

LANTDIV  
403:HDJ  
24 Jun 86

LANTDIV

MEMORANDUM FOR MECHANICAL BRANCH MEMBERS

Subj: UNDERGROUND TANK DESIGN GUIDANCE

- Ref: (a) Mtg btwn Code 114 and Code 403 of 21 Apr 86  
(b) The following references are still in effect;  
#1 EPA Regulation on Oil Pollution Prevention 131:0931  
#2 NFPA 30 Flammable and Combustible Liquids  
#3 NFPA 31 "Oil Burning Equipment" - 1978  
#4 NFGS 15611 "Fuel Oil Handling System" Aug 81  
#5 DM-22 Petroleum Fuel Facilities Aug 82  
#6 Code 403 memo of 15 Feb 78 "Level Devices for Fuel Oil Storage Tanks"  
#7 Code 403 memo of 19 Jun 1981 "Revised Oil Spill Prevention and Control Criteria"  
#13 Code 403 memo Clarification of Spill Prevention Control Criteria - Minutes of 15 Dec 1978 meeting  
#15 OSHA Instruction 1910.106  
(c) The following references are cancelled:  
#8 NAVFAC ltr O4B/O4B3/RUT ser 84-127 "Underground Fuel Storage Tanks, Secondary Containment and Leak Detection" of 29 Oct 1984  
#9 Code 403 memo of 31 Jan 1985 "Underground POL Storage Tanks"  
#10 Code 403 memo of 14 Jun 1985 Underground Oil Storage Tanks, North Carolina Area  
#11 Code 403 memo for Code 09A21 of 1 Jul 1985 Underground Oil Storage Tanks, North Carolina Area  
#12 Code 403 memo of 3 Jul 1985 "New Waste Oil System Advisory"  
#14 Code 114 memo of 29 Jan 1986 "Underground Tank Design Guidance"

- Encl: (1) Underground Fuel and Waste Oil Storage Tank and Monitoring Well Sketches  
(2) Underground Tank Requirements and References

1. In accordance with reference (a), the following guidelines should be implemented immediately for underground oil tanks:

a. On all fuel and waste oil tanks  $\leq$  2500 gallons provide double wall fiberglass tanks with manual leak detector and no monitoring well or pit liner.

b. For tanks  $>$  2500 gallons with fuel oil provide single wall fiberglass tank, one or more monitor well plus pit liner where required and slope to well.

c. Waste oil tanks  $>$  2500 gallons-provide double wall fiberglass for underground with manual leak detector and no monitor well or liner. For above ground use single wall, diked and ground containment.

d. All North Carolina tanks near water wells and streams must meet special provisions of North Carolina regulations which require double walls plus pit liner for tank and double wall or single wall with liner for piping. The Mechanical Branch has draft copy of regulations. Until maps showing locations of wells are developed by Code 114 contact Jerry Harwood at 444-2930 for assistance in well locations.

(1) For Camp Lejeune put waste oil tank above ground where gravity drain can be provided from source to tank, otherwise use underground tanks.

(2) New River prefers underground waste oil tanks.

(3) Future designs at MCAS Cherry Point for waste oil disposal will provide a curbed drum containment area for manual disposal of used oils unless Cherry Point specifically describes an underground tank in their project submission. This curbed area will be provided with a normally closed gate valve for rain water release.

e. Iceland Fuel and Waste Oil Tanks: provide tanks above grade. Enclose tanks in a concrete spill basin of sufficient volume to contain the tank contents. Provide normally closed gate valve to release rain water.

f. Try to place hazardous waste above ground in single wall tank with impervious diked area. If this is not possible, use double wall tank with full liner underground and double wall piping. For extremely hazardous waste consult with Code 114 for exact requirements.

g. Otto fuel is hazardous waste.

h. Acids: Provide curbed concrete storage of drum concentrated acids for disposal of small amounts. Large amounts should be studied for method of storage. Dilute acids should be discharged through neutralization sink to sanitary through acid-resistant piping.

