FG Series Brinemaker

Installation, Operation & Maintenance Manual

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PLEASE NOTE:
The following handling and installation instructions are designed to help SCIENCO/FAST customers properly install FG SERIES Brinemakers in a minimum amount of time. Proper tank handling and installation will result in longer system life. These instructions are only recommendations and do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage or loss of tank contents due to improper handling or installation is the sole responsibility of the purchaser. Failure by the customer to take precautions as outlined in this manual will invalidate the tank warranty. Unknown situations or conditions are also the burden of the purchaser. The presence of Scienco/Fast, Inc. representatives at the job-site does not relieve the purchaser of any of his responsibilities.

Revised August 2016

GENERAL FEATURES

The Scienco/FAST FG Series Brinemaker is designed to meet modern industry's need for an automatic bulk salt storage and brinemaking system, adaptable for use with all types of industrial salt: evaporated, solar and rock.

The FG Series Brinemaker is fabricated of corrosion-free fiberglass and resins approved by the FDA. The complete system includes the tank, salt filling pipe and fittings, air vent and dust collector, water and brine distributors, and top and side manways.

Optional accessories available are controllers, ladders, ladder cages, sump or siphon drains, and heat and insulation packages. Seismic calculations and stamps can also be supplied for the area of installation.

BRINEMAKER SPECIFICATIONS

Tank: The tank shall be constructed of polyester or vinyl ester resins reinforced with filament wound fiberglass. The tank shall be designed in accordance with ASTM D3299. The brinemaker shall be equipped with the following accessories:

- 4" Stainless Steel Filling Pipe. (Not applicable to gravity fill units)
- 8" PVC Vent with polyester dust bag.
- 24" Top manway, weighted as pressure relief.
- 24" Side manway
- 1-1/2" Water inlet and distribution system.
- 2" Brine outlet and collector system.

Piping:

1. All nozzles have standard ANSI 150 Lb. flange bolt-hole arrangement. All mating flanges must be full flat faced. Raised face flanges will damage FRP flanges. A torque of 25 ft. Lbs. is necessary with the required 40-50 durometer gaskets (approx. 1/8" thick).

2. Valves and piping attached to the tank nozzles must be independently supported. Attached piping must be flexible enough to allow for expansion and contraction of tank and piping.

LIMITATIONS IN USE

1. Environment: This tank has been sold for a specific chemical storage application. This tank is to be used to store Sodium Chloride (common salt) and to produce a saturated brine solution. Because certain chemical environments will damage the tank, please consult Scienco/FAST, Inc. on changes of the environment prior to making the changes. The brine, salt and surrounding environment cannot exceed 120F.

INSTALLATION

1. Follow all handling and installation instructions.

2. The tank requires a smooth continuous bottom support.

3. No sharp projections are allowed under the tank bottom.

4. Tanks must be anchored.

5. Hold -Down lugs must be secured to the support pad per current Scienco/FAST installation instructions.

6. Vapor removal equipment (If Installed) must not cause pressure or vacuum conditions beyond those specified below.

   A. Pressure should not exceed 10" of water column.

   B. Vacuum should not exceed 4" of water vacuum.

7. Do not exceed conditions of storage as specified on the tank service label.

8. If storage condition changes are required, contact Scienco/FAST, Inc. review of new conditions.

9. Do not allow stored material to freeze.

10. Do not restrict tank vent or weighted manway. Modifications to tank venting may result in over-pressure or over-vacuum conditions which could be hazardous and would invalidate the existing warranty.

11. Filling above the tank straight-wall height may result in structural damage to the tank.

DELIVERY INSPECTION & HANDLING GUIDELINES

Upon arrival at the destination, the customer shall be responsible for inspection for damage in transit.

IF DAMAGE HAS OCCURRED, IT SHOULD BE NOTED ON THE DELIVERY RECEIPT PRIOR TO SIGNING ACCEPTANCE.

A claim should then be filed with the delivering carrier by the customer. If no claim is filed, the customer accepts all future responsibility for a damaged tank.
The diagram (next page) indicates most of the vulnerable places to be checked upon delivery of the tank. Inspection should be made both inside and outside. Minor damage can be repaired at the jobsite. If needed, call Scienco/Fast at (314) 756-9300 for instructions.

