

CAMERON GREAT LAKES, INC.

MOLECULAR FILTRATION SPECIALISTS

CGL VAPOR & LIQUID PHASE EQUIPMENT

CGL offers a full line of both vapor and liquid phase adsorber vessels. The vapor phase vessels are also available in a radial flow design to accommodate higher air flow.

We can provide complete systems, including blowers and controls. In addition to all the standard vessels, CGL custom engineers systems to specifically suit your requirements.

Rental vessels for short term projects are also offered.



In addition to building new systems, CGL will re-bed your vessels in our IL facility for local pick up.

Vacuum services are available in house at our IL facility.

Custom reactivation of the carbon in your vessels is also available. For more information on vacuuming and reactivation services please contact us directly.



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CAMERON GREAT LAKES, INC.

MOLECULAR FILTRATION SPECIALISTS

VAPOR SCRUB

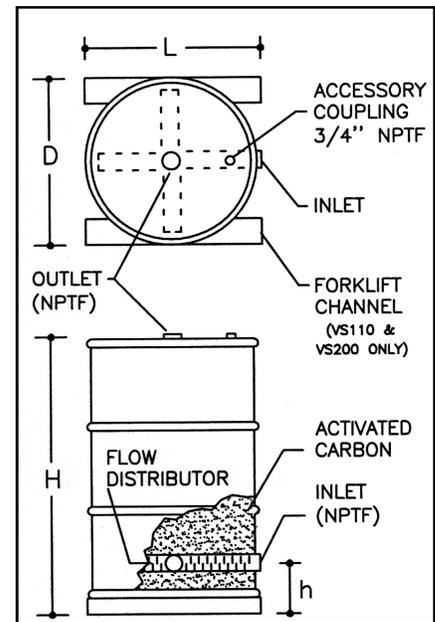
Models VS30-100 - VS55-200 - VS85-300 - VS110-400 - VS200-600

CGL Vapor Scrub units, filled with high quality Cameron/Great Lakes activated carbon, are designed for effective purification of your vapor waste or process stream. CGL Vapor Scrub units have a proven ability to remove organic contaminants to non-detectable levels.

CGL Vapor Scrub units are constructed of heavy-duty mild steel and are lined with double layered epoxy coatings. Forklift channels are provided on the VS110 & VS200 models. Adsorber internals consist of a PVC cross-style inlet flow distributor designed for complete carbon bed use. Upflow operation is standard.

For ease in process maintenance, spent carbon can be removed on site from the vessel by hand or vacuuming out by removing the vessel top head. Alternatively, the spent vessel can be shipped off site for reactivation service or disposal.

(Please contact your nearest CGL office or representative for additional information on disposal and service options.)



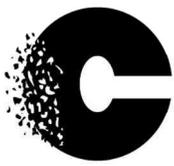
SPECIFICATIONS

Model VS	30-100	55-200	85-300	110-400	200-600
H-height, in.	30	36	40	46	51
D-diameter, in.	19	24	26	32	36
L-length, in.	na	na	na	32	36
h-height, in.	4.3	6	5	8	8
Inlet & Outlet Connection, in.	2	2	3	4	6
Flow Range, cfm*	60-100	80-150	110-200	160-300	210-400
Pressure Drop Range, in.w.g.	2.3-6.8	2.7-8.0	3.0-9.0	3.4-10.3	3.0-10.0
Max Pressure, psig	8	8	8	8	8
Max Temp, deg. F	125	125	125	125	125
Carbon Capacity Weight, lbs.	100	200	300	400	600
Volume, cu. ft.	3.9	7.1	10.0	16.1	20
Shipping Weights, lbs	150	270	380	640	1000

* Based on face velocity range of 30 to 55 fpm/sq. ft. bed area. System design may be dictated by chemistry and residence times.

