

EXXON COMPANY, U.S.A.

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MARINE DEPARTMENT
ENGINEERING AND PLANNING

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S F GOLDMANN — ECONOMICS AND PLANNING
W F ROBINSON — OCEAN TONNAGE

April 6, 1978

EXXON GETTYSBURG

Mr. George Brasewell
Newport News Shipbuilding and Dry Dock Company
4101 Washington Avenue
Newport News, Virginia 23607

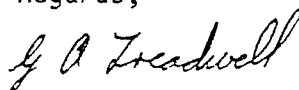
The EXXON GETTYSBURG is expected to enter Newport News Shipyard in May to undergo repairs and alterations. We request that you prepare necessary engineering designs for: (I) conversion of the aft potable water tank and all applicable piping in the amidship square to a sewage holding system, (II) installation of a FAST treatment system and alteration of sanitary piping in the after house, and (III) modification of the cargo manifold. This work will be included in specifications sent at a later time by our repair department, but is being sent in advance to allow time for engineering designs to be developed and approvals processed.

Designs are to be guided by the attachments included, and all final drawings are to have approval from USCG, ABS, USPHS, owners and others as required. We would also like your design work for items I and II to be applicable to three sister vessels, EXXON JAMESTOWN, EXXON LEXINGTON, EXXON WASHINGTON.

As soon as possible please submit to us your best estimate to make these modifications to the EXXON GETTYSBURG. This estimate should include the costs for all materials (except the FAST 26M) and labor, as well as the time required to perform all work in the shipyard.

If you have further questions, please call me at 713-656-5742.

Regards,



G. A. Treadwell
Project Engineer

GAT:a1

bcc: H. P. Leyendecker 
G. L. Cousins
W. A. Ingham
E. J. Worrel

EXX-MOR-010556

EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

I. Sewage Retention - Amidship House

Furnish labor and material required to modify the existing sewage overboard discharge system to incorporate the use of the aft potable water tank in the amidship square as a sewage holding tank. The system is to be complete with tank level and alarm system, saltwater washdown system and tank self-drainage system. The modified sewage system is to be capable of going overboard or to the holding tank.

Modify the sewage piping system to direct black water to the holding tank or overboard (see sketches). One (1) three-way ball valve port and one (1) three-way ball valve starboard are to be provided and installed to allow waste to be directed overboard or to the tank. A single overboard drain line is to discharge through the starboard five inch scupper. Insure that all newly installed drain lines are properly sloped (at least 1/4" drop per foot of pipe run).

Fabricate and install a new forward bulkhead in the aft potable water tank in the amidship square. Allow approximately two feet between the new bulkhead and the existing tank bulkhead. Cut lightening holes between the two bulkheads as necessary. Disconnect the aft potable water tank from the potable water system and seal all connections as required. Remove the aft tank sounding petcocks and seal permanently. The interior of the tank is to have surface preparation of white metal blast (SS SA3), then apply two (2) coats of rust ban 6692 black coal tar epoxy or equal 8 MDFT each coat (16 MDFT total). Tank exterior in the disturbed area is to have needle gun preparation, then apply one (1) coat rust ban 188 or equal 2 to 3 MDFT, one coat rust ban 6566 or equal 1-1/2 to 2 MDFT, and two (2) coats rust ban 6403 or equal 1-1/2 to 2 MDFT each coat (3 to 4 MDFT total). Furnish and install a five inch drain system from the tank to the starboard scupper. Supply and install piping and valve. Construct a suitable manhole access centered over the suction penetration tailpiece. Extend the existing tank vent to a suitable location above deck.

Furnish and install a tank level and alarm system to alarm in the ship's cargo office and indicate tank level. Level switches are to be suitable for hazardous environment. Three switches (DeLaval Gems Series LS 1950 where approved) are to be used which will indicate liquid level in the upper tank zone. Install a saltwater spray down system in the holding tank supplied from the ship's saltwater service system. Install a back-flush line to the tank suction tailpiece, also from the ship's saltwater service system.

New sewage piping is to be FRP (Ameron Bondstrand) where approved. Yard to gain approval as possible. Develop piping layout, design details, and equipment purchases. Provide engineering services to produce drawings and obtain approvals from USCG, ABS, USPHS, owners and others as required. Approval is to be obtained in the final drawings for all revisions or modifications. After completion, prove operation to satisfaction of all concerned.