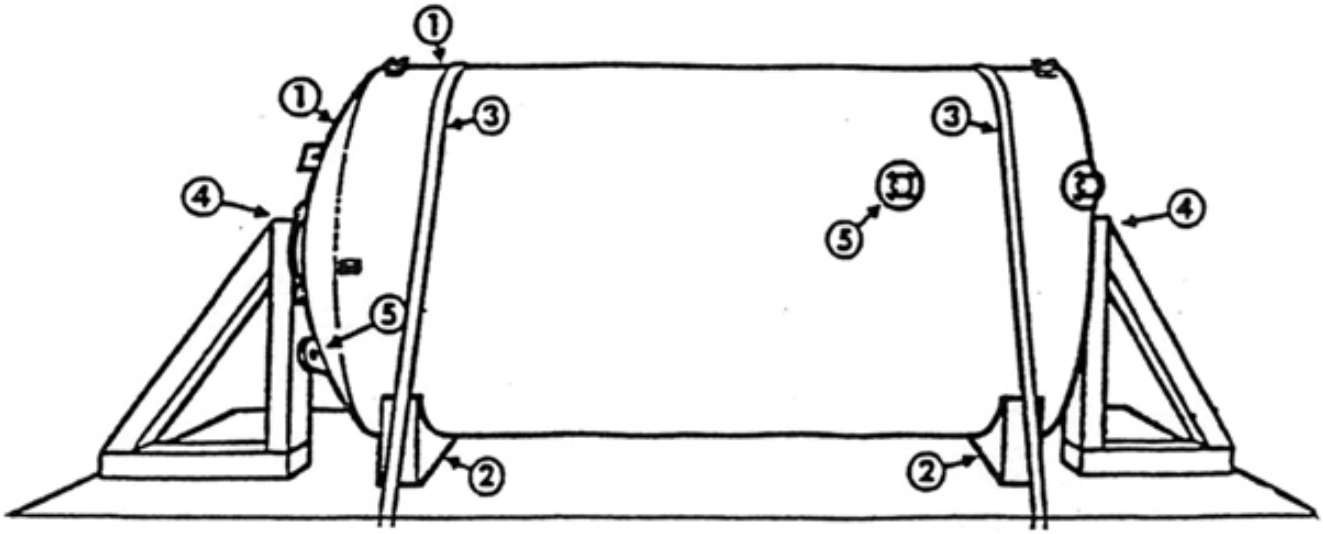
Inspection Points

1. Check top and widest part of load for signs of damage.

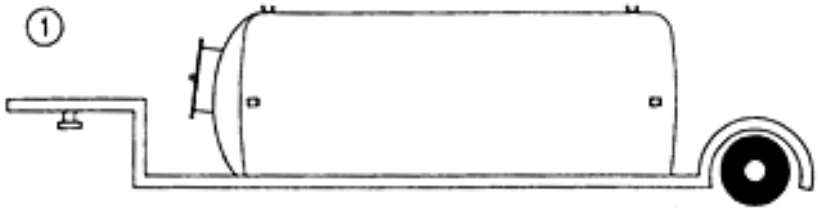
2. Check shipping cradles for movement. Check tank for movement. Check for cracks at points of contact.

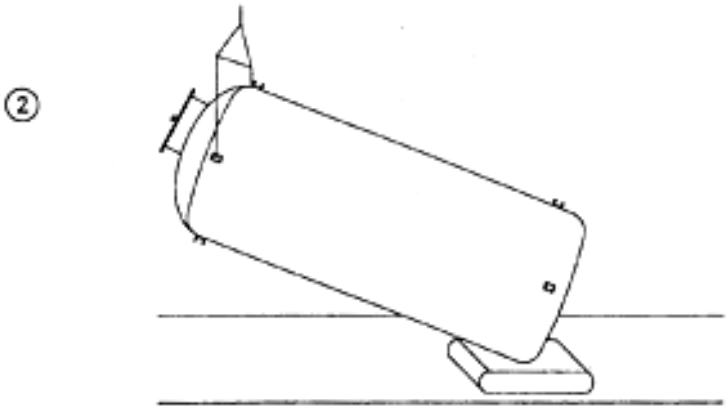
3. Check straps for damage to tank.

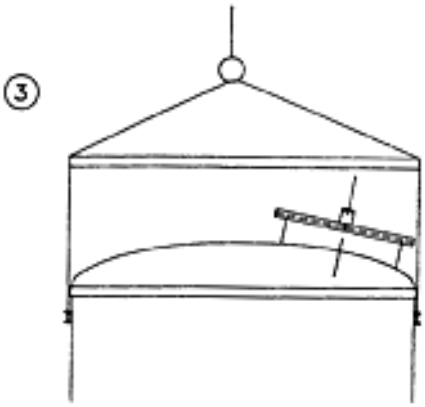
4. Check for any sign of rotation which would damage fittings.



FG Series Tanks should be righted by hoisting with a spreader bar and lines to the lift lugs or clevis and lines to the lift lugs. Adequate padding is necessary to protect the pivot point(s). Workmen should keep control over the tank with guidelines to ensure that the tank is gently brought to rest upon its base.