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VAPOR SCRUB "MI" Adsorbers with Metal Internals

Models VS30-80MI - VS55-160MI - VS85-250MI - VS110-325MI

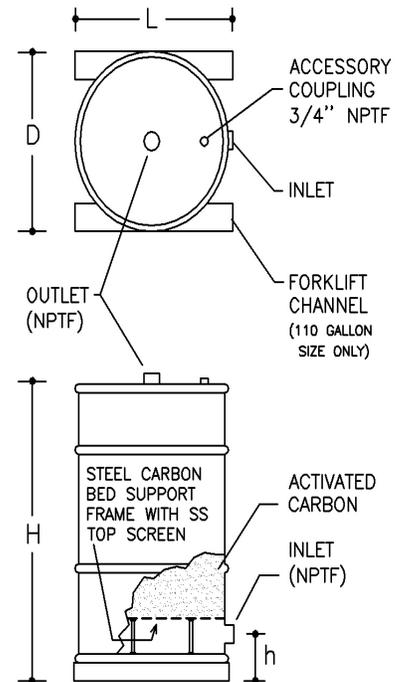
CGL Vapor Scrub MI units, filled with high quality Cameron Great Lakes activated carbon, are designed for effective purification of your vapor waste or process stream. CGL Vapor Scrub MI units have a proven ability to remove organic contaminants to non-detectable levels.

CGL Vapor Scrub MI units are constructed of heavy-duty mild steel and are lined with doubled layered epoxy coatings. Forklift channels are provided on VS-110MI models. Adsorber internals consist of a rugged steel carbon bed support frame and a field replaceable stainless steel top screen. Upflow operation is standard.

For ease in maintenance, spent carbon can be removed on site by hand or vacuuming out by removing the vessel top head. Alternatively, the spent vessel can be shipped off site for reactivation service or disposal. (Please contact your nearest CGL office or representative for additional information on disposal and service options.)

SPECIFICATIONS - "MI" ADSORBERS

Model VS	30-80	55-160	85-250	110-325
H - height, in.	30	36	40	46
D - diameter, in.	19	24	26	32
L - length, in.	na	na	na	32
h - height, in.	4.3	6	5	8
Inlet & Outlet Connection, in.	2	2	3	4
Flow Range, cfm*	60-100	80-150	110-200	160-300
Pressure Drop Range, in. w.g.	2.3-6.8	2.7-8.0	3.0-9.0	3.4-10.3
Max Pressure, psig	8	8	8	8
Max Temp, deg. F **	250	250	250	250
Carbon Capacity, lbs. +	80	160	250	325
Carbon Volume, cu. ft.	3.9	7.1	10.0	16.1
Shipping Weight, lbs.	130	230	330	560



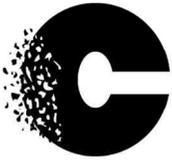
* Based on face velocity range of 30 to 55 fpm/sq. ft. bed area. System design may be dictated by inlet chemistry and required residence time.

** "MI" Units with metal internals can physically withstand a maximum inlet air temp of 250° F. However, the adsorption capacity of activated carbon decreases significantly at operating temperatures over 125° F.

+ Carbon capacity for standard carbon at 30 lb/cu.ft. density. Add 14% to media weight for Type "CI" (caustic impregnated) carbon. Contact CGL for engineering assistance for applications requiring other types of media or media blends.

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CAMERON GREAT LAKES, INC.

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VAPOR SCRUB RADIAL FLOW UNITS

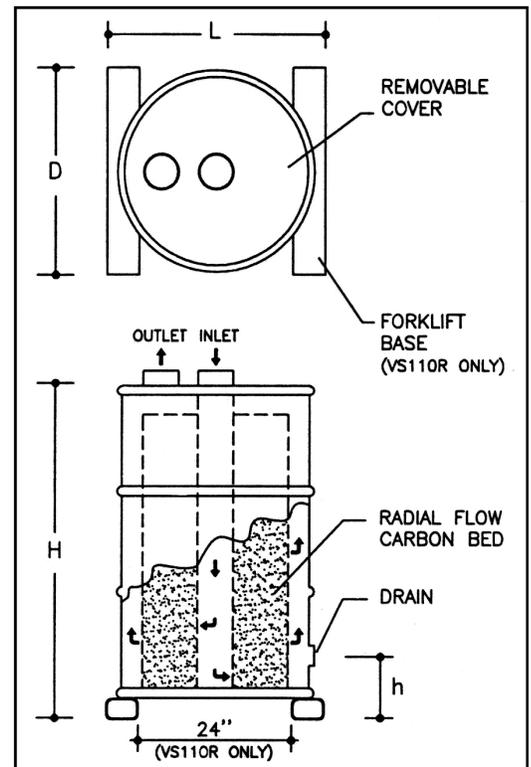
Models VS55-165R VS85-270R VS110-400R VS110-300R

CGL Vapor Scrub Radial Flow units are designed for effective purification of your vapor waste or process stream. The shallow depth carbon bed in this radial design allows processing of high air flows at low pressure drop. CGL Vapor Scrub Radial units are constructed of heavy-duty mild steel and are lined with double layered epoxy coatings. Forklift base is provided on the VS110R models only (base tubes can be "clipped" for trailer mounting as a price option). Adsorbent internals consist of an inlet distributor tube/retention screens and outer screen with spacers to the vessel shell.