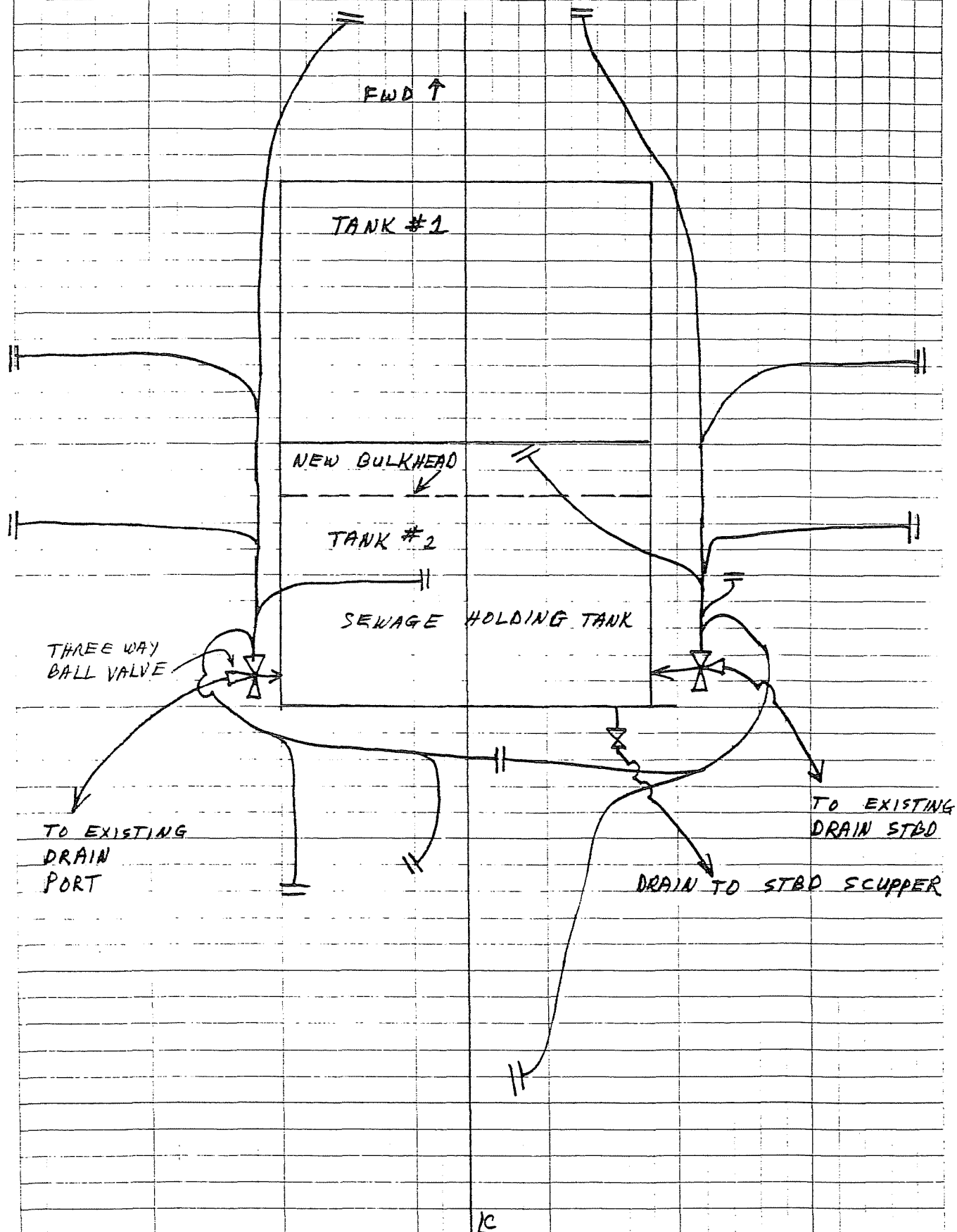
PORT FWD

STARBOARD FWD ↑



EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

SEWAGE RETENTION - AMIDSHIPS - MODIFICATION



EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

II. FAST Sewage System Installation - Afterhouse

Furnish labor and material required to modify the existing sewage overboard discharge system and to install one FAST treatment system (FAST 26M owner furnished) on the port side of the lower engine room space, in the 20-40 frame area (see sketch). Obstructing piping and equipment are to be relocated as necessary. The FAST system is to be installed as per the manufacturer's guidelines. The modified sewage system is to be capable of going overboard or to the FAST system.

Remove the toilet shared by the two deck maintenance rooms on the starboard side (between frame 16 and 18) and cap the 4" drain line.

Modify the sewage piping system as per the sketch attached. Cut a total of eighteen (18) 4" soil lines in the engine room and plug or cap the remaining pipe leading to the six scuppers (seven cuts starboard and eleven port). Install 4" piping on both sides of the engine room to modify the system as sketched. Install two (2) 4" three-way ball valves port and two (2) 4" three-way ball valves starboard. Valves are to be able to direct waste overboard through the center scupper (one port and one starboard) and the after scupper (one port and one starboard) or to the FAST treatment system. Insure that all newly installed drain lines are properly sloped (at least 1/4" drop per foot for pipe running aft or athwartship, and at least 3/8" drop per foot for pipe running forward). Piping is to be FRP where approved (Ameron Bondstrand). Shipyard to gain approval.

Develop piping layout, design details, and equipment purchases. Provide engineering services to produce drawings and obtain approvals from USCG, USPHS, ABS, owners, and others as required. Approval is to be obtained in all final drawings. After completion, prove work to satisfaction of all concerned.

