

BULLETIN 13-10, REV. A

Handling & Installation Instructions

for

Duracor Fiberglass Reinforced Plastic (FRP) Products

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HANDLING AND INSTALLATION INSTRUCTIONS

I. Introduction

This instruction bulletin is intended as a useful guide for Ceilcote Air Pollution Control (CAPC) customers.

With the availability of so many different types of handling equipment, differences in local job site conditions, and the enormous variety of products CAPC manufactures for your needs, it would be impossible to create detailed instructions for every situation. However, we know the following instructions will be of assistance.

Let us emphasize that fiberglass has characteristics different from either glass or steel. In some ways, it is stronger, lighter and more flexible than either steel or glass, but it is also subject to cracking and chipping if proper handling methods are not used.

If you follow some simple precautions described herein, your CAPC products will give you long-term corrosion resistance performance. These precautions must start when you receive the product and continue through startup.

NOTE: These Handling and Installation Instructions are offered as general and typical guidelines only. All safety precautions and the handling methods utilized are the total responsibility of the customer and the “rigging” company employed by the customer.

CAPC will respond to questions pertaining to the handling of the equipment furnished by CAPC. Any response by CAPC to any questions and/or the use of these handling and installation instructions DOES NOT transfer or assign any responsibility or liability to CAPC for any damage or injury to any person, building, equipment, vehicles, etc.

Customers are totally responsible for contracting and determining the capabilities of any and all rigging companies employed/contracted by them.

II. Inspection

All CAPC products are inspected prior to shipment, but should be inspected immediately upon receipt and before any attempt is made to unload. First, visually inspect for any signs of damage. Use the following checklist and look for breakage and abrasion, which would be very easy to recognize. Impact damage would appear as whitening of the laminate of star-shaped cracks or crazes. Such damage, if confined to the exterior on non-immersion products, may only be superficial.

Here is a checklist to assist you:

1. Is the shipping media (packing, blocking, bracing, etc. (still intact)?
 - Check for loose banding, broken boxes, containers, shipping crates, chocks, bulkheads, etc.
2. Is there any damage to the extremities of the products?
 - Check the ends, top, sides and any protruding parts such as nozzles, lugs, etc.
3. Is there any damage at contact points?
 - Check around banding, saddles, chock, bracing, buttresses and all areas of the product which come in contact with shipping media.

Due to the flexibility of the product, there could be internal damage caused by impact without apparent external damage. This internal damage is caused by the wall of the product flexing to absorb shock. If shock is too severe, the wall could flex far enough to damage the interior resin rich surface. Therefore, **it is essential that an internal inspection be performed.** If there is damage to the inside surface, it is essential that the surface be repaired before placing the equipment into service.

4. Is there damage to the inside of the product? (See Section III, Entrance Precautions)

Look for star-shaped cracks and crazes which are actually fractures or breaks in the interior resin rich surface. A portable light is necessary to perform a proper internal inspection. It is very helpful to project the light at different angles on the interior surface. This will cause most fractures to stand out and make recognition easier. Check the entire interior surface.

Check for damage around the nozzles, areas where the product is in contact with the shipping media, or areas where lifting lugs, tie down lugs, ladder clips, or other exterior components are attached, and around all internal components.

III. Entrance Precautions

When entering the interior of the equipment, certain precautions must be taken.

1. Be sure any foreign objects, dirt, pebbles, etc. are removed from the product so that they will not mar the interior surface.
2. Personnel entering the equipment should wear soft-soled shoes which are free of any debris that could injure the interior surface (pebbles, nails, etc.)
3. If a ladder is used for entrance, it should have padded feet. Do not rest the ladder on internal components or point load its base surface.
4. Care must be taken not to drop or bang objects against the product.
5. When walking in the equipment, make sure any area which may flex does not rest against sharp objects. Use padding where necessary.
6. Never use any projection (internal or external) on the equipment for climbing or standing unless it is specifically designed for this purpose.

IV. Damages

In the event the product has been damaged, report the damages to the carrier and call your CAPC sales representative or the project/contract manager to discuss any questions. If damage is observed, write a description of the damages on the shipping papers stating possible cause if such can be reasoned, and photograph the damages. Request an inspection by the delivery carrier and have delivery personnel initial the report before allowing the truck to depart your facility. Contact the trucker's dispatcher if the driver refuses to sign and ask the dispatcher to instruct the driver to sign.

Claims should be promptly filed with the delivery carrier.

For your convenience, a Field Receiving Checklist Report form is attached at the end of this instruction packet. (See Pages 19-20)