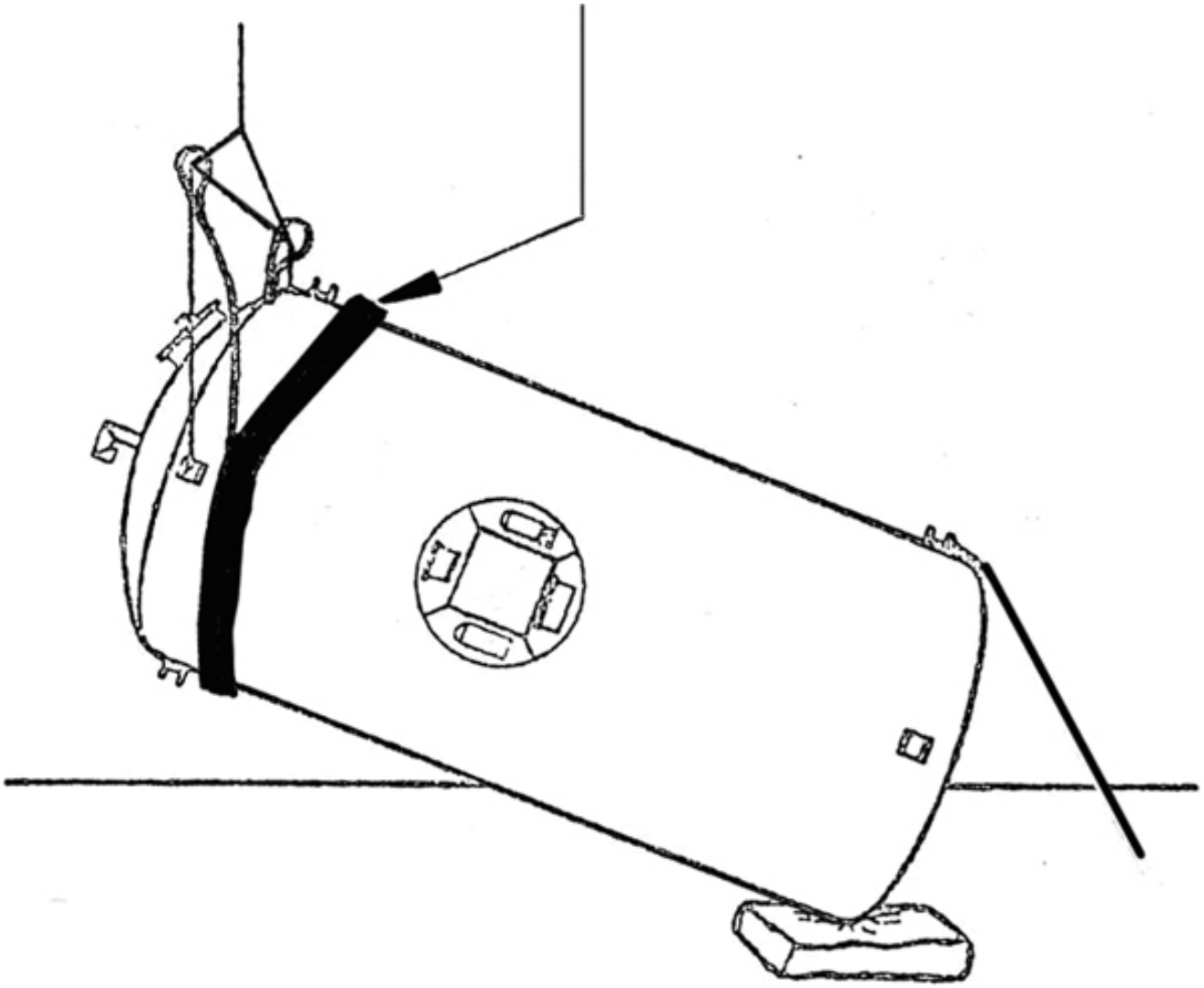




SAFETY SLING

FOR SAFETY, IN CASE OF LIFTING LUG FAILURE, USE A 4” WIDE NYLON SAFETY SLING AROUND THE TANK. THE SLING SHOULD BE POSITIONED BELOW THE LIFTING LUGS AND MUST BE ATTACHED TO THE SPREADER BAR.

“4” NYLON SAFETY SLING AROUND TANK BELOW THE LIFTING LUGS



TANK CONCRETE PAD MINIMUM SPECIFICATIONS (DRAWING MN-26-B)

1. Suggest 3000 psi air-entrained concrete mix be used.

2. Minimum slab thickness of 7"

3. Reinforcing to consist of two layers of No. 4 bars spaced 12" on centers in each direction, in each layer. Minimum of 1-1/2" concrete between each layer and top and bottom of pad.

4. Slab to be designed for 1200-3000 PSF load.

5. 12' x 12' pad for 10 foot diameter tank; 14' x14' for 11'6" tanks.