Untreated vapors enter the inlet distributor tube and proceed horizontally through the carbon bed and outer screen to the free air space inside the vessel wall. The purified air then travels to the upper collection area and exits through the outlet port. For ease in process maintenance, spent carbon can be removed on site from the vessel by hand or vacuuming out by removing the vessel top head. Alternatively, the spent vessel can be shipped off site for reactivation service or disposal.

SPECIFICATIONS

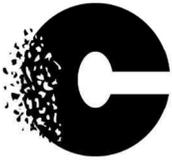
Model VS	55-165R	85-270R	110-400R	110-300R
H - height, in.	30	36	46	46
D - diameter, in.	19	24	32	32
L - length, in.	na	na	36	36
h - height, in.	4.3	6	10	10
Inlet & Outlet Duct Connection, in. dia.	4	4	4	6
Flow Range, cfm*	100-300	120-360	167-500	200-600
Pressure Drop Range, in w.g.	1.2-6.0	1.1-5.6	1.2-6.0	1.0-5.0
Max Pressure, psig	8	8	8	8
Max Temp, deg. F	125	125	125	125
Carbon Capacity Weight, lbs.	165	270	400	300
Volume, cu. ft.	5.5	9.0	16.67	10.0
Shipping Weight, bs.	220	340	740	540



* Based on face velocity range of 33 to 100 fpm/sq.ft. bed area. System design may be dictated by chemistry and residence time.

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VAPOR SCRUB RADIAL FLOW UNITS

Models VS500-1500R VS1000-4500R VS1600-3000R

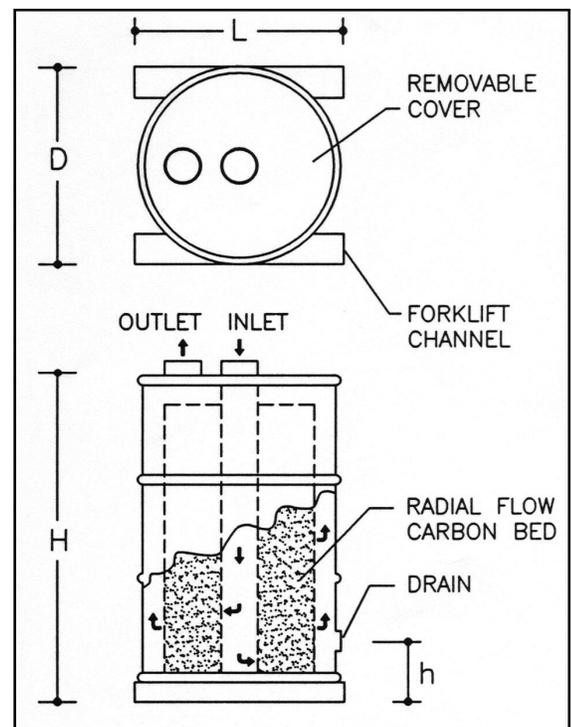
CGL Vapor Scrub Radial Flow units are designed for effective purification of your vapor waste or process stream. The shallow depth carbon bed in this radial design allows processing of high air flows at low pressure drop. CGL Vapor Scrub Radial units are constructed of heavy-duty mild steel and have internal epoxy paint and exterior enamel paint. A steel base is provided for ease of handling using a forklift or pallet truck. Adsorber internals consist of a painted steel inlet distributor tube with galvanized steel retention screen and outer galvanized steel screen with PVC spacers to the vessel shell.

Untreated vapors enter the inlet distributor tube and proceed horizontally through the carbon bed and outer screen to the free air space inside the vessel wall. The purified air then travels to the upper collection area and exits through the outlet port. For ease in process maintenance, spent carbon can be removed on site from the vessel by hand or vacuuming out by removing the vessel top head. Alternatively, the spent vessel can be shipped off site for reactivation service or disposal.