V. Freight

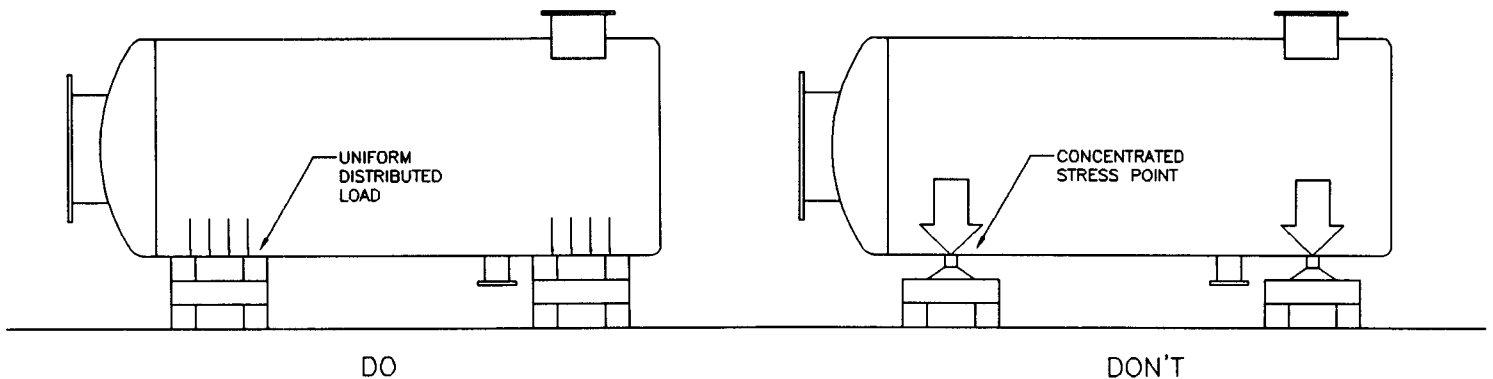
FOB ship point/origin indicates that the customer takes title to the equipment upon acceptance by the carrier. Thus, only the customer can file claims with the delivering carrier. CAPC will work with the customer to the extent possible but CAPC cannot process any claim paperwork or be responsible for any "short-pay" between what the carrier pays for and the actual cost to repair any damage.

FOB destination requires the customer to have a signed "FOB Destination Supplement" on file at CAPC. CAPC remains responsible for the equipment up to the moment the equipment is lifted or removed from the transportation vehicle.

VI. Handling

After an inspection has been performed and if no damage was revealed, the equipment can be handled for installation or temporary storage.

A cardinal precaution for handling FRP products is: **Never permit concentrated stresses at any one point.**



Handling FRP equipment can be done relatively easy and without damage to the product if a few simple precautions are observed. CAPC products are designed and manufactured to withstand the *normal handling required to ship the product to its destination, moving equipment into final site location, installation and placed into service.

* As with any piece of equipment delivered to a job site, minimal movement and/or storage times are preferred and recommended. Long term storage (more than 30 days once delivered) could result in damage and/or distortion which is the responsibility of others. Contact CAPC for information if long term storage is necessary/anticipated.

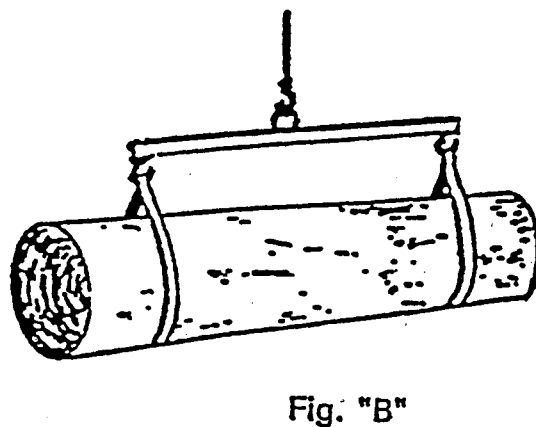
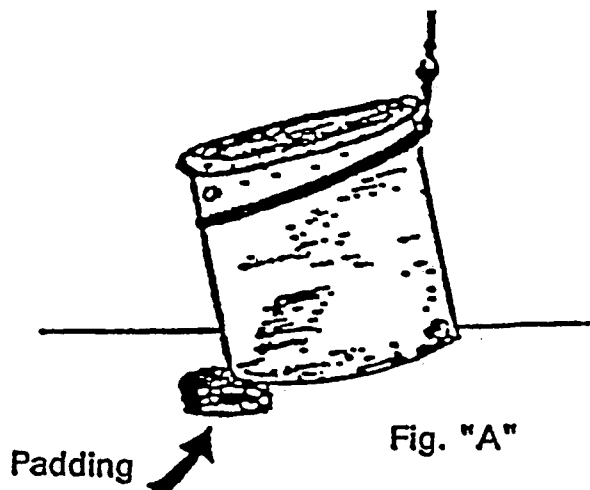
Many items can be handled and stored temporarily with their shipping media (saddles, blocks, etc.). Where this is practical, it should be done. Whenever a product is going to be stored temporarily, it should not rest on any objects which would place a concentrated stress at any one point (see above). The product should be fully protected from abrasion, load, and impacts at all times.

VII. Some Helpful Do's and Don'ts

A. Do's

1. Always use proper rigger and handling procedures.
2. Exercise care to prevent dropping, abrasions and impacts.
3. Always use padding where necessary to prevent abrasion and impact.
(See Fig. "A" below)
4. Always provide sufficient support to prevent undue deflection and distribute pressure over a large surface area.
5. Use a spreader bar with two slings on:
 - * Tanks or scrubbers
 - * Large duct work over twenty feet long
 - * Whenever control of handling can be improved (See Fig. "B" below)
6. Use canvas or nylon flat belt type slings or rope slings no less than one inch in diameter and capable of supporting the weight of the equipment to be handled.
7. Always use guidelines to control product when moving to prevent striking objects.
8. *Use lifting lugs, keeping pull on the lug's centerline in a radial direction only.

* (See Section VIII, "C" of this manual.)