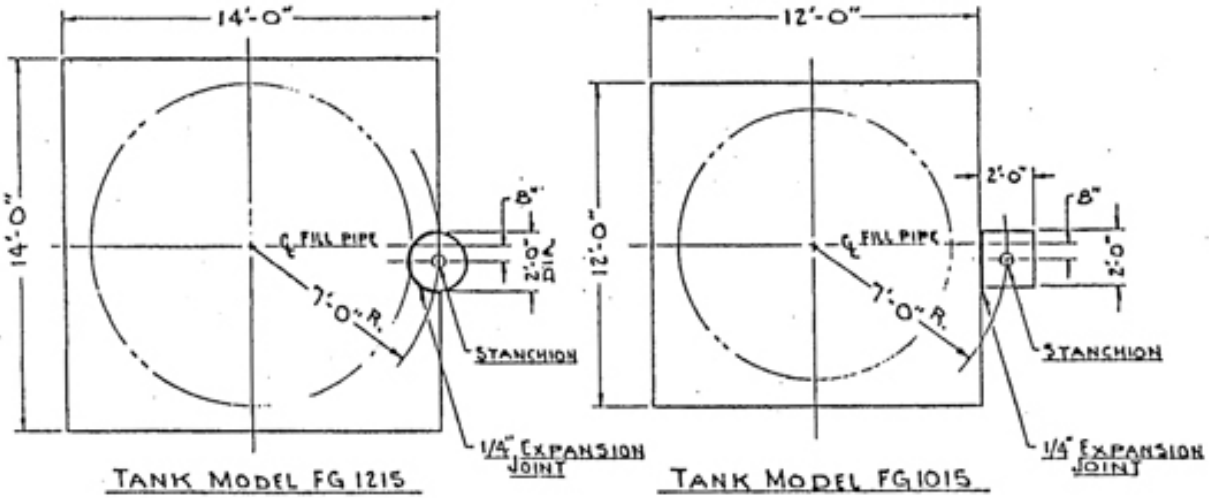
6. Concrete pad should be designed for tank gross loading and local soil-bearing conditions for actual thickness and reinforcement required.

7. A 4" x 15' stanchion to support the salt fill pipe should be inserted in the concrete pad 7' from the center at the time of pad construction. (Only applies to Pneumatic Fill units)

8. Maximum drainage slope 1/8" per 10' in any direction.

9. Hold Down anchors are to be field drilled and utilized for anchoring tanks only after the brinemaker tank has been filled with water and has had time to stabilize. (Usually 12-24 Hrs.) Use 5/8" diameter bolts.

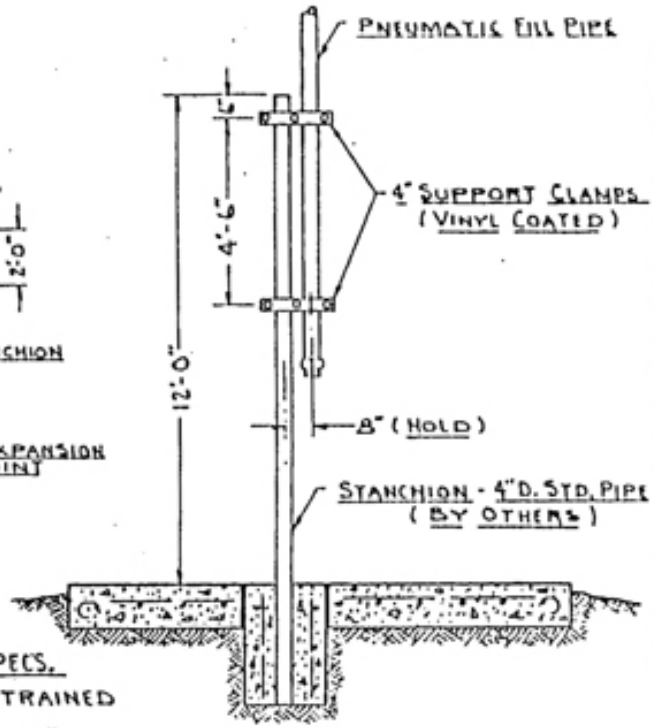
ANCHOR BOLTS SHOULD NOT BE PRE-POURED BECAUSE OF HOLD-DOWN LUG POSITION VARIANCE. DO NOT TIGHTEN HOLD-DOWN LUGS UNTIL TANK IS FILLED.

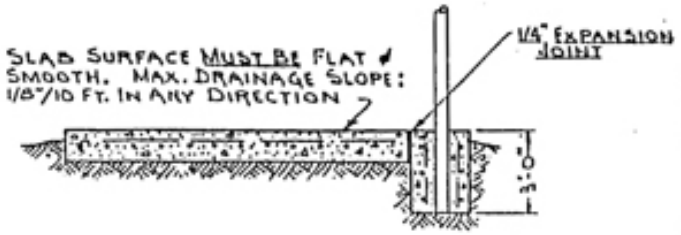


TANK MODEL FG 1215

TANK MODEL FG 1015

PLAN VIEW





SIDE ELEVATION

NOTE : PRE-DRILLING OF ANCHOR HOLES NOT RECOMMENDED DUE TO LUG VARIANCE.

MINIMUM CONCRETE SPECS.