2. Enclosures (1) and (2) provide additional tank criteria in a composite format. Dwight Jenkins has a simplex binder containing references (b) and (c). This binder will be for filing and generating on-going changes for future underground tank requirements. If you have questions on interpretation of subject criteria, see Dwight.

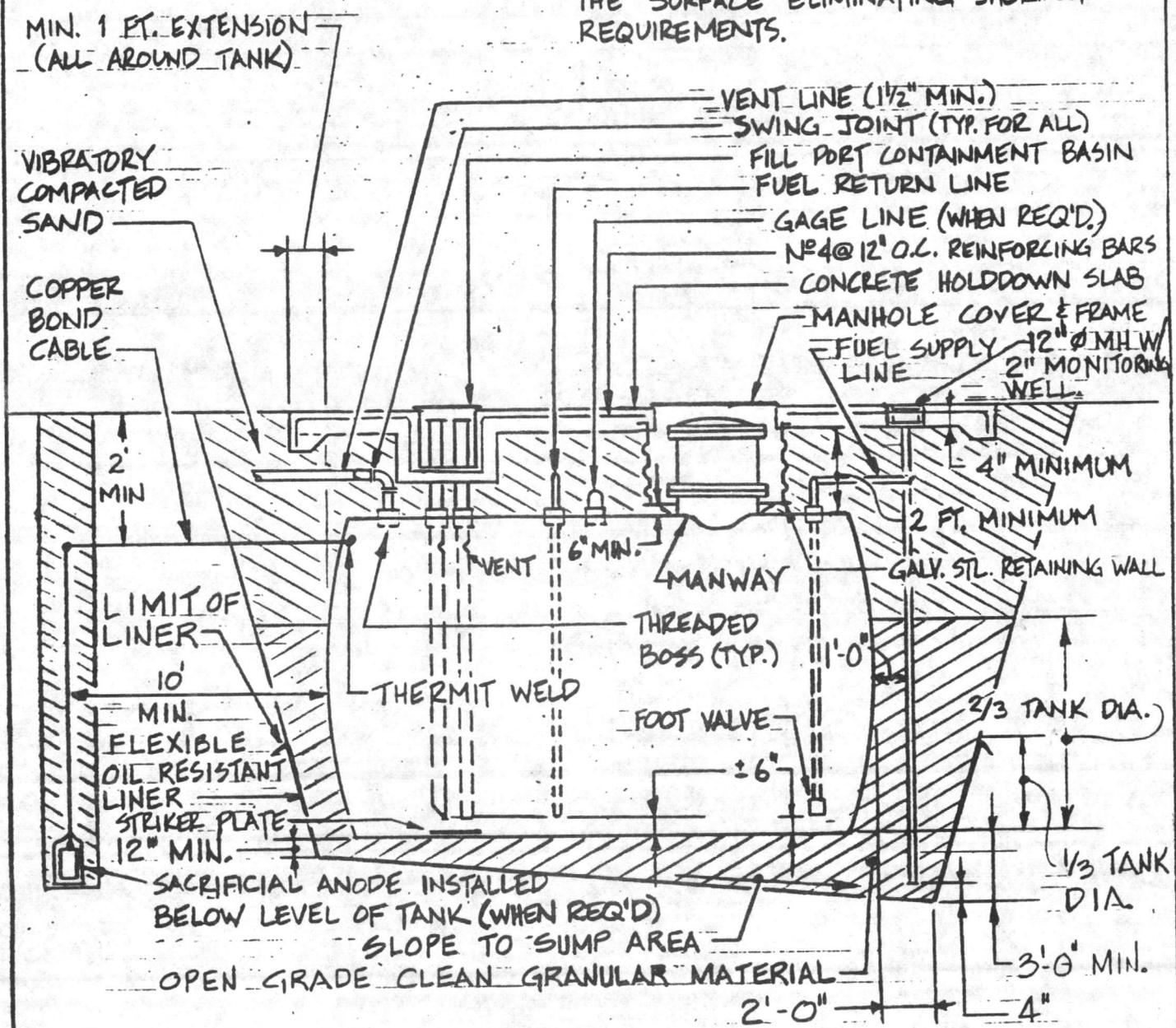


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TANK DETAILS APPLY ONLY TO MOGAS, DIESEL, & No. 1, 2, 3, & 4 HEATING FUELS

REFERENCE NFGS-15611 (AUG 1981)

NOTE: ALL WORK SHALL BE PERFORMED FROM THE SURFACE ELIMINATING SHORING REQUIREMENTS.