Please contact your nearest CGL office or representative for additional information on disposal and service options.

SPECIFICATIONS

Model VS	500-1500R	1000-4500R	1600-3000R
H - height, in.	47	77	77
D - diameter, in.	38	49	49
L - length, in.	40	50	50
h - height, in.	7	7	7
Inlet & Outlet Duct Connection, in. dia.	10	12	12
Flow Range, cfm*	500-1500	1500-4500	1000-3000
Pressure Drop Range, in w.g.	1.0 - 5.0	2.0 - 8.0	1.8 - 8.0
Max Pressure, psig	6	6	6
Max Temp, deg. F	125	125	125
Carbon Capacity Weight, lbs.	500	1000	1600
Volume, cu. ft.	17.5	35	56
Shipping Weight, lbs.	850	1650	2150



* Based on face velocity range of 33 to 100 fpm/sq.ft. bed area. System design may be dictated by chemistry and residence time.



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VAPOR SCRUB - MODEL VS330LP-P

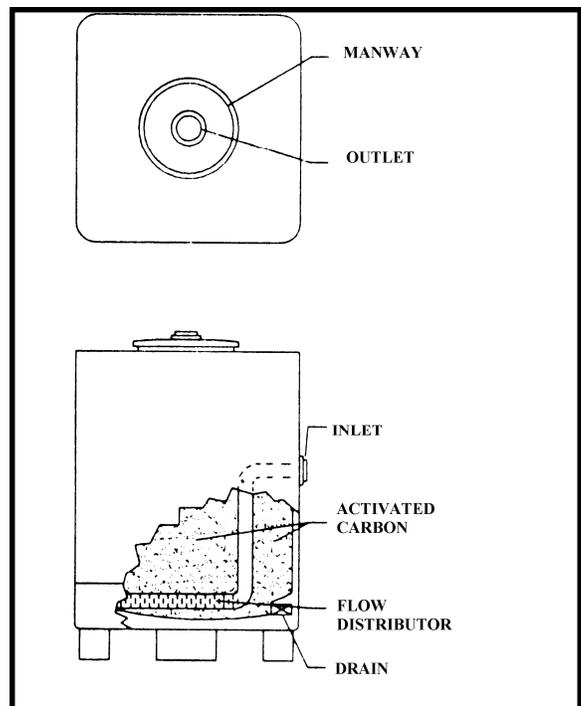
The VAPOR SCRUB Model VS330LP-P, filled with high quality Cameron Great Lakes activated carbon, is designed for effective purification of your vapor stream. The VS330LP-P has the proven ability to remove organic contaminants to non-detectable levels.

The VS330LP-P features a rotationally molded polyethylene (PE) tank with a minimum 1/2" wall thickness for added strength and corrosion resistance. The VS330LP-P features a square base with four-way forklift and two-way pallet jack access. The VS330LP-P container is UN31 rated for shipment of hazardous materials. Adsorber internals consist of a PVC distributor designed for even air distribution across the bottom of the vessel and complete carbon bed use. Upflow operation is standard.

For ease in process maintenance, spent carbon can be removed on site from the vessel by vacuuming out or manual removal through the top 18" manway. (An optional 8" dia. Bottom-sided-mounted gate valve is available to simplify manual removal of spent carbon.) Alternatively, the spent vessel can be shipped off site for reactivation service or disposal. *Please contact your nearest CGL office or representative for additional information on disposal and service options.*

SPECIFICATIONS

Inlet/Outlet, FNPT, (in)	4	6
Manway, (in. dia.)	8	18
Liquid Drain Valve, (in)	1	1
Height, (in)	66	67
Base, (in)	45 1/2 x 45 1/2	
Max Flow, (cfm)	400	1000
Max Inlet Pressure, (psig)	3	3
Pressure drop at max flow, (in. w.g.)	5	8
Max Temp, (deg. F)	120	120
Carbon Capacity		
Weight, (lbs)	1000	1000
Volume, (cu. Ft.)	34	34
Shipping Weight, (lbs)	1300	1300



Cameron Great Lakes, Inc has a policy of continuous research, development and product improvement and reserves the right to change design and specifications without notice. No warranty, expressed or implied, is made relating to the suitability of the product for a particular purpose or application.

