	3,500 Lbs	8,300 Lbs
CR5000	78"	98.625"	26.5"	3.8125"	72"	64"	21"	43"	39"	2,200 Lbs	7,200 Lbs	17,200 Lbs

## Operating Instructions

### Installation Instructions

The CR vessels can be moved using a fork truck or lifted by crane using the lifting lugs. Position the vessel on a flat level surface capable of supporting the operating weight. A suggested piping arrangement is given in the Typical Installation Diagram.

### Preparation for Start-Up

1. Remove the blank flanges provided for shipping from the influent and effluent connections.
2. It is recommended to install a pressure relief device, either a rupture disk or pressure relief valve (supplied by others) in the influent piping connected directly to the vessel without restriction or valves. Note: the design of the vessel is 50 psig at 100F. The relief device should be adequate for these design conditions. See Typical Installation Diagram.
3. Connect the process inlet line to the inlet connection on the top head.
4. Connect the process outlet line to the outlet connection on the lower sidewall. The process outlet line should have a clean water connection so that the vessel can be filled up-flow for initial wetting of the GAC.

### Installation of the GAC

1. In most cases the CR vessels are shipped with the GAC installed. If so, proceed to the section "Wetting - Deaerating the GAC".

2. If the GAC is shipped separately, open the top manway and fill at least 200 gallons water to the CR2000 vessel to provide a water cushion at the bottom of the vessel. (500 gallons for the CR5000).
3. Fill the vessel with GAC.
4. Water can be added after each bag of GAC to keep the material submerged in water and to minimize dust generation.
5. After the GAC is installed, drain the water from the bed by using drain connection.

### Wetting - Deaerating the GAC

1. Open the inlet valve to act as a vent.
2. Connect the clean water source to the outlet connection and fill up-flow at 30 gpm maximum (CR2000) until water flows from the inlet connection (70 gpm for the CR5000).
3. Allow the GAC to soak for 3 days to fully deaerate the GAC. If the vessel must be started before the GAC is fully wetted, monitor the pressure drop across the vessel as an indication of the air coming out of GAC. Drain the bed and backfill after several days to remove the remaining air from the bed and complete the deaeration procedure.
4. During the soak period, check the water level once or twice per day and add water to keep the GAC submerged.
5. After the soak period, drain the water from the bed as described in the previous section and fill up-flow with clean water. The vessel is now ready for operation.

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### Backwashing/Backflushing

The CR vessels are not designed to allow for fluidization of the bed by backwashing, but backflushing to eliminate some fines and air is possible. The water source for backflushing must be clean, uncontaminated water. Introduce backflush water through the process outlet line and use the process inlet line as the backflush outlet. The backflush flow rate should be a maximum of 30 gpm for the CR2000 and 70 gpm for the CR5000. The operator should monitor the backflush effluent for solids to set the backflush run time.

1. Connect to clean water source.
2. Start backflush water flow at a low rate and ramp up to desired backflush flow rate.
3. Monitor the effluent for solids. If granular carbon is found, reduce water flowrate.
4. End backflush when the effluent is relatively clear.

### Start-Up

The vessel must remain full of water to operate effectively for adsorption. This can be accomplished by maintaining a backpressure on the vessel or by providing an anti-siphon loop in the effluent piping to prevent draining when the vessel is off-line. See Typical Installation Diagram.

1. Connect the influent piping to a contaminated water source.
2. Connect the effluent piping to the water discharge point.
3. Initiate the water flow and then open the outlet valve.
4. Open the inlet valve. Water should now be flowing through the vessel.

### Operation

1. Periodically check the inlet pressure, the discharge pressure, the water flow rate and contaminant levels. Note this information in the operator's log.
2. When the pressure drop across the vessel builds up to 10 psi greater than the initial pressure, it is recommended that the vessel be backflushed. If the pressure cannot be restored, consider changing the carbon. Also consider installation of a pre-filter if suspended solids are present in the influent water.
3. When the contaminant level in the discharge exceeds the treatment objective, the GAC should be replaced.

### Carbon Bed Life Estimate

For an estimate of carbon bed life contact your local Technical Sales Representative.

### Carbon Exchange

GAC can be removed by either vacuuming or by pressurized slurry discharge. For vacuum removal, drain the water from the vessel at least 24 hours before the GAC is to be removed. Use the top manway to access the spent GAC. Vacuum the spent GAC into suitable containers such as steel drums with a bung hole on the latching lid to enable venting the drum before emptying.

### Caution:

If the process piping is carbon steel, either pressurized water or compressed air can be used to transfer carbon. If the process piping is plastic, then only the pressurized water can be used for transfer. Plastic piping is not recommended in service with compressed air.