NOTE FOR DESIGNER:  
FLEXIBLE LINER IS REQUIRED IN AREAS WHERE WATER TABLE IS BELOW BOTTOM OF TANK.

NAVAL FACILITIES ENGINEERING COMMAND - ATLANTIC DIVISION  
UNDERGROUND OIL STORAGE TANKS  
(FOR NON-HEATED TANKS ABOVE 660 GALS. CAPACITY)

ENCLOSURE 101



**NOTES UNDERGROUND OIL STORAGE TANK DETAIL:**

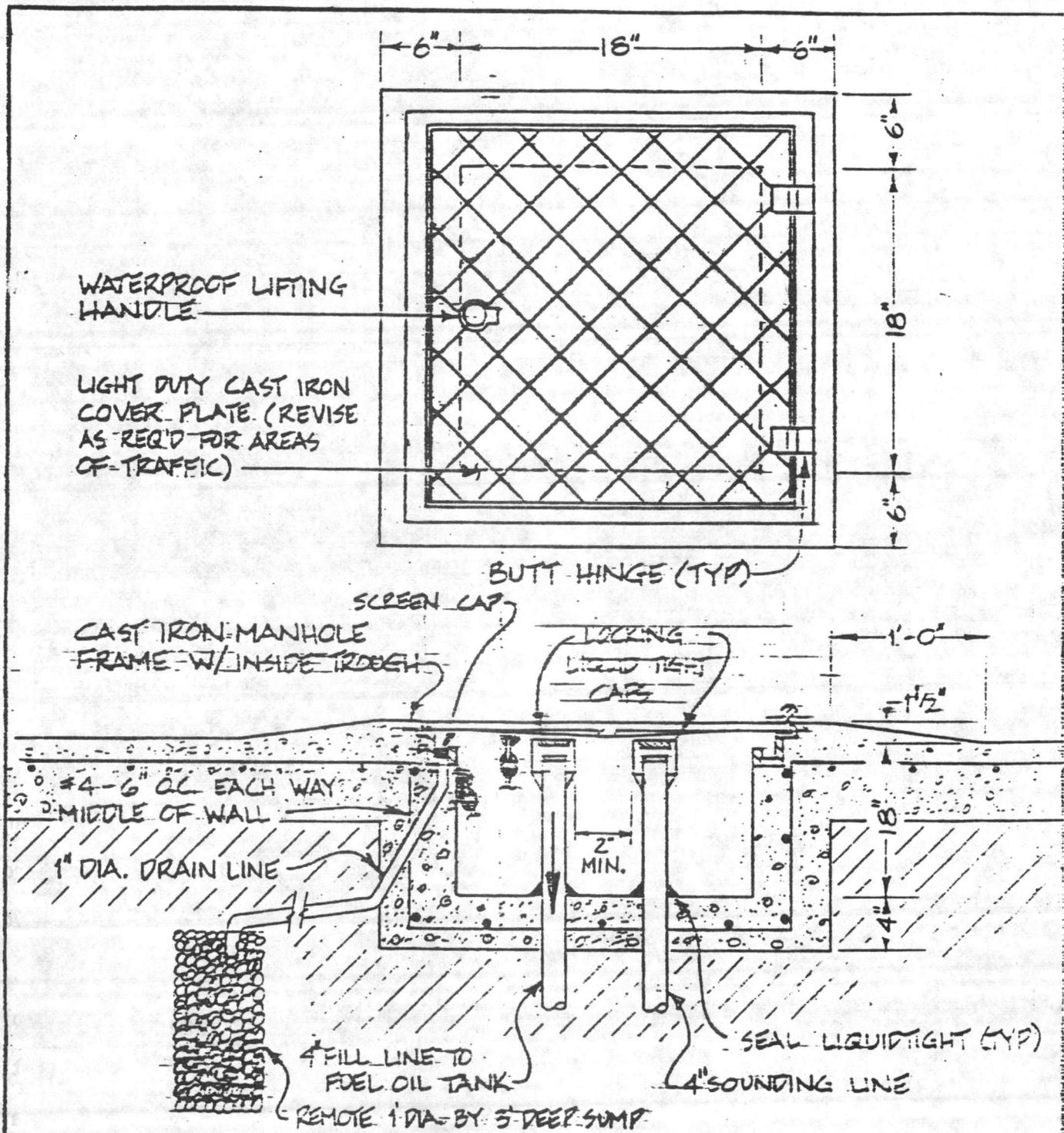
1. These drawings are to be used in conjunction NAVFACENGCOM Guide Spec 15611 dated August 1981 as a guide for underground tank installation. Normally, FRP tanks should be specified. If unusual conditions exist, (i.e. rocky areas, settlement problems, etc.) steel tanks should be specified. If steel tanks are specified, the need for cathodic protection for both the tanks and steel piping should be checked. Cathodic protection shall be designed in accordance with Section 3 of DM4.6 Lighting & Cathodic Protection.
2. The slab thickness shown is a minimum. The concrete slab is to be designed with a safety factor of 1.5 assuming empty tank buoyancy completely submerged below the water table. For calculations, use 100 lb/ft<sup>3</sup> for soil density and 150 lb/ft<sup>3</sup> for concrete density.
3. Frames and covers for manholes shall conform to RR-F-621, Figure 1, Size 22A for frame and Figure 8, Size 22A for cover in paved areas, and Figure 4, Size 22 for frame and Figure 12, Size 22 for cover in nonpaved areas. Frames and cover shall be factory coated with asphalt based paint.
4. On contract drawings provide tank capacity, tank diameter, tank length, fuel supply line size, fuel return line size, vent line size, slab thickness, manway size, manhole size, anode material, number of anodes, weight of anodes, and bond cable gage. Provide a whistle vent in an accessible location in the