VII. Some Helpful Do's and Don'ts (Continued)

B. Don'ts

1. Never place concentrated stress at any one point.
2. Never use chains or steel cables. (See Fig. C below)
3. Do not roll or drag the products.
4. Never roll over a fitting, lug or other component. (See Fig. D below)
5. *Do not lift or pull the product by fittings or other components except for lifting lugs. *(See Section VIII, "C" of this manual.)
6. Never pull sideways on a lifting lug.
7. Do not use nozzles or other components as stepping rungs unless specifically made for this purpose.

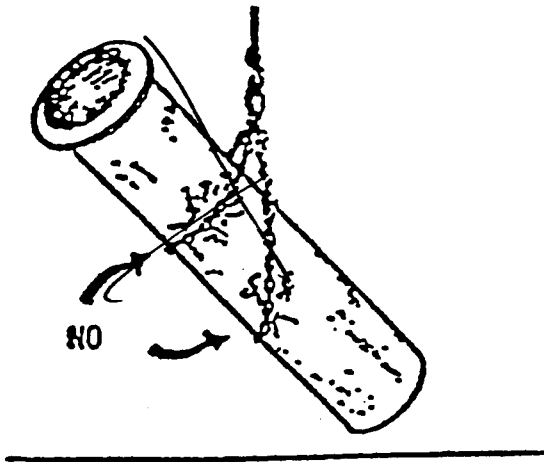


Fig. "C"

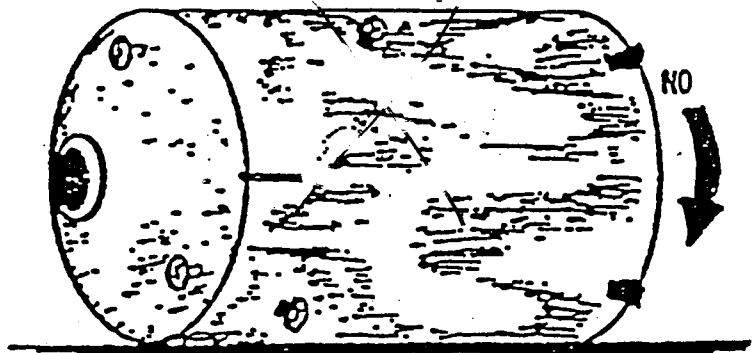


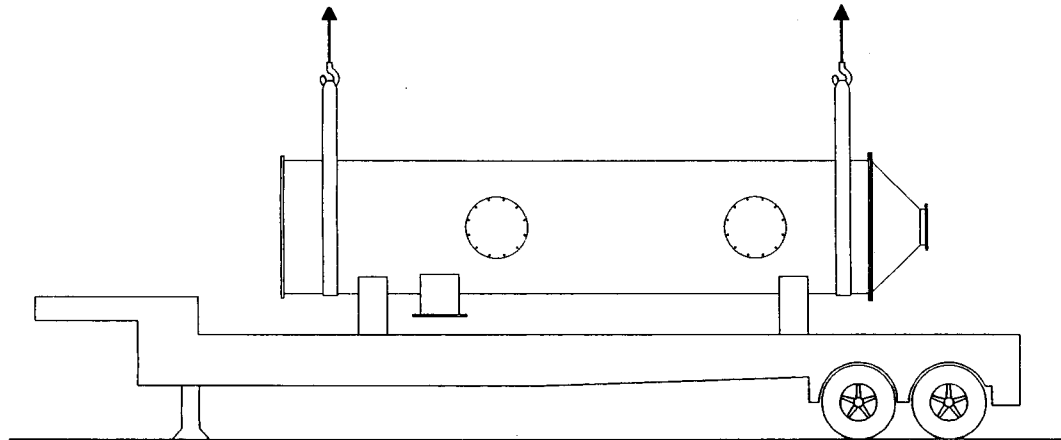
Fig. "D"

VIII. Installation

Due to their light weight, FRP products are relatively easy to install. The normal handling precautions should always be observed. Workmen should be cautioned not to let tools or other objects strike the product and not to hammer on the product.

The following information will be helpful during installation:

A. Vertical Scrubber/Tank Installation

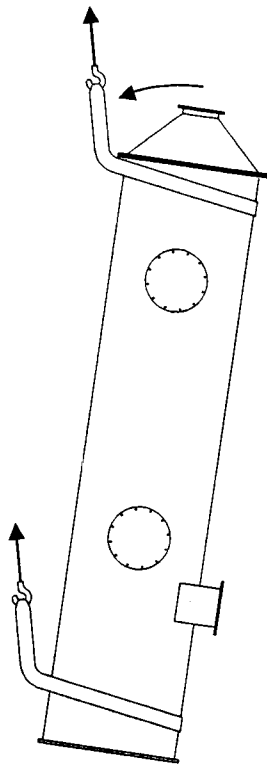


Option #1:

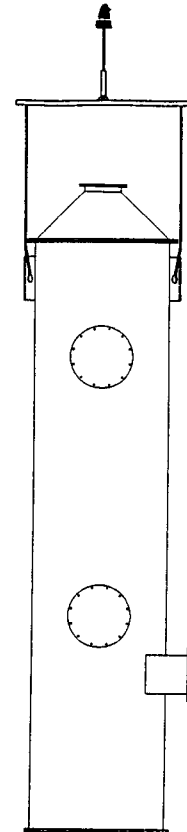
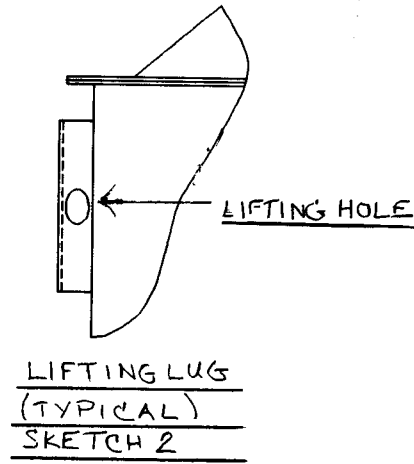
With the scrubber/tank in the horizontal position on the truck, install a strap beneath the top cover flange on the body of the unit. (**DO NOT** wrap this strap over any nozzle or other projection on the shell otherwise damage could result) and a second strap near the bottom of the unit (same caution as noted above) see above. Adequately “choke” the straps to avoid slippage as the unit is being lifted. Depending upon the crane “set-up” or “rigging”, one crane may be able to connect to both the upper and lower straps and have each strap independently controlled so as to “swing” the upper section up while the lower section swings down thus ending in a vertical position. This is dependent upon the customer’s rigging capabilities and/or limitations. Otherwise, multiple cranes may be necessary. Lift the scrubber/tank off the truck and onto the ground and into a vertical position. See Sketch 1 (next page).

Once on the ground (or while still on the truck), “feed” a strap or cable or clevis through **ALL** lifting lugs and **BOTH** “eyes” (2-2” holes on each lug). See Sketch 2. With the use of a cross spreader bar (see Sketch 3), connect all of these strap/cables/clevis devices to the crane and lift vertically into position. For safety considerations and depending upon the cranes “set-up”, leave the one strap “choked” beneath the upper flange and attached to the crane as an added precaution in the event of any failure of any strap/cable/clevis. **ALL LIFTING LUGS REQUIRE UNIFORM LOADING AT ALL TIMES.**

DO NOT lift the scrubber/tank with any items such as support plates; mist eliminators, packing, etc. installed inside of the scrubber.



SKETCH 1



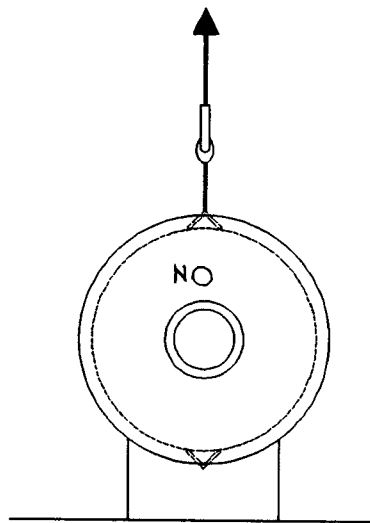
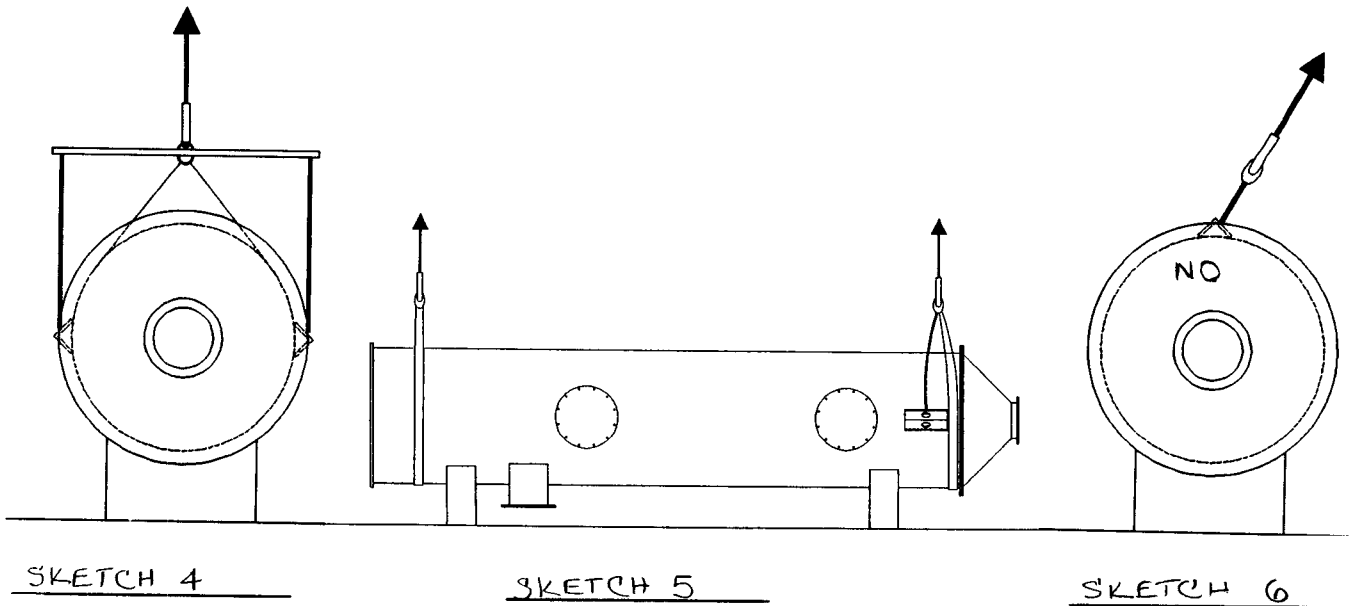
SKETCH 3