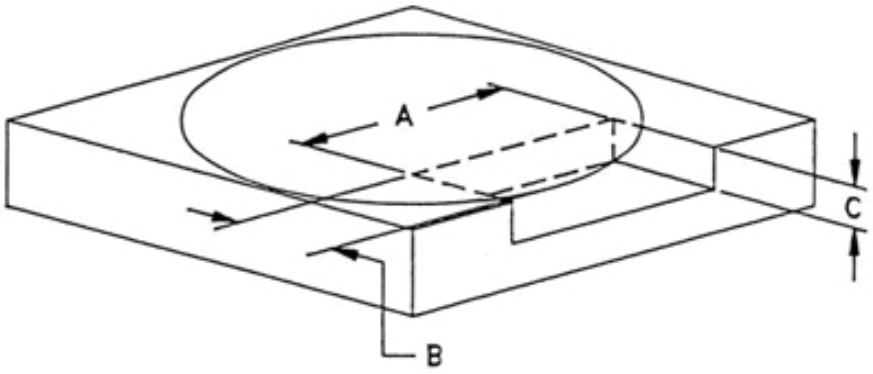
1. - SUGGEST 3000 PSI AIR-ENTRAINED CONCRETE MIX BE USED.
2. - MIN. SLAB THICKNESS TO BE 7".
3. - REINFORCING TO CONSIST OF 2 LAYERS OF #4 BARS SPACED 12" O.C. IN EACH DIRECTION IN EACH LAYER. MIN. OF 1½" CONCRETE BETWEEN EACH LAYER AND TOP AND BOTTOM OF PAD.
4. - SLAB DESIGNED FOR 1200 - 2000 PSF LOAD.

CONCRETE PAD SHOULD BE DESIGNED FOR TANK GROSS LOADING LOCAL SOIL BEARING CONDITIONS FOR THICKNESS AND REINFORCEMENT REQUIRED.

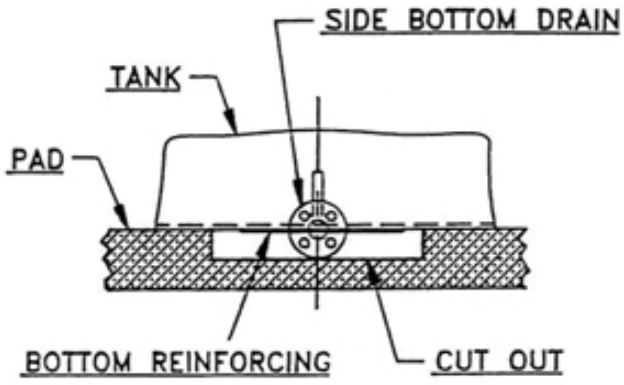
SCIENCO INC.

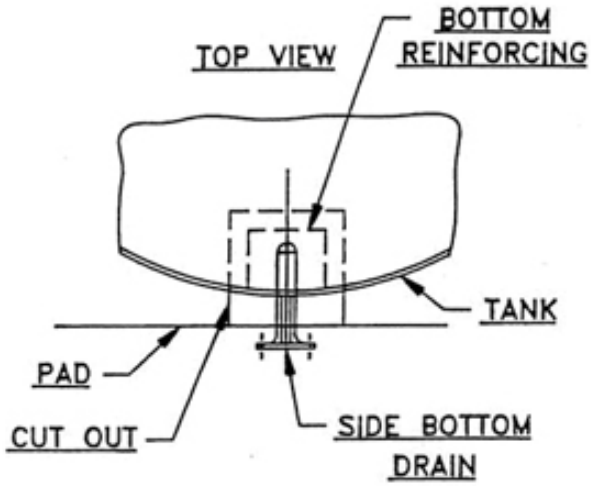
TANK PAD for FG BRINEMAKER

SCALE	ENGINEER	SHEET
—		1 of 1
DATE 1-21-75 REV.	DRAWN C.S.	DRG. NO. MN-26-B



DRAIN SIZE	A	B	C
2"	9	8	3-1/4
3"	10	8	3-3/4
4"	11	8	4-3/4
6"	13	8	5-3/4
8"	15	8	6-3/4
10"	18	8	8 1/2
12"	21	8	10





At grade concrete slab construction

(Recommendations based upon the "Concrete Reinforcing Steel Institute Design Handbook.")

Recommendations:

1. 800 to 1200 psf load:
   - Suggest 3000 psi concrete mix to be used.
   - Min. slab thickness to be 7".
   - Reinforcing to consist of 1 layer of #4 bar (1/2" thick) spaced 12" O.C. in each direction. Min. of 1-1/2" concrete between bar and bottom of pad.

2. 1200 to 2000 psf load:
   - Suggest 3000 psi concrete mix to be used.
   - Min. slab thickness to be 7".
   - Reinforcing to consist of 2 layers of #4 bar (1/2" thick) spaced 12" O.C. in each direction. Min. of 1-1/2" concrete between each layer and top and bottom of pad.