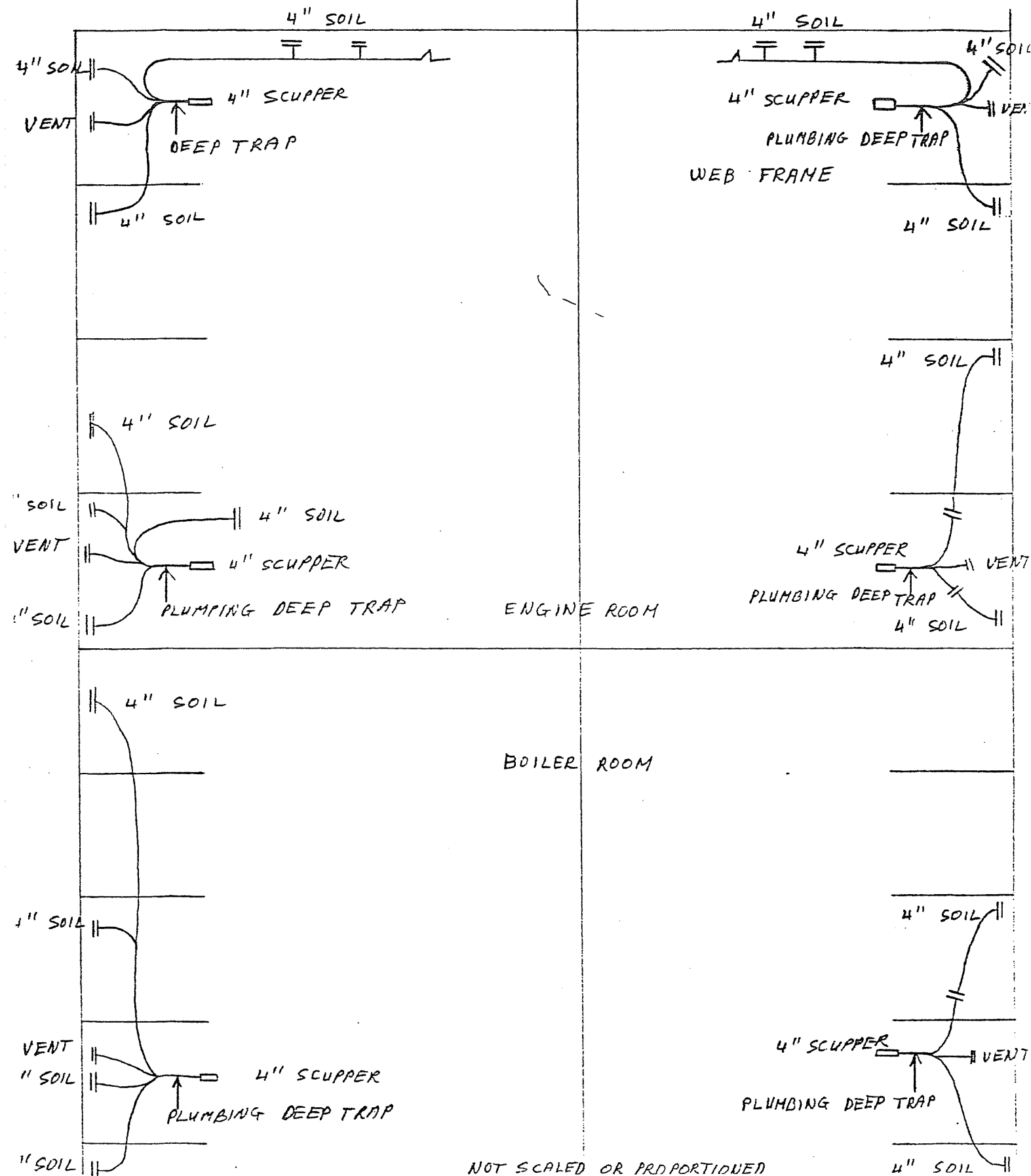


EXXON GETTYSBURG - AFTER HOUSE SANITARY SYSTEM

PORT FWD EXISTING

LC

STARBOARD FWD



EXXON GETTYSBURG - AFTER HOUSE FAST SYSTEM INSTALLATION

FWD ↑

4" FRP WHERE
APPROVED OR
4" X HEAVY

THREE-WAY BALL VALVE

TO FAST TANKS

2" VENT

4" SCUPPER

PLUMBING DEEP TRAP

THREE-WAY
BALL VALVE

TO FAST TANKS

PLUMBING

2" VENT

ENGINE ROOM

BOILER ROOM

FAST SYSTEM

TO FAST TANKS

2" VENT

4" SCUPPER

PLUMBING DEEP TRAP

1 1/2" OVB

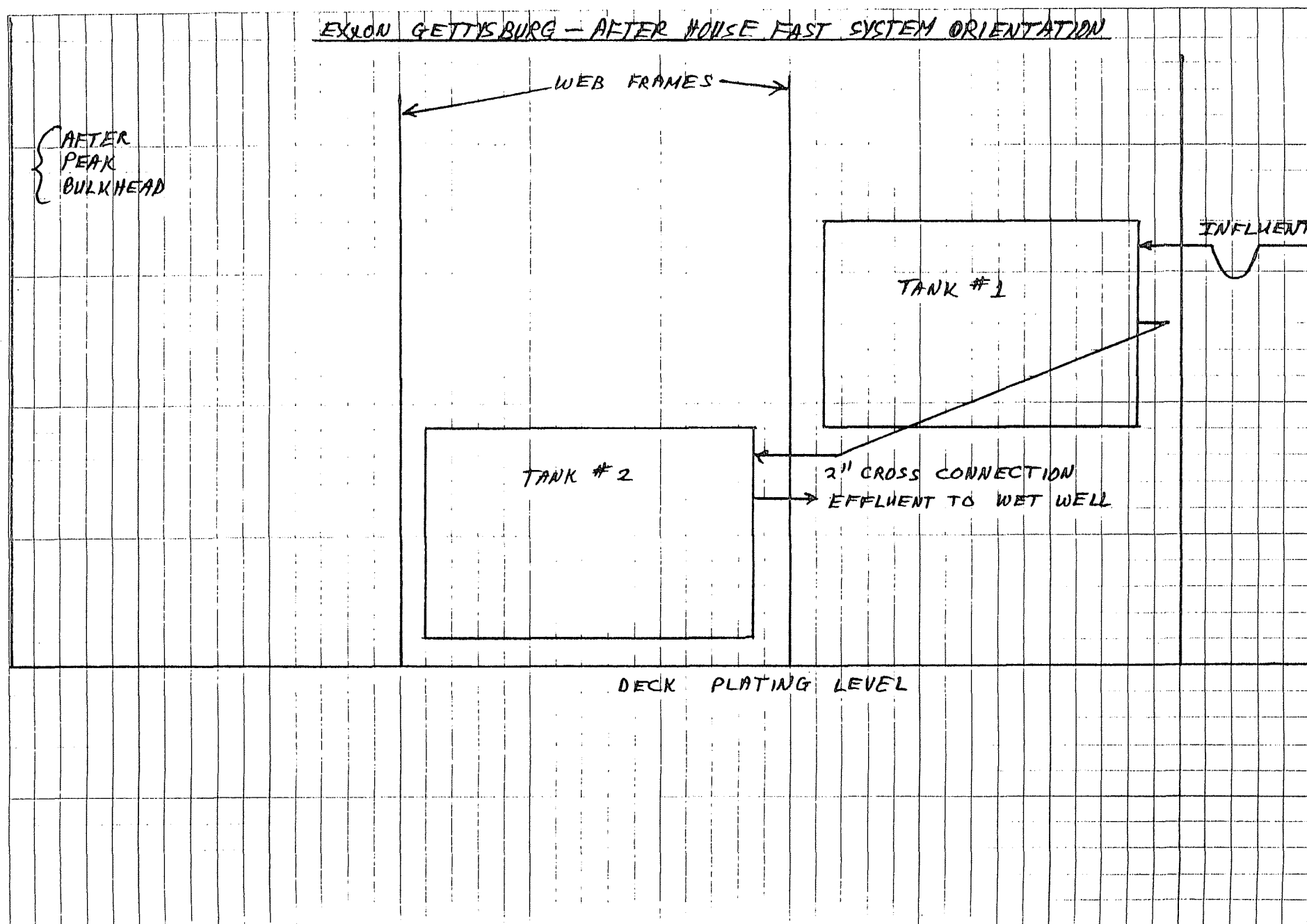
DISCH FROM
SEWAGE PUMP

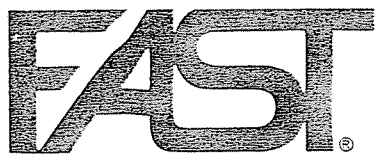
TO FAST TANKS

4" SCUPPER

PLUMBING TRAP

2" VENT





Marine Sewage Systems

Installation Instructions: M Series

Installation Instructions

For Models 6M, 9M, 13M and 18M *AND 26M*

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- Startup Procedure

General. Each M Series FAST system is a complete marine sewage plant in component form. The components can be located where space is available and then interconnected. Each component is fully assembled prior to shipment, and will pass through a 28" x 60" watertight door without disassembly. Components may be

oriented fore and aft or athwartships.

The most critical aspects of installations are piping and venting, so that the sewage will flow freely into and through the system. Read these instructions and the associated drawings carefully.

Each boat and installation is unique. If you have any questions, call your local distributor or St. Louis Ship. To assist you in installation we make available a qualified field representative for up to two (2) days at no cost to you, other than for transportation expenses (billed at cost).

Operation. As fresh sewage enters the media tank, an equal volume of purified water is displaced through the tablet chlorinator and into the wet well. Liquid level switches in the wet well operate the discharge pump. The blower runs continuously.

Equipment Furnished. Media tank, tablet chlorinator, wet well, discharge pump, blower, pump and blower motor starters, 45 lb. drum of chlorine tablets.