Option #2 (Option #1 is the PREFERRED AND LESS RISK option:

With the scrubber/tank in the horizontal position on the truck and with the use of a cross spreader bar (see Sketch 4), “feed” a strap/cable/clevis through **ALL** lifting lugs and **BOTH** “eyes” (see Sketches 4 & 5). Install a strap near the bottom of the shell (same caution as noted above) and adequately “choke” the strap as noted above. Avoid any “sideways pulling” (see Sketch 6), on any of the lifting lugs while lifting the scrubber into a vertical position and/or lifting with one (1) lug only (see Sketch 7). For safety considerations and depending upon the cranes “set-up”, have one strap “choked” beneath the upper flange and attached to the crane as an added precaution in the event of any failure of any strap/cable/clevis. **ALL LIFTING LUGS REQUIRE UNIFORM LOADING AT ALL TIMES**

Once on the ground in a vertical position (or all in one motion from horizontal to vertical position and into final position - depends upon the rigger, equipment, experience factor, etc.), the unit can then be lifted into final position.

DO NOT lift the scrubber/tank with any items such as support plates; mist eliminators, packing, etc. installed inside of the scrubber.



NOTE: These are meant as general and typical guidelines only. The customer and his rigging company are ultimately responsible for ALL safety and any special considerations caused by site or "other" conditions. Questions can be directed to Ceilcote Air Pollution Control (CAPC) and CAPC has NO responsibility or liability for any damage or injury. Customers are totally responsible for contracting with responsible and capable rigging companies. All equipment is adequately designed and fabricated by CAPC for moving equipment into final location provided proper lifting practices are employed and these guidelines are followed.

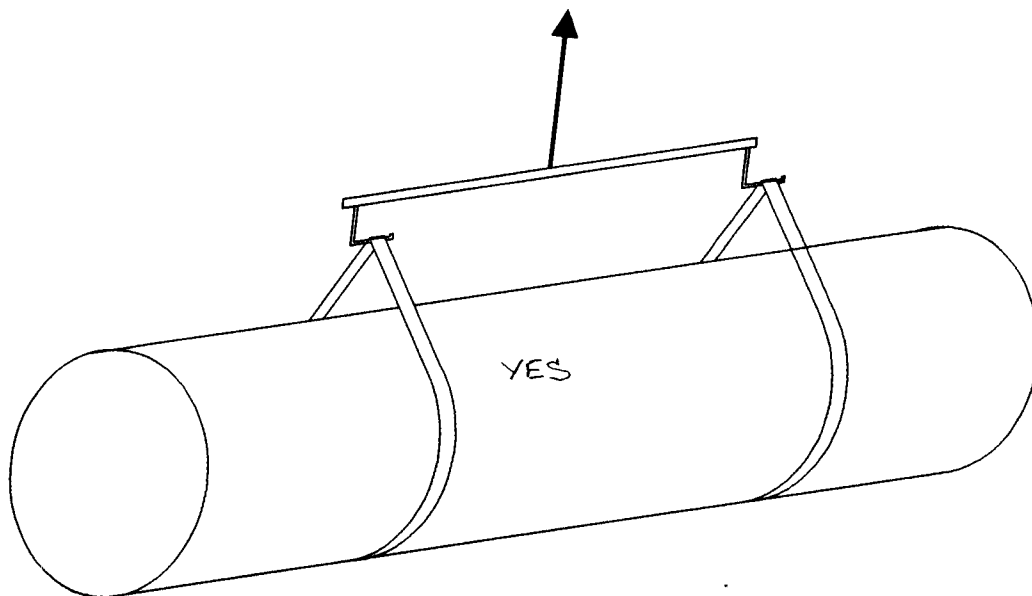
Equipment without lifting lugs (Refer to Fig. A and Sketch 1 above for reference) can be brought to a vertical position in the same manner by using a canvas or nylon flat belt sling wrapped around the equipment and fastened in a choker manner. A rope should be attached to a hold down lug or nozzle as a “guide rope” to prevent the equipment from swinging and/or to assist in positioning the equipment before being lowered. However, care must be taken not to allow these ropes to support the product load. The sling should be placed in such a manner that approximately two thirds (2/3) of the product weight is below the sling.

Care should be taken not to put any strain or stress on nozzles, ladder clips, access door bolts, or other components when lifting the product.

On large equipment with flanged open tops, such as tanks or scrubbers, it is advisable to lift in the above manner rather than trying to lift by the flange. (Refer to Fig. A above)

If the equipment must be transported a great distance to the installation site, the use a spreader bar with two slings is preferred, rather than a single sling with the product in a tilted position. A boom and walk-up is generally the safest method. (Refer to Sketch 8)

When setting the equipment in place, be sure the area has been swept clean. Set the equipment down gently to avoid damage. On equipment with legs, make sure each leg carries an equal share of the load. Use shims or grout when needed.