### For GAC slurry discharge using compressed air (for systems with carbon steel piping):

1. Fill the vessel with water.
2. Connect an air source to the process inlet line.
3. Connect a flex hose to the carbon discharge line and direct the hose into a suitable container.
4. The recommended compressed air source is 20 scfm at 30 psig.
5. Turn on the compressed air and allow the pressure to build up inside the vessel; then open the carbon discharge valve.
6. Carbon transfer is complete when air is heard coming from the discharge hose.
7. Allow the air to bleed out of the vessel, then open the vessel for inspection.
8. All spent carbon must be removed from the vessel. Inspect, and if necessary, wash inside of vessel and repeat removal steps.
9. Once all spent carbon is removed, the fresh GAC can be installed. Refer to the installation procedure given previously. It is recommended that the same type of GAC be installed for subsequent carbon exchanges.

### For GAC slurry discharge using water (for systems with plastic pipe):

1. Fill the vessel with water.
2. Connect a water source to the process inlet line.
3. Connect a flex hose to the carbon discharge line and direct the hose into a suitable container.
4. The recommended water flow is 50 gpm at 30 psig.
5. Turn on the water, then open the carbon discharge valve.
6. Monitor the flow into the receiving container; carbon transfer is complete when no carbon is detected in the flow into the storage container.
7. Drain water out of the vessel, then open the vessel for inspection.
8. All spent carbon must be removed from the vessel. Inspect, and if necessary, wash inside of vessel and repeat removal steps.
9. Once all spent carbon is removed the fresh GAC can be installed. Refer to the installation procedure given previously. It is recommended that the same type of GAC be installed for subsequent carbon exchanges.

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### Spent Carbon Return

Spent carbon can be returned to Calgon Carbon for reactivation after the carbon acceptance procedure is complete. Contact your local Technical Sales Representative for detailed instructions and to arrange for carbon acceptance testing. We recommend starting the carbon acceptance testing as soon as possible after start-up to give sufficient time to complete the testing and make arrangements for change out.

### Shutdown

1. For short term shutdowns, less than one or two weeks, close the inlet and discharge valve and keep a vent line open. The water does not need to be drained unless there is the chance of the vessel freezing.
2. For long-term shutdowns, drain the water from the vessel and close all valves except for a vent line. For re-starting the vessel refer to the wetting/deaeration procedure.

### Caution!

1. A pressure relief device is not supplied with this vessel. It is recommended that the user provide a suitable relief device in the system piping. The pressure relief device must not be plugged or restricted in any manner.
2. Wet activated carbon removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing activated carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable federal and state requirements.

### Wetted Parts

- Epoxy lining
- Stainless steel GAC discharge pipe
- PVC distributor and collector pipe
- PPL water collection nozzles
- Bronze, chrome plated steel and TFE in the carbon discharge valve

### Available Options

- PVC Pipe Manifold for series or parallel operation (Refer to Bulletin number ES-0007-1003)

**Warranty:** Calgon Carbon Corporation (Seller) warrants that the CR vessels shall be free from defects in materials and workmanship for a period of one hundred eighty (180) days from the date of shipment or thirty (30) days from the date of startup (defined as the first day water flows into the vessel),

whichever occurs first. This warranty does not apply to problems associated with normal wear and tear, improper maintenance, negligence, misuse, or the failure to operate in strict accordance with the operating and maintenance plan provided. All other warranties, either express or implied, are hereby disclaimed including but not limited to the warranty of merchantability and fitness for a particular purpose.

Seller warrants that any/all activated carbon provided hereunder shall conform to the specifications for such grade as published from time to time by the Seller. There are no warranties made with regard to the activated carbon or equipment to be sold hereunder other than those contained in this paragraph or stated elsewhere in the proposal. All other warranties, either express or implied, are hereby disclaimed including, but not limited to, the warranty of merchantability and fitness for a particular purpose.

This warranty is limited to the replacement and/or repair by the Seller of any part, parts or material, which in the Seller's determination are defective. This warranty does not cover any charges by the Buyer for replacement of parts, adjustments or repairs, or any other work unless such charges shall be assumed or authorized in advance in writing by the Seller.

**Limitation of Liability:** Seller's liability and the Purchaser's exclusive remedy for any cause of action arising out of purchase and use of the CR vessels, including but not limited to breach of warranty, negligence and/or indemnification is expressly limited to a maximum of the purchase price of the CR vessel as sold. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall the Seller for any reason or pursuant to any provision of these warranties be liable for incidental or consequential damages, or damages in excess of the purchase price of the CR vessel, nor shall the Seller be liable for loss of profits or fines imposed by Governmental agencies.

### Site Services

Calgon Carbon Corporation can provide a full range of services including:

- equipment selection
- assistance with vessel installation
- start-up assistance
- supply of virgin and reactivated carbon
- carbon exchange
- carbon disposal and reactivation

Visit our website at [www.calgoncarbon.com](http://www.calgoncarbon.com)



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