OVERVIEW

- Unified Facilities Criteria and ASTs
- New Features
- Tank Sizing & Layout
- Drawing Excerpts
- Tank Bottom & Roof
- Dike Area
- Questions
DoD Fuels Facilities Documents

- Unified Facility Criteria (UFCs)
  - Authoritative, mandatory unless waived by Service HQ

- Standard Designs (Std Dsn)
  - Starting point for design, edited for site adapt
    - Engineering Design is still needed
  - Identifies preferences and design choices
    - Includes designer notes
    - Lists which UFGS to be used
  - Major Deviations require Service HQ approval

- Unified Facilities Guide Specifications (UFGS)
  - Edited for the job
  - Designer choices in brackets
Unified Facilities Criteria (UFC)

- UFC 3-460-01 Design: Petroleum Fuels Facilities
  - Guidance for all new design and construction

- Chapter 2 – General Design Information
  - Fire protection, Safety
  - Environmental
  - Electrical Design & Area Classifications
  - Security
  - Emergency shutdown
Unified Facilities Criteria (UFC)

- Chapter 8 – Atmospheric Tanks
  - Tank Spacing
  - ASTs, vertical, horizontal,
  - USTs
  - Diking, spill containment
  - Vapor Emission Control systems
  - Tank Roofs, floating pans
  - Foundations, tank bottoms
  - Appurtenances
  - General Design Considerations

- Follows/directs use of NFPA 30, 30A
- Directs use of DoD Standard Design AW 78-24-27
DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS
FEBRUARY 2015

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AST Standard Design

- Vertical Steel Tanks in JP-5 or JP-8/F-24 Service
  - Can be used for other products
- For >5K, <100K BBL Vertical ASTs
- Fixed roof, floating pan
  - Considerations given for tanks w/o pans

- For new construction, but can be used for renovations
- Elevated and non-elevated foundations
  - Areas with/without high water tables
- Requires design in accordance with API 650
- For CONUS and OCONUS
History & Current Status

- Original Design in mid 80’s

- Update in Feb 1993
  - Shop drawing detailed
  - Only included Tank, not site layout

- Last Update Published in 2012
  - Rely more on API 650, prescribe government preferences

- Current Update 2015
  - Includes piping/dike details

- Will post to USACOE Std Dsn website
AST Standard Design

- Has sidestream filtration option
  - Fuel polishing, water drawoff

- Incorporates DLA ATG policy for gauge wells
  - Fuel level and water detection

- Includes 2 sheets designer notes
  - Use in corrosive and northern environments
  - Tank sizing and site planning
  - Foundation options
  - Tanks without floating pans
AST Standard Design

- Useable Volumes
- High/Low Level Control & Shutoff Logic
- Roof Structure, Compression Ring
  - Single column for diameters $126 \text{ ft} > D > 91 \text{ ft}$
  - No columns for diameters $< 91 \text{ ft}$
- UFC 3-460-01 Was Updated To Resolve Conflicts.
AST Standards Additions

- Typical Site Plans
- Piping Layout Plan
- Containment System Details
- Stairway Details
- Misc Piping Details
- Pipe Support Details
- Typical Electrical Details
Typical Site Plan – Vertical Containment Walls