3. 2000 to 3000 psf load:
   - Suggest 3000 psi concrete mix to be used.
   - Min. slab thickness to be 8".
   - Reinforcing to consist of 2 layers of #5 bar (5/8" thick) spaced 12" O.C. in each direction. Min. of 1-1/2" concrete between each layer and top and bottom of pad.

4. 3000 to 5000 psf load:
   - Suggest 3000 psi concrete mix to be used.
   - Min. slab thickness to be 10".
   - Reinforcing to consist of 2 layers of #5 bar (5/8" thick) spaced 12" O.C. in each direction. Min. of 1-1/2" concrete between each layer and top and bottom of pad.

INTERNAL COMPONENTS INSTALLATION

SAFETY PRECAUTIONS WHEN WORKING INSIDE OF FG Series TANK

1. BRINEMAKER IS A CONFINED SPACE. IT SHOULD ONLY BE ENTERED USING PROPER PROCEDURES AND EQUIPMENT FOR CONFINED SPACE ENTRY.

2. TOP MANWAY MUST BE OPEN FOR PROPER VENTILATION.

3. ENTRY TO THE TANK SHOULD BE MADE ONLY THROUGH THE SIDE MANWAY.

4. A STANDBY SAFETY OBSERVER MUST BE PROVIDED TO ASSIST THE PERSONNEL WORKING INSIDE THE TANK AND TO SERVE AS A RESCUER IF REQUIRED. THIS STANDBY PERSON CAN HAVE NO OTHER DUTIES THAN ASSISTING AS OBSERVER/RESCUER. IN ADDITION, ONE EXTRA PERSON IS REQUIRED TO BE WITHIN HEARING DISTANCE, TO ASSIST IN A RESCUE IF REQUIRED.

5. MECHANICAL VENTILATION AND AN AIR MONITORING METER SHOULD BE PROVIDED WHEN WORKING WITHIN THE TANK.

After positioning the tank on the pad, the following items should be installed.

1. Install the special PVC tee into the 1-1/2" SS coupling on the inside of the tank wall. Use Teflon tape on the PVC threads.

2. Position the two 1-1/4" water distributor pipes through the wall brackets. The two plugged ends should be on the opposite side from the 1-1/4" tee.

3. Use the SS hose clamps provided and connect the unplugged ends to the tee.

4. Drill 3/16" diameter holes on 12" centers on a horizontal plane, avoid interference from the wall brackets.

CAUTION: DO NOT DRILL THROUGH BOTH SIDES OF THE DISTRIBUTOR PIPE

5. Install the 22" plenum in the tank through the 24" diameter side manway. The plenum should be positioned in the center, with the two flanged tabs positioned

under the two fiberglass clips on the tank bottom. This should give an approximate position with sufficient clearance for final adjustment. Use the gaskets, SS bolts, nuts and washers to install the 2" PVC brine discharge pipe between the brine plenum and the connection on the interior of the tank sidewall. Allow the brine pipe flanges to determine the final position of the brine plenum. It should move in or out, or turn slightly in order to properly align the flanges on top of the plenum and the inside wall of the tank. Install the six sections of slotted PVC pipe into the six holes in the sides of the brine plenum open ends first. Then position the six pipes with the ***slots facing down*** and put the caps on the outside ends of the pipes. The PVC slotted pipes should be positioned evenly; use a few pieces of gravel to hold the slotted PVC pipes in position and to prevent them from rolling. If a gravel bed is not used run a bead of food grade caulking along both sides of the slotted pipes at the outer end for about 6 inches to hold the pipes in place.

6. Replace the side manway cover and gasket. Tighten the bolts evenly to avoid leakage or damage.

7. For pneumatically filled brinemakers, the 4" fill pipe be should positioned through the top center 6" flanged fitting. Two pairs of 4" clamps are supplied to secure the pipe to the 4" stanchion pipe for vibration reduction. (The stanchion pipe is to be supplied by others.)

AVOID EXCESSIVE STRESS ON THE TOP OF THE FLANGE FITTING
When the positioning is complete, a permanent bracket should be attached between the fill pipe and the stanchion.

8. The 8" vent pipe extension should be connected using the rubber coupling to a "U" made with the two 8" elbows, to the vent pipe. The pipe used to assemble the 8" elbows is not furnished by Scienco/FAST. The vent is held in position by clamping it to the two mounting lugs on the exterior of the tank wall. A clamp and polyester dust bag are provided for use during unloading to control excessive salt dusting.

9. When all fittings and connections are complete, the tank should be filled with water to check for leaks. This should be done before installing the gravel support bed that is required when using granulated grades of salt. The water should be held at least 12 hours, and then a careful inspection should be made to determine that no small leaks have developed. (Contact Scienco/FAST if leaks are detected.)

10. Drain and install gravel if needed. See further instructions below.

11. The tank should be re-filled with 7' of water and the pressure switch of the Levetrol Plus SR Controller should be adjusted at this time. (See the Levetrol Plus SR Installation & Operating Section for instructions.)