Special Note. The FAST 18M differs from the other models in one respect. It uses two model 9M media tanks, connected in series rather than a single tank. The first media tank should be set about 6 inches higher than the second tank to insure gravity flow from the outlet of the first tank to the inlet of the second tank. This will permit the tanks to be located up to 10 feet apart. If greater spacing is desired, raise the first tank an additional 1/4 inch per additional foot of separation. Otherwise, all installation requirements are the same as for the other models.

Labor and Materials Required, but not furnished. Structural foundations, interconnecting piping and wiring.

Caution. Do not weld on the bodies of the media tank or wet well. Their interiors are coated with epoxy resin and the heat will destroy the coating. Also, protect the plastic parts of the tablet chlorinator from weld splatter during installation.

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Soil Piping. Soil piping to the system must slope 1/4 inch per foot when the vessel is at its normal trim. This will insure adequate flow velocity and prevent deposition of sewage solids in the pipes.

Bypass. Provision should be made for direct overboard discharge of sewage, bypassing the FAST system. This will provide sanitary facilities for the crew in case of malfunction, and also permit bypassing at sea where treatment is not required.

The simplest method is a two valve gravity flow arrangement. Ball valves are recommended. Gate valves are acceptable so long as the stems are oriented upward to prevent clogging.

Trap. It is necessary to isolate the vessel soil piping from the sewage system with a water seal trap. Occasionally, detergent foam will form in the media tank and partially block the media tank vent, creating backpressure. The trap will prevent this backpressure from affecting operation of the toilets.

The minimum depth of the trap shall be not less than sixteen (16) inches, from the centerline of the outlet pipe to the centerline of the pipe at the bottom of the trap.

Note that the inlet to the trap is 1'-0" or more above the outlet. This 1'-0" drop corresponds to the expected worst case backpressure in the media tank vent. If 1'-0" drop is not available, increase the size of the media tank vent according to Table 1 below. Increasing the vent size will reduce the back pressure to correspond with the drop actually available. When in doubt, use the next largest pipe size for the media tank vent.