vent line for tanks up to 10,000 gallon capacities.

5. Replace paragraph 3.1.11.2 with the following:

3.1.11.2 Underground Fuel Oil Tanks; tanks shall rest on a minimum of 6" of washed-in sandfill for steel tanks or 12" of washed in sandfill for fiberglass reinforced plastic tanks. Tank bottom shall slope toward one end at a slope of approximately 1 to 60. For tanks connected to recirculating systems, suction piping shall be located at the low end of the tank. For non-circulating systems, suction piping shall be located at the high end of the tank. Vent lines must slope toward the tank at a minimum slope of 2" in 10'. Tanks shall have a cover of earth of not less than 2', with all pipe connections at top of tank. Backfill for tanks shall be washed in sandfill and vibratory compacted sand. Backfill shall be well compacted, particularly under the tanks, in order to provide adequate support. Before placing tank into excavation, all foreign matter shall be cleaned from tank. Excavation shall be free from all materials that may cause damage to the tank or tank coating. Tanks shall be carefully lifted and slowly lowered into the ground. The tank shall be filled with product during backfilling with sand to avoid tank floating. The level of product should not exceed the level of backfilling. Contractor shall coordinate acquisition of government supplied product with the contracting officer. Under no circumstances shall lifting devices damage the tank or tank coating. Handle tanks during transportation in such a manner as to prevent damage to tank and protective coating.