A GRAVEL BED IS REQUIRED IF FOOD GRADE GRANULATED TABLE SALT WILL BE USED. DO NOT USE CRUSHED ROCK. USE NSF STD. 61 APPROVED, WASHED GRAVEL

GRADED FILTER GRAVEL

Gravel bed consists of: 7" coarse filter gravel (1/4" x 1/2") on the bottom and 5" of fine filter gravel (1/8" x 1/4") on the top. This should be done carefully to keep the slotted PVC pipes in proper position.

Gravel is packed in 100 lb. bags that equal about 1 cubic foot.

7 foot diameter tanks require:
- 23 bags of 1/4° x 1/2" on the bottom.
- 16 bags of 1/8° x 1/4" on top of that.

8 foot diameter tanks require:
- 30 bags of 1/4" x 1/2" on the bottom.
- 21 bags of 1/8" x 1/4" on top of that.

10 foot diameter tanks require:
- 46 bags of 1/4° x 1/2" on the bottom
- 35 bags of 1/8° x 1/4" on top of that.

12 foot diameter tanks require:
- 70 bags of 1/4" x 1/2" on the bottom.
- 50 bags of 1/8" x 1/4" on top of that.

KNOWN SUPPLIERS OF GRAVEL/WATER FILTRATION MEDIA

RED FLINT SAND AND GRAVEL 715-855-7600
EAU CLAIRE, WI

FLORIDA SILICA, SAND CO. 305-691-5881
MIAMI, FL

NORTHERN FILTER MEDIA 563-263-2711
MUSCATINE, IA

THE PARRY CO. 740-884-4893
CHILLICOTHE, OH

U. S. SILICA 800-257-7034
MAURICETOWN, NJ

OPERATING INSTRUCTIONS

SALT LOADING FOR PNEUMATIC FILL UNITS

1. The salt truck should connect the 4" delivery hose to the fitting on the salt fill pipe.
2. After airflow is established, water should be added through the 3/4" flow control orifice on the salt filling pipe at a rate of approximately 3 gals. per minute.
3. The water injection will dissolve the majority of the dust formed during the loading operation.
4. When the truck has been emptied, the water injection should be shut off before stopping the flow of air in the fill pipe.

Dust Control

The primary dust control system is the water injection into the fill pipe during delivery. A polyester dust bag and clamp are provided for installation on the 8" vent pipe. This is utilized as an additional protection device to avoid salt dust. It is extremely important to use the water injection feature to minimize salt dust. If the water injection is NOT used, you will experience dust from the top manway and excessive salt dust in the dust bag.

UNDER NO CIRCUMSTANCES SHOULD THE TOP MANWAY EVER BE FASTENED DOWN OR RESTRICTED AFTER THE BRINEMAKER IS OFF LOADED FROM THE TRUCK AND PLACED IN POSITION. FASTENING THE TOP MANWAY OR BLOCKING THE OPENING WITH A SCREEN OR FABRIC CAN CAUSE THE BRINEMAKER TO BE OVER PRESSURIZED WHILE FILLING AND RESULT IN FAILURE/RUPTURE OF THE BRINEMAKER TANK. THE TOP MANWAY IS A DEVICE TO ASSURE PRESSURE WILL NOT BUILD UP IN THE TANK AND MUST BE ALLOWED TO RELIEVE ANY PRESSURE, UNOBSTRUCTED.

IMPORTANT - THE DUST BAG MUST BE REMOVED AFTER EACH SALT DELIVERY AND RINSED THOROUGHLY IN FRESH WATER TO REMOVE THE ACCUMULATED SALT DUST. AFTER DRYING, THE BAG SHOULD BE STORED IN READINESS FOR THE NEXT SALT DELIVERY.

Brine Handling

The brinemaker can be operated by gravity flow or by pump, but the flow rate should not exceed the designed GPM.

Operation

Maximum outflow of brine from the various models using *granular* salt are:

All 12 foot diameter models 56 GPM
All 10 foot diameter models 39 GPM
All 8 foot diameter models 25 GPM
All 7 foot diameter models 19 GPM

Maximum outflow of brine from the various models using *coarse or rock* salt are:

All 12 foot diameter models 28 GPM
All 10 foot diameter models 19 GPM
All 8 foot diameter models 12 GPM
All 7 foot diameter models 9 GPM

Tank salt level rise per full 48,000 pounds of *granular* salt delivery:

All 12 foot diameter models 6 feet
All 10 foot diameter models 8-1/2 feet
All 8 and 7 foot diameter models will not hold an entire 48,000# delivery

Tank salt level rise per full 48,000 pounds of *coarse or rock* salt delivery:

All 12 foot diameter models 8-1/2 feet
All 10 foot diameter models 12 feet
All 8 and 7 foot diameter models will not hold an entire 48,000# delivery

Water Make-Up
If high grade salt is being used and brine purity is an important factor, the make-up water should be softened. If not, the make-up should be clean plant water.