Table 1.

Minimum Media Tank Vent Pipe Size (Inches)	6M	9M	13M	18M**
Available Drop				
12 inches	2*	2½*	3*	3
8 inches	2½	2½	3	4
4 inches	2½	3	4	4
2 inches	3	4	4	5
0 inches	4	4	5	5

*Size of vent connection on top of media tank.

When larger vent size is required, enlarge to the larger pipe size as close to the media tank as possible.

**Each 9M media tank used in the 18M is equipped with a 2-1/2 inch vent connection. These should be combined into a single vent of the size specified in the table as close to the media tanks as possible.

The trap should be equipped with a 2 inch cleanout and fill connection at the top of the inlet pipe, and a 2 inch cleanout at the bottom.

Note: If some of the sewage is pumped to the system and the remainder flows by gravity, the pump should discharge into the gravity line upstream of the trap. The trap and media tank vent must be selected as specified above. If all sewage is pumped to the system, a trap is still required between the raw sewage pump and the system. Centerline to centerline depth of the trap should be sixteen (16) inches, but no drop is required. Inlet and outlet can be at the same level. Also, a separate trap vent is not required. The media tank vent should be the smallest pipe size specified in Table 1 for the model being installed (i. e. 2½" for Model 9M).

Trap Vent. The upstream side of the trap should be equipped with a 2 inch vent to the exterior of the vessel. This will permit free flow of sewage in the soil pipes. If the soil lines are adequately vented to atmosphere, this vent may not be required. However, if the fixtures incorporate one way (check valve) air inlets, a separate trap vent will be required. The trap vent may be fabricated from ordinary black iron pipe.

Media Tank Vent. The media tank must be vented to the exterior of the vessel, and this vent must not be combined with the trap vent or any other soil line vent upstream of the trap.

The media tank vent should be fabricated from galvanized steel pipe or other material suitably protected against corrosion. If a flame screen is required (for inspected vessels only), the exterior termination of the vent should be fitted with a

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pipe reducer, so that the opening and flame screen will be two pipe sizes larger than the vent pipe size. This will reduce the additional pressure drop due to the screen. The exterior termination of the vent should be located to permit removal and cleaning of the screen.

See Table 1 for minimum tank vent size.

Vent Piping (General). Vents must terminate not less than 10 feet from any ventilation air inlet, window used for ventilation, doorway normally used by personnel, or source of vapor ignition. Vent piping must slope not less than 1 inch per foot upward and away from the media tank or trap so that condensation will not accumulate in the vent. Vent runs should be as short as practicable.

For inspected vessels, the U. S. Coast Guard requires a flame screen on all vents.

Water Piping. Pump discharge piping should be 1-1/4 inch and all other water piping shall be 2 inch pipe size. The 2 inch pump suction piping should be reduced to 1-1/2 inch at the pump suction connection.

If media tank and wet well are set at the same deck level, maximum length of the spillover line from media tank to chlorinator to wet well is 30 feet. Piping should slope downward from the media tank at 1/4 inch per foot.

The run between the media tank outlet and chlorinator inlet must be equipped with a trap with centerline to centerline depth of sixteen (16) inches. No drop is needed. Inlet and outlet of the trap can be at the same level.

For fresh water sewage, piping materials may be schedule 40 galvanized, schedule 80 PVC or reinforced PVC hose. For sea water sewage, PVC is preferred but galvanized schedule 40 is acceptable.

Note: If PVC hose is used, it will be necessary to use silicone rubber or other sealant to effect a watertight joint.

Note: In both water and air piping use unions to permit removal and maintenance of components.

Air Piping. Air piping from blower to media tank must be one (1) inch pipe size. Acceptable materials are schedule 40 galvanized and ordinary neoprene air hose. If rigid piping is used, a flexible connection should be installed near the blower to reduce noise transmission through the pipe.

Media Tank. The media tank may be installed on a flat deck or on two longitudinal or three transverse frames with bearing areas at least 3 inches wide. The frames should pick up the six bolt holes predrilled on the tank baseplate. The tank may be secured in place with six 1/2 inch grade 5 bolts, or with three, 3 inch long 3/16 inch fillet welds spaced along each long side of the baseplate. The tank baseplate should be horizontal when the vessel is at its normal trim. Provide at least 2'-0" above the top of the tank for access.

Tablet Chlorinator. The tablet chlorinator is preassembled to a bracket for bulkhead mounting. It should be installed so that the notches in its bottom are at the downstream end. Tilt the bracket or shim the chlorinator so that it slopes 1/4 inch per foot (centerline of outlet connection about 1/2 inch below centerline of inlet connection). Be sure the tilt angle is such that water does not accumulate in the bottom of the chlorinator.

The chlorinator may be located at any point in the line between media tank and wet well, but must be downstream of the trap and not less than 2'-8" above the base of the wet well.

Provide at least 1'-0" access above the top of the feed tubes for their removal.

Wet Well. The wet well may be installed on a flat deck or on two frames with bearing areas at least 3 inches wide. The frames should pick up the four bolt holes predrilled on the tank baseplate. Secure with either four 1/2 inch grade 5 bolts or with two 3 inch long 3/16 inch fillet welds on each side. The tank baseplate should be horizontal when the vessel is at its normal trim.

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Allow at least 1'-6" above the top of the tank for access.