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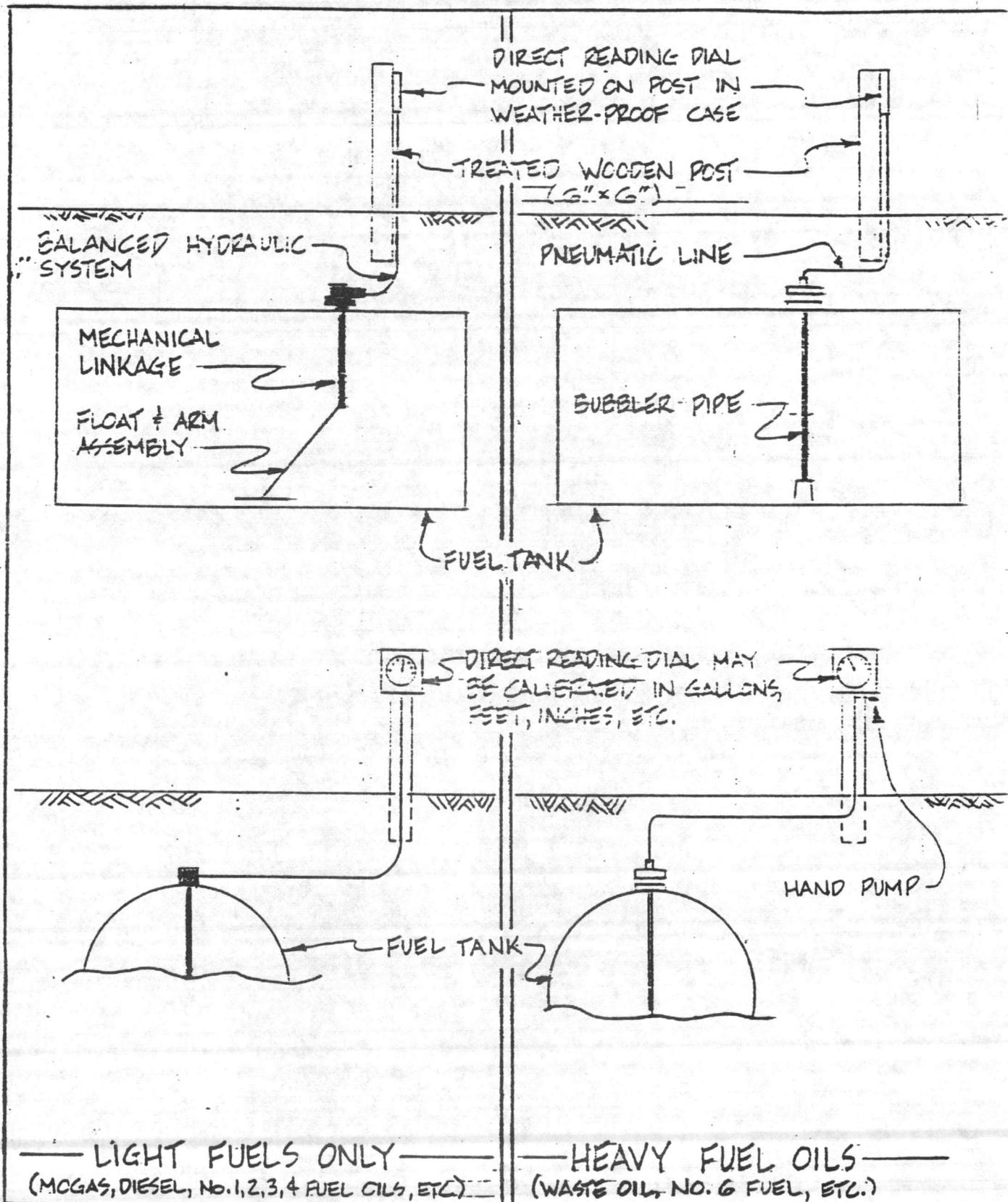


NOTES:

- 1- INSTALL FILL PORT AS HIGH AS POSSIBLE
- 2- MANHOLE FRAME & LID SHALL BE NEENAN MODEL R-6685-C OR EQUAL.

NAVAL FACILITIES ENGINEERING COMMAND - ATLANTIC DIVISION  
 FILL PORT CONTAINMENT BASIN  
 (FOR CAPACITIES ABOVE 660 GALS.)