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VAPOR SCRUB HIGH PRESSURE STEEL FILTER VESSELS

CONSTRUCTION

Vapor Scrub high pressure rated filter vessels are electric welded, low carbon steel constructed. Standard vessels are designed for 100 PSIG working pressure and factory tested. The vessels are either lined with 6 mils DFT phenolic epoxy and the exterior coated with a rust inhibiting primer and top coat or hot dip galvanized. Vessels with a 30 inch diameter and less have two 4 x 6 inch hand holes in the top head and lower side shell. Tanks with a 36 inch to 60 inch diameter have an 11 x 15 manway in the top head and a 4 x 6 inch hand hole in the lower side shell. Tanks with a 66 inch diameter and larger have two 11 x 15 inch manways, one in the top head and one in the lower side shell. Standard connections are NPT threaded full couplings.

OPTIONAL: ASME CODE pressure vessels are fabricated and stamped in accordance with ASME code, Sec. 8, Div. 1. Vessels are available with Canadian Registration Numbers (CRN), special pressure ratings, connections, relief valves, various openings and interior and exterior coatings. Vessels are furnished with flanged connections when required.

FILTRATION MEDIA

ACTIVATED CARBON: Standard activated carbon is size 4 x 8 mesh, 60% CTC activity, 950 minimum iodine number and a minimum abrasion number of 95. Additional grades and specialty carbons are available.

ODOR OXIDIZING MEDIA: This filtration media starts with a aluminosilicate base material possessing significant molecular sieve sorption capacity impregnated with 6% by weight potassium permanganate.

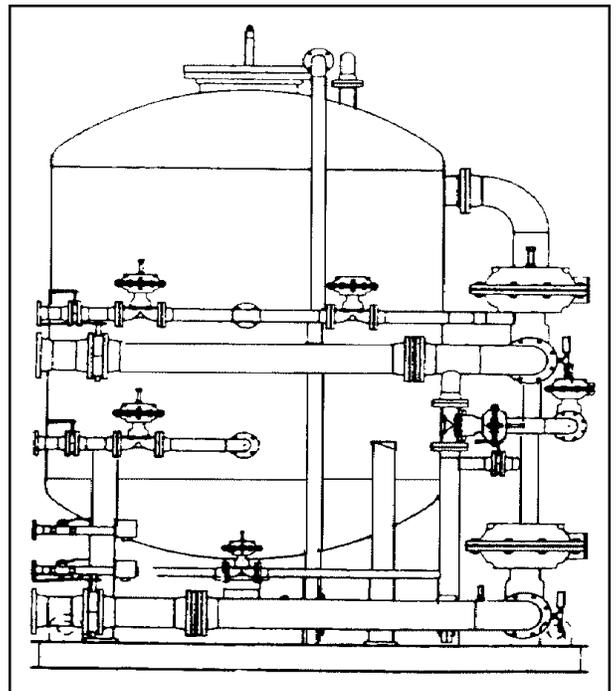
(Please request CGL / ZK6 Product Bulletin for additional information.)

OPTIONS AND ACCESSORIES

- A. Flanged or threaded connections.
- B. Linings: Rubber, epoxy, galvanizing, fiberglass.
- C. Number, size, and location of manways, handholes, fittings; structural legs; skid or flat base.
- D. Valves, sample taps, skid mounting, and controls.
- E. Vessel pressure ratings and certifications: ASME, National Board, Military, CRN
- F. Various grades and mesh sizes or media.
- G. Additional diameters and sideshell lengths.
- H. Special materials & alloys; design for on-site desorption using steam.

DISTRIBUTOR SYSTEM

Standard vessel design is air "up flow". Standard bottom diffuser is a hub & lateral design using PVC materials. All metal internals available as an option for severe service or for on-site steam desorption.