MAINTENANCE AND CLEANING

Granulated Salts
This grade of salt is totally soluble, so that a complete clean-out can be very infrequent. However, in all "Down Flow" brine making systems, there is a tendency for "fines" to collect in the lower section of the salt bed-dissolving zone. This gradually increases the pressure drop across the salt bed, until finally the weakest point will break through and channel. This sudden velocity increase will usually cause fine gravel and undissolved salt to be carried out with the brine.

This condition can be avoided when using granulated salt by periodically introducing water through the brine outlet fitting to dissolve away the fines. This should be done every three to six months, depending on the salt used and the brine flow rates.

The brinemaker should be taken out of service and a supply of fresh water should be temporarily connected to the brine outlet piping. A flow of 8 to 10 GPM of fresh water should be introduced to the tank until a total of about 1,000 gallons has been added (18" to 24"); then return to the normal piping arrangement. **If the brinemaker is immediately returned to service, the first brine will be less than saturated, and a sufficient quantity should be drawn off until the brine becomes saturated before returning the system to normal plant operation.**

A major clean out may be required after a number of years of service. A bulk salt dissolving system tends to accumulate the impurities and foreign matter delivered with the salt. This might be small amounts of dirt from the truck as well as rubber particles from a worn or damaged delivery hose. Many of the particles are static in nature, and tend to stick to the upper areas of the tank.

In most cases the tank can be cleaned as follows:
CONSUME THE SALT TO AS LOW A LEVEL AS PRACTICAL, STILL MAINTAINING SATURATED BRINE. THIS WILL BE AT APPROXIMATELY THE ONE-FOOT LEVEL.

Continue to dissolve away the remaining salt until the side manway can be opened. Then connect a supply of fresh water to the brine outlet and introduce water through the brine collector system and the gravel bed, allowing it to overflow out of the side manway. If necessary, the walls should be washed down with water or scrubbed with a long handled brush.

The backwash and overflow should be continued in order to keep the dirt from dropping into the gravel bed. In very extreme conditions, it may be necessary to replace the gravel support bed.

Rock Salt

When rock salt is being used there will be a residue of un-dissolved calcium sulphate remaining in the bottom of the brinemaker. This will be mixed with about 50% fine salt. As the impurities accumulate, the pressure drop increases across the dissolving zone until a break-through zone occurs, which will carry solids out with the brine, due to the sudden localized increase in velocity.

A rock salt dissolver should be taken out of service and cleaned before reaching the point of channeling. The tonnage of salt that can be dissolved before reaching this point is partly determined by the flow rate, but in general a 7-foot diameter Brinemaker should be cleaned after using 175 tons of rock salt. An 8 foot diameter Brinemaker should be cleaned after using 225 tons of rock salt. A 10-foot diameter Brinemaker should be cleaned after using 300 tons of rock salt. A 12-foot diameter unit should be cleaned after using 500 tons of rock salt.

The Rock Salt Brinemaker should be cleaned by using as much salt inventory as practical. The liquid should then be drained, and the side manway opened. The mixture of impurities and salt should be removed and properly disposed of according to local regulations. The collector system and the center plenum should be thoroughly washed out and repositioned. All internal piping and supports should be carefully inspected for any breaks or damage before placing the brinemaking system back into service.

WARRANTY

Scienco/FAST Inc. warrants each new product manufactured by it to be free from defects in material, workmanship, and parts, under normal use and service, such obligations under this Warranty being limited to making good at the Scienco/FAST factory, any parts which shall, within 12 MONTHS after shipping date to the original purchaser, be returned to Scienco/FAST, with transportation charges prepaid and which Scienco/FAST's examination shall disclose to it's satisfaction to have been defective. All other material and parts are warranted for 90 days after installation by the original owner if examination by Scienco/FAST discloses that failure was caused by a defect in workmanship or material under normal use and service.

THIS WARRANTY BEING EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, AND OF ALL OTHER OBLIGATIONS AND LIABILITIES ON THE PART OF SCIENCO/FAST SYSTEMS INC. AND SCIENCO/FAST NEITHER ASSUMES OR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS.

"WHAT THIS WARRANTY DOES NOT INCLUDE"

This Warranty does not include any Field Labor Charges for replacement of parts, adjustments, repairs or any other work done on SCIENCO/FAST'S products. This Warranty does not apply to any product which shall have been modified or altered in any way outside of SCIENCO/FAST'S factory or authorized service agency in any way so as, in SCIENCO/FAST'S judgment, to affect its stability, nor which has been subject to misuse, negligence, accident, improper installation, improper operation, nor the free replacement of parts inoperative because of wear occasioned by use.

No merchandise will be accepted for warranty service or return to the factory without prior written authorization from the company.

CHANGES

The company reserves the right to modify or change the equipment in whole or part, at any time prior to delivery thereof, in order to include therein, electric or mechanical refinements deemed appropriate by the company; but without incurring any liability to modify or change any equipment previously delivered, or supply new equipment in accordance with earlier specifications.