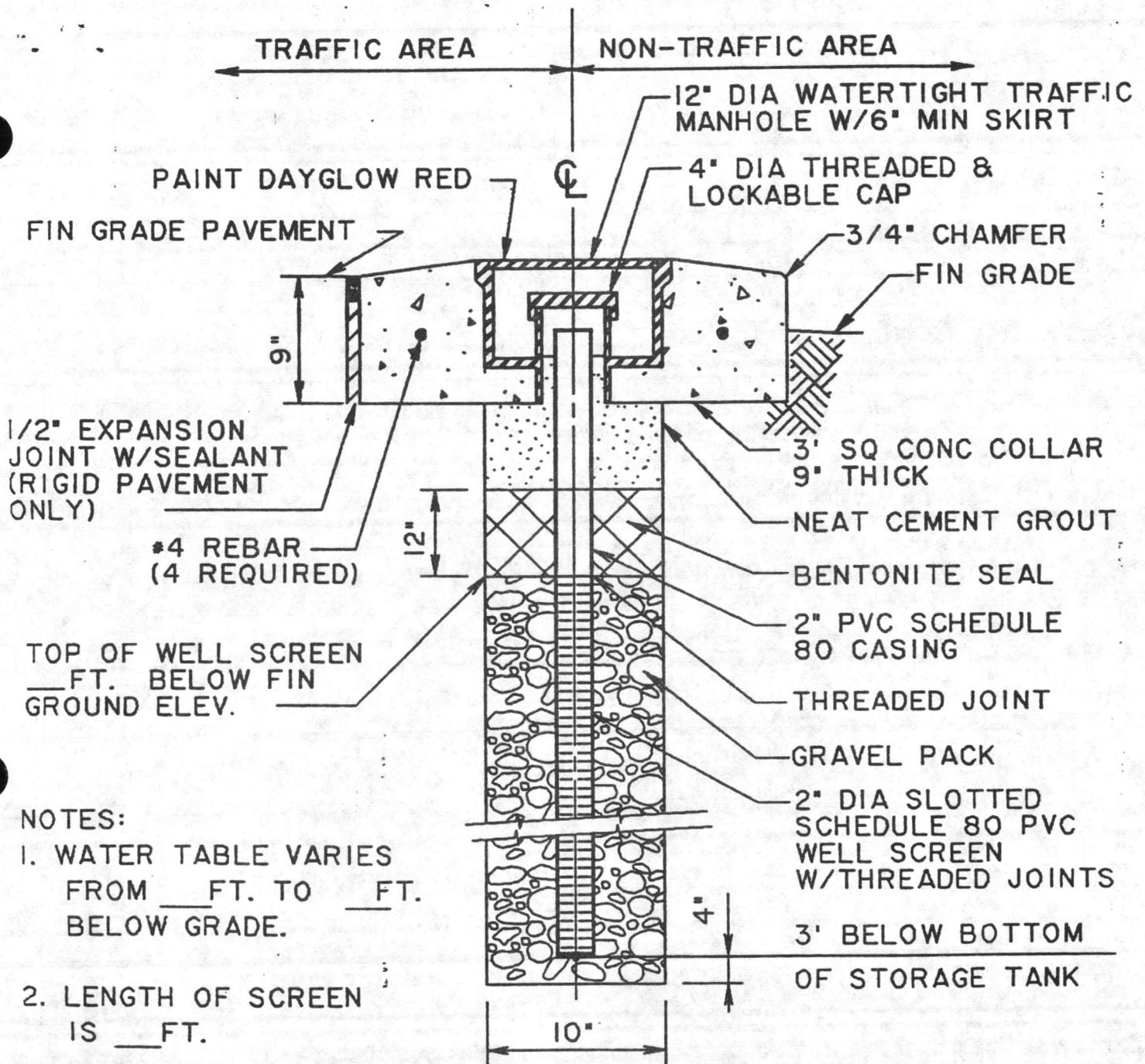
NOTE: FOR INSTALLATION OF UNDERGROUND FUEL TANKS - SEE SKETCH

NAVAL FACILITIES ENGINEERING COMMAND - ATLANTIC DIVISION

# FUEL LEVEL INDICATOR

(FOR CAPACITIES ABOVE 5000 GALS.)