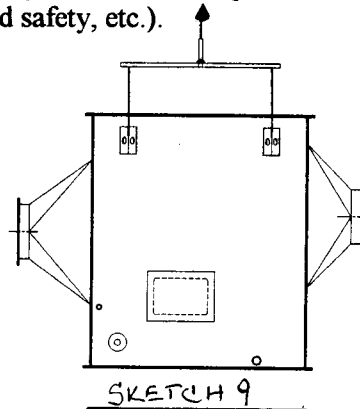
SKETCH 8

VIII. *Installation* (continued)

B. Horizontal Scrubber and Skid Mounted Instructions

1. Scrubbers (Refer to Sketch 9)

The same guidelines listed for vertical installations are to be followed here as well as pertains to uniform loading on all lifting lugs at all times, utilization of lifting straps in addition to spreader bars and lifting lug attachments (for added safety, etc.).



With the use of the lifting lugs, the unit can be elevated so as to insert a strap beneath each end of the scrubber (pad the strap where it overlaps any sharp edge). Follow the same cautions as listed under Vertical units for avoiding nozzles, projections, etc) and “choking” all straps.

As with Vertical equipment, it is not recommended to lift the horizontal unit with packing or mist eliminators installed.

2. Skid mounted (this is equipment shipped to the site on a permanent steel skid) systems are meant to be lifted off the delivering trucks to the extent of assembly as delivered. CAPC **does not recommend** or support any additional equipment being installed onto the skid until the skid is installed into its final on-site position.

Care must be taken so as to prevent any “twisting”, “deflection” or “bending” to the skid as it is lifted off the truck and/or moved into final position. The skid must be adequately supported over the entire length of the skid so as to avoid such “stresses” otherwise, damage to pre-piped or wired systems may result. (NOTE: ALL bolting and wire connections must be tightened before any additional equipment is mounted onto the skid and/or before adding power and/or water to the system. Also, all pumps and couplings must be connected, tightened and realigned before use.)

The use of steel cable and/or chains to lift a skidded system off the truck is acceptable provided such items **DO NOT** come into contact with any equipment already installed on the skid. Utilize the lifting lugs and/or hold-down lugs (as attached to the skid) for lifting the skid. (DO NOT

use any lifting lugs installed on any equipment mounted onto the skid for purposes of lifting the skid.)

Once the skid is in its final resting place, then the balance of the skid assembly (if any) can proceed and/or the final assembly of equipment can also proceed.

VIII. ***Installation*** (continued)

C. Set-Up and Installation Instructions

1. This instruction is to be used in conjunction with Customer Drawings and this Bulletin.
2. Ensure that the equipment foundation is adequate for its intended purpose. Ceilcote Air Pollution Control (CAPC) does not provide recommendations or warranties on civil or structural designs unless they are part of CAPC scope of supply at the time of contract award.
3. The support pad must be perfectly level and free from any voids or projections. Since many of CAPC systems are in chemical service, we do recommend the use of corrosive protection materials to protect your pad.
4. Set the equipment onto the pad using the listing lugs or nylon slings. If using lifting lugs, DO NOT fill the unit with support plates, packing, etc. We suggest that you not have the top installed as well. Use of grout or wet sand under the vessel is not recommended. A double layer of asphalt impregnated paper or thin rubber under the vessel can minimize minor imperfections in the pad.
5. Anchor the equipment as soon as possible, using the recommended system as shown on the CAPC drawings. Anchor bolts, hold-down plates, etc, are typically not provided. These items should be provided by the site mechanical contractor.
6. All piping and ductwork connections must be independently supported by others.

VIII. ***Installation*** (continued)

D. Assembly Instructions

PLEASE NOTE THESE DIRECTIONS ARE GENERIC AND MAY NOT COVER ALL OF THE ITEMS ON YOUR PARTICULAR ORDER, OR MAY CONTAIN INFORMATION THAT DOES NOT APPLY TO YOUR ORDER. ANY QUESTIONS SHOULD BE DIRECTED TO YOUR ASSIGNED PROJECT MANAGER. To provide you with fast assistance, please have a drawing number available when you contact Ceilcote Air Pollution Control (CAPC) with any questions. The drawing number is found in the lower right hand corner of the customer drawing as furnished by CAPC.

1. A vertical (Countercurrent), cylindrical scrubber and/or a horizontal (Cross-Flow), rectangular scrubber will come in several pieces. These are:
 - a. Scrubber body
 - b. One or two kinds of Tellerette® packing in black bags
 - c. Box or boxes of nuts, bolts and gaskets
 - d. Packing support plates (“egg crate grids”), in sections
 - e. Chevron (zigzag) blade mist eliminator, may be in sections
 - f. Spray nozzle(s)
 - g. Other items (pumps, pipe, pH system, etc.) will be shipped separately.
2. After setting the scrubber in place and bolting it down, insert the lower packing support plate. This plate may be in sections for ease in handling. The plate will be either thin polypropylene construction colored milky white, or FRP construction colored usually green, orange or gray. If it is polypropylene, the flat side is to be placed down, with the open side up. If it is FRP, both sides are the same. Pay attention to the grid” curvature. If the grids are to be tied down, a detail for this will show on the scrubber drawing.
3. Fill the scrubber with the appropriate Tellerette® packing. Pay attention to the fill level shown on the drawings, and to the type of packing shown in the “notes” section of the drawing. As an example, the scrubber may take “#2K Type K Tellerettes®” in the main packed bed section, and “#2 (or #1) Type R Tellerettes® in the mist eliminator above the packed bed section. The bags of Tellerettes® are clearly marked.
4. The mist eliminator section (entrainment separator section) is that area above the spray header pipe(s), at the top of the column. The mist eliminator can be either a certain depth of Tellerette® packing, a chevron (zigzag) blade assembly, or a mesh pad, as identified on the drawings.