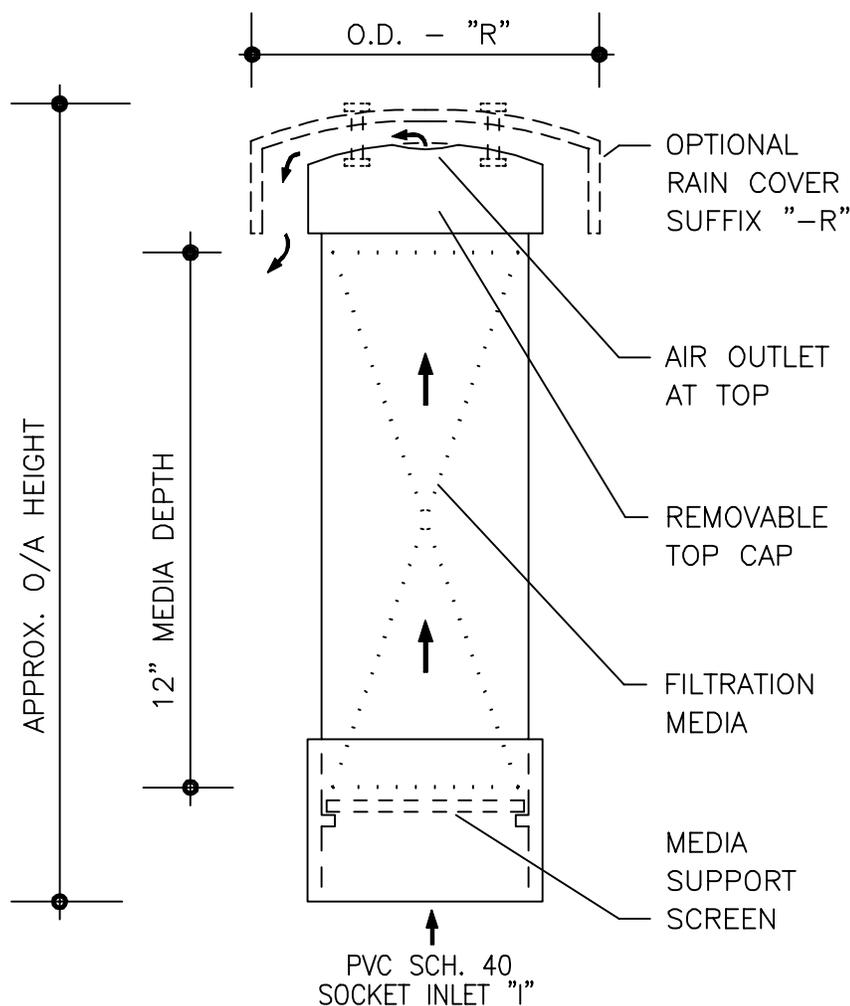
ENVIROVENT Size 2", 3", 4" & 6" Vent Adsorbers

CGL ENVIROVENT (EV) vent adsorbers are designed for efficient purification of your vapor vent or process stream. The filtration media is contained in an upflow design housing arranged for vertical mounting.

To provide long life and corrosion resistance, materials of construction are PVC with polypropylene and/or 304 SS carbon screens. The top cap is removable to allow change out of spent filtration media.

Untreated vapors enter through the bottom media support screen and flow up through the filtration media bed. Treated air exits through the screened outlet hole in the top of the housing.

An optional rain cover (suffix "-R" on model number) is available for outdoor mounting.



SPECIFICATIONS

CGL MODEL NO.	EV2x12-.75	EV3x12-1.7	EV4x12-3.0	EV6x12-6.7
INLET SIZE "I" - inches	2	3	4	6
Approx. O/H Height - in.	16	17	18	20
O.D. with rain cover - in.	5	7	7	9
<u>MEDIA CAPACITY</u>				
VOLUME - ft ³	.022	.049	.087	.196
WEIGHT @ 34.0 lb/ft ³ density (CPCI Carbon) *	0.75	1.7	3.0	6.7
SHIPPING WEIGHT - lbs. *	4	6	9	14
MAX. FLOW - cfm	3	5	8	20
PRESSURE DROP - in.w.g.	3.5 in. w.g. at max. flow			
MAX. PRESSURE / TEMP.	12 psig at 120 °F			

* CPCI = Coal based Pelletized Caustic Impregnated carbon. Media & shipping weights will change with ZK6 or other filtration media.