NOTES:

1. WATER TABLE VARIES FROM \_\_\_ FT. TO \_\_\_ FT. BELOW GRADE.

2. LENGTH OF SCREEN IS \_\_\_ FT.

3. PROVIDE STAMPED METAL IDENTIFICATION PLATE, AFFIXED TO MANHOLE COVER, WITH THE FOLLOWING INFORMATION:
- 1.) DRILLING CONTRACTOR, NAME AND REGISTRATION NO.
  - 2.) DATE WELL COMPLETED
  - 3.) TOTAL DEPTH OF WELL
  - 4.) DEPTH TO SCREENS
  - 5.) A NOTE SAYING 'WELL IS FOR MONITORING AND IS NOT CONSIDERED SAFE FOR DRINKING'.

# U.G. FUEL STORAGE TANK MONITORING WELL

NTS

NOTE: FOR NOTES TO DESIGNER SEE SHEET 2 OF 2.

ENCLOSURE  
SHEET 1 OF 2



1E  
1E  
1E  
1C  
1C

1E  
1C  
1E  
1A



# U.G. FUEL STORAGE TANK MONITORING WELL

## NOTES TO DESIGNER

1. LOCATE TOP OF WELL SCREEN ABOVE THE MEAN SEASONAL WATER TABLE ELEVATION. DETERMINE WATER TABLE ELEVATION FROM SOIL BORING LOGS AND INSERT THE TOP OF WELL SCREEN DEPTH BELOW FINISHED GROUND ON THE MONITORING WELL DETAIL.
2. A FLEXIBLE OIL RESISTANT LINER IS REQUIRED IN AREAS THE WATER TABLE IS BELOW THE BOTTON OF THE FUEL TANK.
3. WHEN MORE THAN ONE FUEL TANK IS PROVIDED, PROVIDE A MONITORING WELL AT SUMP AREA OF EACH TANK.
4. WHEN MONITORING WELL IS TO BE PROVIDED AT EXISTING FUEL TANK LOCATIONS:
  - A. SINGLE TANK LOCATIONS: PROVIDE A MONITORING WELL AT EACH END OF THE TANK.
  - B. MULTIPLE TANK LOCATIONS: PROVIDE A MONITORING WELL AT TWO DIAGONAL CORNERS.
  - C. MONITORING WELL SHALL EXTEND 25 FEET BELOW FINISHED GRADE.
5. GRAVEL PACK IN NEW TANK LOCATIONS SHALL BE OPEN GRADED CLEAN GRANULAR MATERIAL REQUIRED FOR TANK BEDDING. GRAVEL PACK IN EXISTING TANK LOCATIONS IS DEFINED IN THE MONITORING WELL SPECIFICATION. SCREEN OPENING SHALL BE DESIGNED FOR GRAVEL PACK PROVIDED.
6. INCLUDE THE FOLLOWING NOTE ON EXISTING FUEL TANK DESIGNS REQUIRING A MONITORING WELL. CONTRACTOR SHALL VERIFY EXACT LOCATION OF THE EXISTING TANK AND SURROUNDING UTILITIES PRIOR TO DRILLING WELL.
7. PROVIDE A MONITORING WELL LOCATION POST IN NON TRAFFIC AREAS WHERE THE WELL WILL BE HARD TO FIND OR PRESENT A HAZARD.



## UNDERGROUND TANK REQUIREMENTS

### Level Indication

- 660-10,000 gallon capacity: Provide a whistle vent alarm that is audible at fill station (Ref #7)
- 10,000 gallon capacity and up (Ref #7); 5,000 gallon capacity and up filled by tank truck (Ref #13, Ref #6); any waste oil tank (Ref #13, Ref #7): provide continuous, direct readout, non-whistle type level indicators with display convenient to fill attendant.