If the mist eliminator is Tellerette® packing:

- a. Assemble and place the packing support plate (grid) in its position, same as item #2 above. There will be a ring or ledge to support the grids.
- b. Fill the area above the support plate with the proper type and size Tellerette® packing, as shown on the drawings.
- c. Packing can be “dumped” in randomly and raked level at the proper depth. Fill the sections with packing to a level a few inches above the recommended level to allow for later settling.

If the mist eliminator is Chevron blades:

- a. The blade assembly usually rests on a ring or ledge. There is no need to hold down the blades, unless specifically shown on the drawings.
- b. Work with the assembly drawing for proper fit of each module if the assembly is in more than one piece.
- c. The “troughs” on the blades face “down” into the airstream.

If the mist eliminator is a mesh pad:

- a. The pad will rest on a ring or ledge, and usually is furnished with its own supporting grids.
 - b. Work with the assembly drawing for proper fit of each section if the pad is in more than one piece. The pad should fit tightly into the circular area.
 - c. Tie down the pad, if shown on the drawings, with the ties provided.
5. Install the spray nozzle(s), usually from Bete Fog Nozzle Company, into the spray header pipe. The nozzle(s) should be pointing directly downward, with no sideward cant. Tighten firmly with a strap wrench. Typically, the nozzles will come pre-installed in the spray header assembly. To confirm this fact, look at the end of the spray header assembly and you should NOT see any “threads” at the end of a coupling or ninety-degree elbow. If you do see threads, then indeed the nozzle has not been installed.
 6. Bolt on the top cover or cone section with the bolts provided. The gasket for the top may be already cut to fit, or can be a strip of adhesive-backed foam rubber. If it is a strip gasket, it must be placed inside the bolt circle. Do not over tighten the bolts (see “Bolt Torque Recommendations”, Item 8).
 7. Bolt on the access door covers. The gasket may be as in Item #6 above. Do not over tighten the bolts.
 8. Bolting torque for flanges are as follows:
 - a. Up to 16: diameter – 25 ft/lbs.
 - b. 18 to 36” diameter – 30 ft/lbs.
 - c. Above 36” diameter – 35 ft/lbs.
 - d. Access doors – 25/30 ft/lbs.

9. Use Teflon tape on all threaded connections. Be extremely careful not to cross any threads. Tighten plastic connections with a strap wrench.
10. Use soft gasket material only. Gaskets, except for the access doors and top cover, are not normally provided. Do not use hard rubber or Teflon envelope gaskets on plastic flanges. Use full-face flange gaskets only.
11. The bottom sump area of the scrubber can be leak tested by filling with water up to the overflow nozzle only. Do not blank off any nozzles in an attempt to fill the entire scrubber with water checking for leaks. Serious damage could result. **NEVER** pressure test a scrubber with air or water. Serious damage, rupture and flying debris can result during a pressure test. We recommend that you do contact CAPC with any questions or to inquire about performing “tests” on your equipment. **Testing at pressure (positive or negative) that exceed design levels or if testing is not properly done, may cause serious injury or death.**
12. Support all piping and ductwork independently of the scrubber, unless piping supports are provided. Flexible connectors are recommended at all flanged connections.
13. This instruction is meant to be utilized in conjunction with customer drawings and all appropriate sections of this Bulletin 13-10, Rev. A (Handling & Installation Instructions).

IX. *General Instructions*

Equipment such as tanks and scrubbers must have full bottom support. The foundation must have sufficient strength to support the product when full, without sagging or deflection.

The equipment should be well anchored by securing all the hold down lugs before proceeding with the piping.

Valves, piping, etc. which are attached to nozzles or fittings on the equipment must have independent support.

Nozzle flanges are to be bolted according to the instructions in this manual. Be sure all flange faces are free of all debris. Use the type of gasket specified and carefully torque bolts using no more or no less force than indicated in the manual.

Follow all instructions attached or marked on the drawings.

Agitators and vibrators should not be attached to the equipment unless the product has been specifically designed for this purpose, and then only where provided.

On equipment with bottom drain nozzles, a drain recess must be provided in the installation pad which does not allow the weight of the vessel to rest on the drain nozzles or the fiberglass strapping which attaches the nozzle to the vessel.

Make certain all vents are open and free of debris.

Covers are designed for foot traffic only, unless otherwise specified.

After the equipment has been installed, it should be inspected again to insure that no damage has occurred during installation.

The equipment has been designed and built for a specific application. Therefore, use only the recommended testing procedures and only for the application it was designed for.

Because certain environments (chemical, physical, etc.) could result in damage to the product, please consult the CAPC Project Engineer prior to making changes in the operating conditions.

FIELD RECEIVING CHECKLIST

Job Site Location (City/State): _____

Date of Receipt: _____

Delivered Equipment List: _____

Name of Carrier: _____

Name of Driver: _____

It is essential that this inspection be done prior to off loading as significant liability could result should any item be damaged.

1. We suggest you arrive at the job site before the driver arrives to confirm that the load is tarped (not all loads are tarped) and well secured. Note any exposed areas or if the tarp appears loose and may have allowed debris to blow into/under the tarping.
2. BEFORE the rigger goes to connect any crane or equipment to off load the material, do a complete walk around WITH THE RECEIVING PERSONNEL, to confirm that no dents, creases, broken, busted, torn, scratched or damage is on any of the goods/materials to be off loaded.