Discharge Pump. The discharge pump should be operated in the flooded suction mode. Its base should be not more than 2'-0" above the baseplate of the wet well. If the discharge head is greater than 15 feet or if the discharge point may be submerged, install a check valve in the discharge line. The pump base should be tack welded to the deck. **Do not run the pump dry!**

If the pump is run backward, the rotor may unscrew and the pump will not deliver water. If this happens, disassemble the pump and reassemble the rotor and pump.

Blower. The blower assembly is preassembled to a bracket for bulkhead mounting. Install so that the silencer inlet will not pick up foreign objects from the deck, and with belt drive towards the bulkhead.

Make sure that the blower gear case has oil in it before starting. The fill plug is at the top of the gear case (opposite the drive end), the oil level plug is below it and just above the drain plug. Add SAE 40HD oil until it overflows from the oil level plug hole.

See Table 2 for standard sheave sizes.

Table 2.
M Series Sheave Sizes

FAST Model No.	Motor Sheave	Blower Sheave
6M	4.2	5.6
9M	5.2	5.6
13M	5.6	4.8
18M	5.6	4.0

Blower Relief Valve. The relief valve should be equipped with three (3) weights, each 1/4" thick x 6" diameter. If one or more of these have been misplaced, replacement weights can be cut from mild steel plate.

The purpose of the relief valve is to protect the blower from damage due to overpressure. Make sure that the relief valve operates freely and is lubricated with machine oil.

Electrical Equipment. Motors and the pump starter control transformer can be connected for either 220/230 VAC or 440/460 VAC operation. (These motors are **not** suitable for 208 VAC operation. If 208 VAC operation is required, special motors are required.) Unless otherwise stated in the purchase order, the overload heater coils furnished will be for 440/460 VAC. Table 3 lists proper Cutler-Hammer part numbers.

Table 3.
Overload Heater Coil Part Numbers

Line Voltage	Blower Starter	Pump Starter
208 VAC	H1030	H1029
220/230 VAC	H1029	H1028
440/460 VAC	H1024	H1023

Your unit will be equipped with one of two different motor starter arrangements. If there are separate pump and blower starter enclosures, the heater coils will be as specified in Table 3. If both pump and blower starters are in a single enclosure, **both** starters should use the heater coil numbers specified under "Pump Starter" in Table 3.

The pump starter incorporates a line disconnect which can break all current to both motors. It should be located in sight of the motors. The pump starter also incorporates a fused control transformer to produce 110 VAC for the pump pilot circuit.

Electrical service required is 3.5 KVA. The branch circuit feeding the motor starters should be protected by a 20 amp circuit breaker. Cables should be bronze armored marine type, TTIB-4 and DTIB-4 as applicable. Junction boxes should be watertight, and cables should enter starter enclosures at the bottom. In running cables and locating cable supports *do not weld on body of media tank or wet well.*

The liquid level switch on the wet well incorporates 3 independent sets of contacts: pump off (2 red wires), pump on (2 yellow wires) and high level (2 blue wires). If the high level

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switch is to be used with an external circuit, note that contacts are rated for 120/240 VAC 100 VA maximum. For greater load currents use a De Laval GEMS load pak or relay for isolation.

The high level alarm should be powered by a separate 110/115 VAC source. If power to the motor starters is inadvertently shut off at the switchboard or the line disconnect, the high level alarm will then still function.

Deck Connection. If the vessel periodically goes to sea and leaves territorial waters, a deck connection is not required. If the vessel operates continually in territorial waters, a deck connection is required for periodic pumpout of the media tank to a receiving station.

The discharge pump outlet should be equipped with two 1-1/4 inch valves to direct the flow either overboard or to the deck connection.

Steel ball valves with 316 SS balls and teflon seats are preferred. PVC ball valves are acceptable. Bronze is not recommended for sea water applications. The deck connection should be 1-1/2 inch pipe size to comply with U. S. Coast Guard requirements.

Gravity Flow. If specified in the purchase order the system will be furnished less pump and associated controls. The overboard discharge line must slope 1/4 inch per foot.

Note that the line from the chlorinator enters the wet well at the lower 2" coupling, and the overboard discharge line leaves from the upper 2" coupling. (This is the reverse of the arrangement when a discharge pump is installed.) A valve should be installed to drain the wet well for layup.

External Air Supply. If specified in the purchase order, the system will be furnished less blower, but will incorporate a pressure regulator and orifice plate for flow regulation. Connect to the external air supply with a 1 inch line and provide a separate shutoff valve upstream of the regulator. Set regulator to 3.5 PSI.

Table 4 lists SCFM required for each model.

Table 4.

Model	6M	9M	13M	18M
SCFM	9	13	20	26

High Level Alarm. If specified in the purchase order, an indicating light station and horn will be furnished to operate with the high level switch installed in the wet well. Electric cable used for hookup should be bronze armored marine cable, DTIB-4 or TTIB-4 as applicable.