PROPRIETARY DRAWING			
DRAWING MAY NOT BE USED OR REPRODUCED WITHOUT WRITTEN AUTHORIZATION OF CAMERON / GREAT LAKES, INC.			
TOLERANCES:		LENGTH: +/- 0.125 IN.	
REV.	DATE	BY	REMARKS
--	11/22/99	JMB	ORIGINAL ISSUE



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DRAWN:	JMB	TITLE:	GENERAL ARRANGEMENT- ENVIROVENT VENT ADSORBER CONN. SIZE 2, 3, 4 & 6"
CHECKED:	RAH	SCALE:	N.T.S.
APPROVED:	JMB	DRWG NO.	EV-2,3,4,&6



CAMERON GREAT LAKES, INC.

MOLECULAR FILTRATION SPECIALISTS

Installation & Operation Procedures Vapor Scrub Carbon Adsorption Vessels

Cameron Great Lakes, Inc. Vapor Scrub and Vapor Scrub *Radial Flow* Carbon Adsorption Vessels are designed for simplicity of installation and operation. Typical installation procedures include:

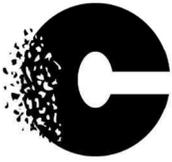
1. Place the vessel(s) in your designated area. Considerations in choosing a location include:
 - Access to all vessel connections and location and orientation of inlet & outlet ductwork,
 - Headroom over the vessel to allow spent media change out (if the unit is to be serviced *in place* as opposed to moving the unit to a different location for service), and
 - Ease of access for a forklift or pallet jack to move or change out units.

CGL Vapor Scrub units do not require special bracing or anchoring for most applications. The only requirement is a flat level surface capable of supporting the weight of the unit.

2. Please refer to the CGL specification sheet for the Vapor Scrub or Vapor Scrub *Radial Flow* series vessels [or job specific drawing(s) if supplied] for vessel weight, dimensions, and connection sizes. CGL Vapor Scrub units are designed to be installed and operated in a standing (vertical) position. Typical installation ductwork features by the owner to facilitate servicing include inlet & outlet isolation dampers and flexible hoses for connection to the process air connections. Other common features include sample taps on the inlet & outlet ductwork, pressure gauges, and temperature gauges. Be sure to use Teflon tape or other suitable pipe thread sealant/lubricant to protect pipe threads and to guard against leaks. **NOTE – Unless specifically ordered, CGL Vapor Scrub units are not rated for pressure service. Be sure not to exceed the maximum inlet pressure as noted on the specification sheet(s) provided with the unit.** Please contact CGL with any questions you may have on your proposed installation design arrangement.
3. Most Vapor Scrub units are shipped full of carbon ready for operation at the site. Some units are shipped empty for ease of handling at the jobsite...please check your sales order for details on how the initial charge of carbon was shipped for your order. **It is normal for the initial flow (1 to 2 minutes) of air out of the unit to be gray or even black in appearance** due to carbon dust or “fines” that are carried out of the carbon bed by the initial air flow. It may be desirable to vent the air exiting the unit to the outdoors or other non-sensitive area at the job site during start up. Once in operation, check system for leaks, excessive pressure drop, and filter media in the discharge hose or duct.

Caution – The adsorption process is an *exothermic* reaction. **Heat is released when volatile organic compounds (VOCs) and other contaminants are adsorbed by the carbon.** Normal system airflow through the carbon bed is usually sufficient to carry away the heat resulting from adsorption. If the carbon bed is partially spent (i.e., partially loaded with VOCs), it is recommended that the airflow be maintained through the carbon bed at all times. **Stopping the airflow may allow pockets of high VOC concentration to develop “hot spots”, and may result in damage to the carbon or create a fire hazard.** Other operating procedures for partially spent beds may include isolating the bed(s) when not in use to limit oxygen availability and/or purge and blanket the bed(s) with an inert gas. *Extreme care should*

(Continued on page 2)



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MOLECULAR FILTRATION SPECIALISTS

(Continued from page 1)

be taken in the design, monitoring and operation of any vapor phase carbon adsorption system.

Installation & Operation Procedures – CGL Vapor Scrub Carbon Vessels

Normal Operation – Monitoring of Carbon Bed Performance

The owner or operator will need to monitor the performance of the carbon bed by taking regular samples of the inlet and outlet air for laboratory or other analysis. Sample analysis and report frequency are established by the permit to operate the system or by OSHA or other Health & Safety / IAQ requirements for the site. *It is the responsibility of the owner or operator to follow all requirements of the operating permit for the system using this carbon vessel(s).*

Most systems are designed with two carbon beds connected in series flow. This allows sampling between the beds to determine when the lead bed of carbon has become “spent”. The carbon is spent when “breakthrough” occurs, evidenced by a sudden increase in the concentration of the target VOC(s) in the outlet air from the lead bed (the second bed remains on line, removing the VOCs from the air stream). Once the first bed becomes spent, it is isolated from the system, serviced as noted below, and reconnected to the system as the new “polish” or second bed.