### Fill Port Containment Basin

- Provide the basin on fuel tanks above 660 gallons (Ref #7)
- All waste oil tanks shall have the basin (Ref #7)

### Manhole and Extension Neck

- 1,000 gallons to 12,000 gallon capacity 30" manhole (Ref #4 and #5)  
(Note: Standard manhole sizes on fiberglass tanks are 22", 30" and 36")
- 12,000 gallon capacity and up 36" manhole (Ref #4 and #5)

### Tank Cover

- Non-Traffic Areas: 2' of earth or 1' of earth with a 4" thick reinforced slab (Ref #2 and #3)
- Traffic Areas: 3' of earth or 18" of earth with either a 6" thick reinforced slab or 8" asphaltic concrete (Ref #2 and #3)
- Hold down slabs shall extend 1' from the tank outline (Ref #2 and #3)

### Tank Clearances

- Distance from tank to property line or building wall must be greater than 1' (Ref #2, #3, and #15)
- Minimum distance from tank to property line for Class I storage is 3'  
<sup>#2</sup>  
(Ref #2)
- Minimum distance between adjacent underground tank shells is 3' (Ref #5)
- Minimum distance between adjacent building or property line and underground tank (except pumping facilities) is 10' (Ref #5)
- Minimum distance from regularly traveled roads or highways to an underground tank is 25' (Ref #5)

- Minimum distance from electrical power transmission and distribution lines to an underground tank is 50' (Ref #5)
- Minimum distance from main railroad tracks carrying through traffic to an underground tank is 100' (Ref #5)

#### Tank Piping and Connections

- All piping shall enter tank on the top (Ref #3)
- All piping other than straight fill and sounding lines shall have double swing joints, ANSI listed flexible hose or shall be arranged to permit movement of tanks (Ref #3 and #4)
- All pipe connections to steel tanks shall be made with Dielectric Unions (Ref #4)
- Submerge fill pipe to within 6" of tank bottom (Ref #5)
- Fill pipes shall have a tight metal cover (Ref #3)
- Fill pipes shall have a removable strainer (Ref #4)
- Tanks for Class I liquids over 1,000 gallon capacity shall be equipped with a tight fill device for connecting the fill hose to the tank (Ref #2)

- The sounding line shall have a vapor tight cap (Ref #2 and #4)
- Provide a sounding line with stilling well to within 3" of the tank bottom (Ref #5)
- Pump suction lines shall extend to within 6" of the tank bottom (Ref #4)
- Oil supply piping shall pitch toward the tank without traps (Ref #3)
- Vent piping shall connect at high end of tank (Ref #4)
- For circulating systems suction piping shall be at the lower end of the tank (Ref #5)
- For non-recirculating systems suction piping shall be at the high end of the tank (Ref #5)
- Vent piping shall drain towards the tank (Ref #3)
- Outer ends of the vent piping shall terminate in a weatherproof fitting (Ref #3)
- Vent pipes shall be sized per table 2-1 of NFPA 31 (Ref #3)
- Vent pipe slope shall not be less than 2" in 10' (Ref #5)

## Tank Installation

- Welded steel tanks shall conform to UL 58 (Ref #5)
- FRP tanks shall be UL listed and comply with Mil Spec Mil-T-52777 (Ref #5)
- Steel tanks shall be coated by (a) epoxy coal tar, Steel Tank Institute STI-P3 system; (b) coal tar primer and enamel in accordance with NAVFAC TS-15057; (c) factory applied FRP coating (Ref #5)
- Provide a 12"x12"x1/4" striker plate below the fill and sounding line (aluminum laminated for fiberglass tanks and steel plates for steel tanks) Ref #4)
- Tanks shall slope to one end at a 1 in 60 slope (Ref #5)
- Tanks shall be a minimum 5,000 gallon capacity for auto filling stations (Ref #5)
- Cathodic protection shall be provided for steel tanks in accordance with DM-4.6 Section 3 (Ref #5)
- Tanks shall be surrounded with a minimum of 6" inert material (Ref #2)

14

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