If no damage is noted, including the insulation (if insulated such as tears, dents or dirty), then proceed to have the rigger remove the equipment from the truck by following the guidelines provided in Bulletin 13-10, Rev. A.

If there is damage or debris, take pictures (BEFORE off loading) and do note the damage on the delivery receipt, the extent of damage or dirt or debris and do get the driver to sign the delivery receipt copy. If there is any reluctance from the driver or if he refuses to sign, contact the driver's dispatcher and resolve the matter (if this shipment was made FOB Destination; contact the CAPC Project/Contract Manager immediately.

Serial Number of the Damaged Equipment: _____

Attach a copy of the SIGNED delivery receipt to this form.

3. Confirm that all flanged duct or pipe, if shipped loose, has blind flanges installed to keep debris out. Confirm that crates or loose materials are in good condition with no visible damage. Any damage or concerns are to be handled as listed above.

-
4. Allow off loading to proceed once this pre-off loading inspection has been completed. If an item is damaged during off loading, note and record this and if possible, take a picture as well. Point out to the receiver any such damage (even scratches) as having taken place during off loading. Record this information as well.

Time that off loading completed: _____ A.M./P.M.

Comments _____

Any damage reported above: _____ Yes _____ No

If damage is reported, what date was the carrier notified and who was notified:

Date

Name of Person Contacted

Person Completing this Report:

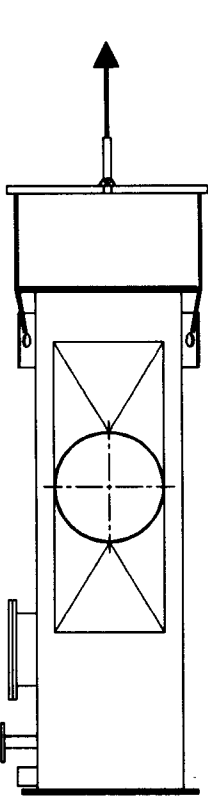
Printed Name

Date Completed

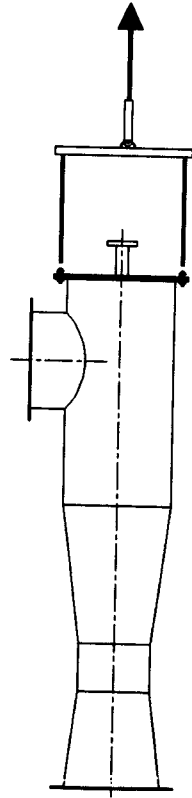
Signature

XI. **Lifting Lugs/Eyelets for all CAPC Equipment**

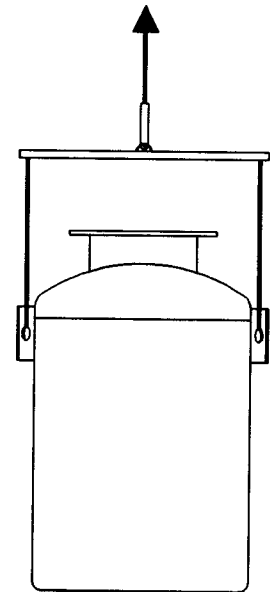
Proper lifting requires lifting with all lifting lugs/eyelets as supplied with the equipment.



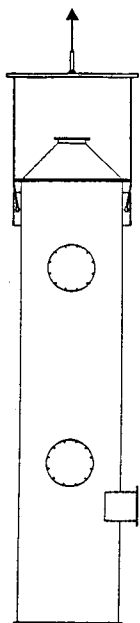
HORIZONTAL SCRUBBER
(END VIEW)



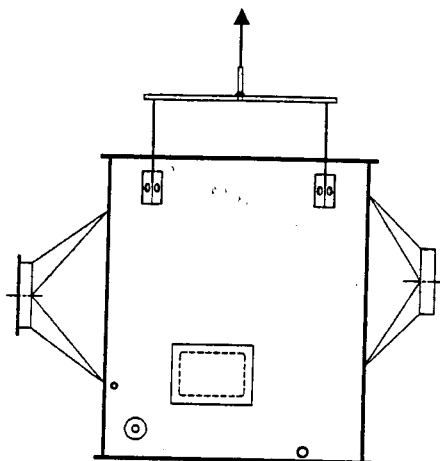
EDUCTOR SCRUBBER



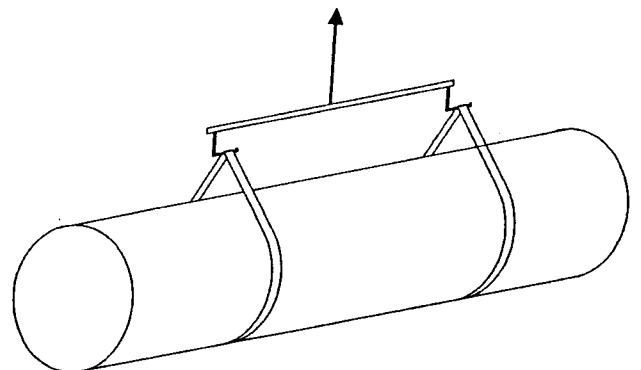
TANK



COUNTERCURRENT
(VERTICAL SCRUBBER)



HORIZONTAL
(CROSSFLOW) SCRUBBER



DUCT