For single bed carbon systems, at least one sample tap and valve should be provided at 50% of the bed depth to determine when approximately half of the carbon has become spent. The operator can then predict when the bed must be taken out of service for spent carbon change out as noted below.

Periodic Replacement of Spent Carbon

When the carbon in the vessel (or lead vessel) has become spent, the vessel must be taken out of service, drained of any water or other liquid which may have accumulated at the bottom of the vessel, and the spent carbon removed. For standard Vapor Scrub series vessels, the spent carbon is usually removed by vacuuming out through the top of the unit (custom design units may have a side-mounted port for removal of spent carbon by gravity flow). The empty vessel is then reloaded (through the top access opening) with fresh dry carbon and placed back in service or reconnected to the system as the new polish or second bed.

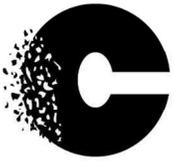
NOTE – When filling or refilling an empty vessel, load the carbon in *slowly* to avoid damage to the PVC internals at the bottom of the unit.

NOTE - *It is normal for black carbon dust to be present when re-filling the unit with dry carbon as noted above. Workers should wear dust respirators and goggles while filling the unit.* Proper ventilation of the vessel service area is recommended. Please refer to the MSDS data sheet provided with your unit(s) for additional information when working with activated carbon.

It is the responsibility of the operator to properly characterize, store, transport and dispose of the spent carbon as “hazardous” or “non-hazardous” material per applicable U.S. EPA, U.S. DOT, and applicable state guidelines. *Please contact CGL or your nearest CGL representative for assistance for periodic spent carbon vessel service and options for spent carbon reactivation or disposal service.*

Routine Maintenance

Vapor Scrub vessels require virtually no maintenance during normal operation. The operator should periodically check system pressure gauges to insure against excessive pressure drop, which could reduce airflow through the system. CGL has a policy of continuous research & product improvement and reserves the right to change specifications without notice. No warranty, expressed or implied, is made relating to the suitability of the product for any particular purpose or application.



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Warranty, Limitation on Liability, and Service Information

Warranty - Equipment manufactured by our company is warranted for a period of 12 months from date of start-up (not to exceed fourteen (14) months from date of shipment) to be free from defects in workmanship or material. Our sale obligation under this warranty is limited to the replacement or repair, free of charge, F.O.B. our shop, of such parts as our inspection proves to be defective. This warranty will apply to our equipment that has been operated within normal capacity rating and operating conditions, and is withdrawn in the event the user makes any repairs or alterations which have not been authorized by us in writing. This warranty excludes cost of shipment to and from our shop.

This warranty is in lieu of all other warranties expressed or implied, including all warranties of merchantability and warranties of fitness for a particular purpose. No person whatsoever is authorized by CGL to make any express warranty with respect to the merchandise referred to herein which extends beyond the scope of the warranty provided by this paragraph.

Component parts incorporated in our product which are not of our manufacture will carry only such warranty as their manufacturers allow (typically, 12 months). We will endeavor to secure for our Customer the benefits of such other manufacturer's warranty, should inspection prove such parts to be defective.

Limitation On Liability - Seller's total responsibility for damages whether arising in contract or tort arising out of or relating to its performance of this contract or the products covered hereunder shall be limited to the contract price for the product. In no event shall Seller be liable for any incidental or consequential damages such as lost profits, loss of use of productive facilities or equipment or lost production or expenses incurred in reliance on Seller's performance whether suffered by Buyer or any third party. Nothing in this paragraph shall in any way be construed to affect the liability Seller may have for personal injury or death of any third party.

Service Information - For service or technical assistance, please contact your local CGL sales representative or the nearest CGL office (locations listed below).

Cameron Great Lakes, Inc. has a policy of continuous research, development and product improvement and reserves the right to change design and specifications without notice. No warranty, expressed or implied, is made relating to the suitability of the product for any particular purpose or application.