Startup Checklist. Before startup, check these items:

1. Soil piping leading to FAST system must be sloped at 1/4 inch per foot and vented to vessel exterior upstream of the trap.
2. Media tank vent and drop into trap must be in accordance with Table 1 in *Trap* section of this instruction.
3. Media tank vent must not be combined with any other vent.
4. Horizontal vent runs must slope upward and away from media tank.
5. Vents must not terminate within 10 feet of weather deck, ventilation air inlets, windows or doors used for ventilation, doorways normally used by personnel, or sources of vapor ignition.
6. If flame screen is used on media tank vent, it must be two (2) full pipe sizes larger than size of vent pipe.
7. Media tank base must be at same level as, or higher than, wet well base.
8. Gravity flow lines from media tank to chlorinator to wet well to overboard (if applicable) must slope 1/4 inch per foot.
9. Grease bearings on blower drive end and on both motors before startup.
10. Blower must be filled with oil and be equipped with proper sheaves, as per Table 2.
11. Blower relief valve must be equipped with three (3) large weights, be lubricated and operate freely.

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12. Blower and pump starters must be equipped with proper overload heater coils, and each coil should be installed with pointed end up.
13. Chlorinator must tilt 1/4 inch per foot, and the downstream tube must be charged with chlorine tablets. Make sure tablets lie flat in feed tubes, and that water does not stand in chlorinator when there is no flow.
14. Does vessel have operating instruction manual?

Startup Procedure.

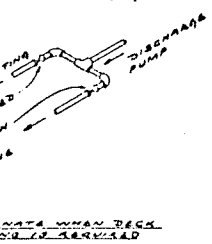
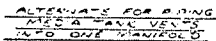
1. Set up for automatic operation and turn on blower (air lift operation).
2. Fill media tank with water and leave water running to check automatic operation of pump. Turn off water.
3. Close overboard bypass and allow sewage to enter media tank.
4. Flush all toilets to check for proper operation. If flushing is slow, check soil pipe venting.
5. Instruct vessel personnel in operation of system.

FAST
SEWAGE SYSTEMS



ST. LOUIS SHIP

DIVISION OF POTT INDUSTRIES INC
611 EAST MARCEAU STREET, ST. LOUIS, MO 63111



ACCESS
MEDIA TANK TOP AND ONE END 1'-6"
WET WALL TOP 2'-0" ONE SIDE 1'-6"
GALVANIZED TOP OF HEAD TUBES

APPROVALS		CONTRACT	
REVISION		DATE	
OWNER		DATE	
ARCH		DATE	
ADD		DATE	

EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

III. Cargo Manifold Modification

Provide labor and material to modify the port and starboard cargo manifolds in accordance with the attached sketches. Only lines A and B are to be altered. Spacing is to be as follows:

A ₁ to A ₂	3'6"
A ₂ to B ₁	2'
B ₁ to B ₂	3'
B ₂ to C ₁	2' (as existing)

Remove the existing four (4) cargo line Y-connections (A and B port and A and B starboard), and furnish and install four (4) new cargo line Y-connections. Remove the existing spool reduction pieces from the A and B lines (8 spools total), and install them in the same sequence on the new Y-connections. Each new Y is to be properly supported and tied to the existing stripper line(s). A centrally located 1-1/2" drain line and ball valve are to be furnished and installed with each new Y. The drain line is to allow drainage from the cargo line to the collection pan.

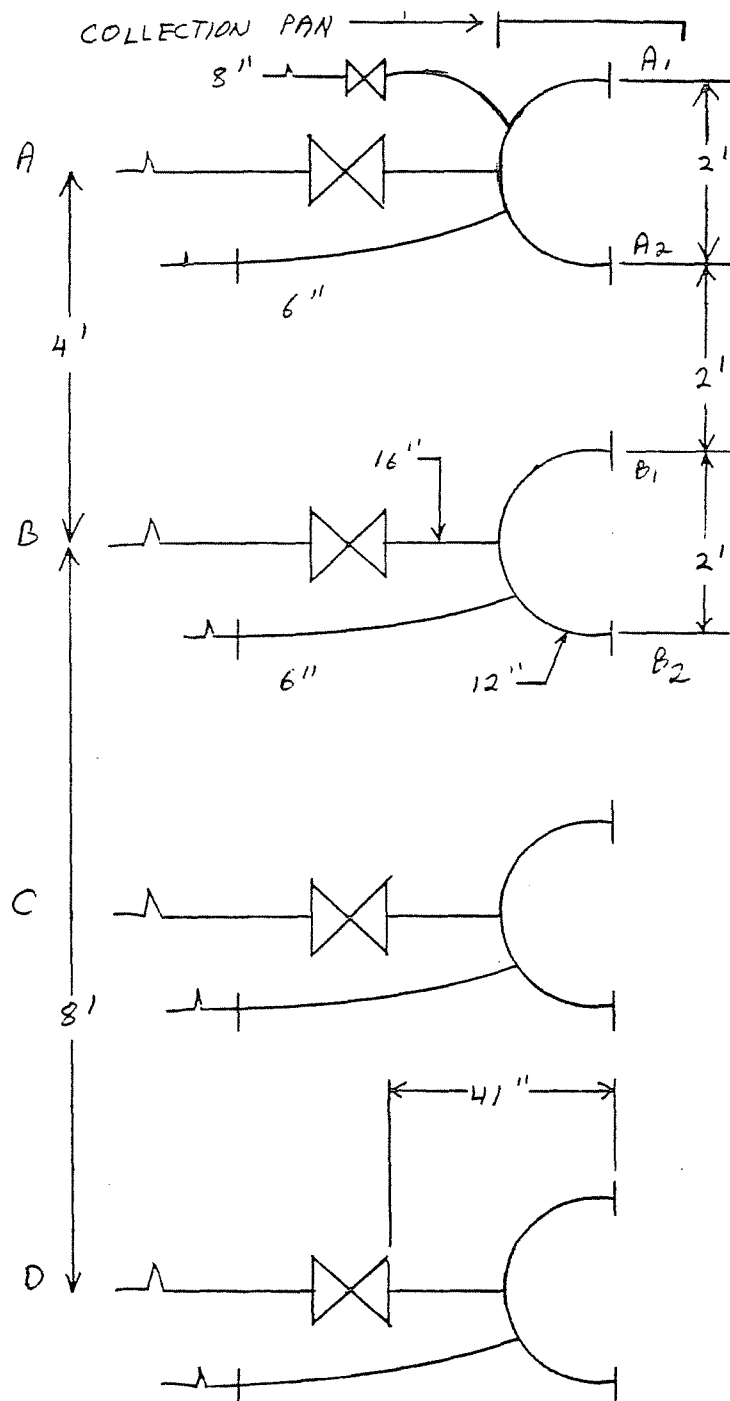
Furnish and install a 2-1/2' extension to the forward side of the existing drip pan, port and starboard. Support as needed.

Provide engineering services to develop details, produce drawings, and obtain approvals from USCG, ABS, owners and others as required. All final drawings are to have approval from all concerned. After completion of work, prove to satisfaction of owners and others as required.

EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

STARBOARD CARGO MANIFOLD - EXISTING
PORT IS MIRROR IMAGE

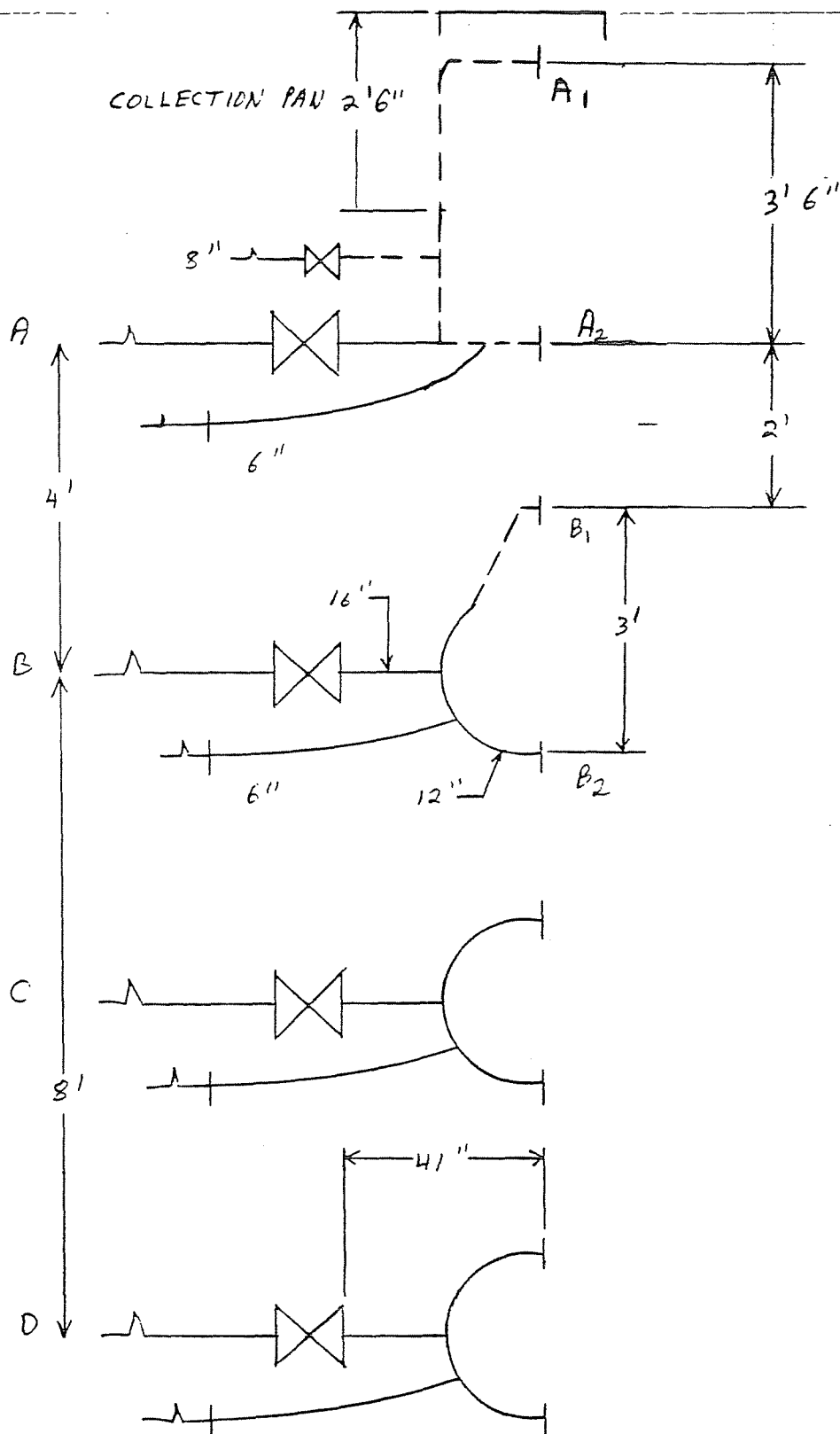
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STARBOARD CARGO MANIFOLD - MODIFICATION

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SUBJECT

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DATE

DEPARTMENT

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EXXON GETTYSBURG - 1978 SHIPYARD SPECIFICATIONS

STARBOARD CARGO MANIFOLD

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