DESIGN NOTES:
1. SITE PLAN SHOWN IS A TYPICAL 30K BBL TANK WITHOUT AN ELEVATED TANK FOUNTION. DIMENSIONS SHOWN IN TABLE 1 ARE FOR PLANNING PURPOSES ONLY AND ARE INTENDED TO ILLUSTRATE THE APPROPRIATE SIZE OF WALLS NEEDED FOR SECONDARY CONTAINMENT.
2. FOR PLANNING PURPOSES, THE SECONDARY CONTAINMENT AREA SIZE SHOWN IS BASED UPON A 15'-0" MAXIMUM ALLOWABLE HEIGH/VERTICAL CONFINEMENT WALLS, INCLUDING 1/2" OF FREEBOARD WITH A WALL THICKNESS OF 5'-1".
3. Groups of tanks with no tank larger than 15K BBL and not exceeding 10K BBL in aggregate capacity may be considered as a single site containment system. Secondary back-dike containment is required if any tank exceeds 15K BBL in aggregate capacity. See Table 1 for intermediate walls.
4. The maximum allowable wall height is 15'-0", SFC 3-2941.17 requires a minimum of 15'-0" of freeboard. Vertical, concrete containment walls are an acceptable alternative when these are not required by available for that site or local ordinance. Secondary containment area design shall comply with UCF 3-201, 29 CFR 1910, 30 CFR 30, and other federal, state, county, and local regulations.
5. NO VEHICLE ACCESS IS PERMITTED WHEN VERTICAL, DICE WALLS ARE UTILIZED.
6. SECONDARY CONTAINMENT SHALL BE PROVIDED BY A FUEL-INHIBITING LINER. THE LINER SHOULD BE A FLEXIBLE MEMBRANE FOR USE IN CONCRETE FOOTWALLS AS DESCRIBED IN SESSION 25-55 OF THE FUEL, INHIBITING LINER SYSTEM. A 15'-0" HIGH FLEXIBLE VINYL LINER USED MAY BE USED IF IT IS COMPLETELY COVERED WITH CONCRETE. MATERIAL NEEDS TO BE PROVIDED TO PREVENT any LINING DAMAGE TO THE WALL. BALACLAVA MATERIAL SHAL BE COVERED WITH A CONCRETE "INHIBITING LINER" SHAL BE 5'-1" THICK AND LOCATED NO LESS THAN 15'-0" FROM THE TANK. SEE TABLE 1 FOR DETAILS.
7. CONCRETE SLAB SURFACING AND BAGS MAY BE USED TO COMPLETELY FLATTEN THE DICE WALL. THE CONCRETE SLAB SHALL BE RECOMMENDED FOR CONCRETE SURFACE CONCERNED WITH CONCRETE. LOCATE CONCRETE BAGS NO LESS THAN 15'-0" APART AND LOCATE TANK TOPIZATION NO LESS THAN 15'-0" FROM THE TANK. SEE TABLE 1 FOR DETAILS.
8. SLOPE DICE WALL CMK SURFACES A MINIMUM OF 1% FOR DRAINAGE. DRAINAGE SWALES SHOULD BE SLOPED NO FLATTER THAN 1%. THE DRAINAGE SWALE, SEE SHEET C-08, FOR DRAINAGE DRAIN DETAILS.
9. PROVIDE STEEL STAIRWAYS OVER THE DICE WALLS. NO LESS THAN TWO DICE STAIRWAYS SHALL BE PROVIDED OVER THE DICE WALLS FOR EMERGENCY ESCAPE. SEE DETAIL ON SHEET C-08.
Non-Mounded Tank

Add photo of non-mounded tank
Mounded Tank
<table>
<thead>
<tr>
<th>NOMINAL TANK SIZE (KBBL)*</th>
<th>NOMINAL DIAMETER (FT)</th>
<th>NOMINAL SHELL HEIGHT (FT)*</th>
<th>FLOWRATE FILL/ISSUE (GPM)</th>
<th>NOZZLE SIZE FILL/ISSUE (INCHES)</th>
<th>SHELL VOLUME (KBBL)***</th>
<th>USABLE VOLUME (KBBL)</th>
<th>LILLA VOLUME (BBL)**</th>
<th>SECONDARY CONTAINMENT</th>
<th>DIMENSIONS</th>
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* NOMINAL TANK SIZE = APPROXIMATE USABLE VOLUME = VOLUME FROM LLA TO HLA.
** APPROXIMATE VOLUME BETWEEN SUMP AND LILLA.
*** SHELL VOLUME = VOLUME INSIDE ALL OF THE SHELL.

GRAPHIC SCALE
1. See designer notes, sequence of operation, and level set point table for level switches and hyl set point elevations.

2. Provide a water drain-off system as an option, provide in addition a Section 3 filtration system.

3. Provide level switches on the tank fill line, drain, tank issue line, drain, and hyl, as an option, provide drain listed here with motor operators with limit switches (only when approved by service Headquarters). Hyl remains its limit switch in this case.

4. Hyl and hyls chambers and level controls, float chamber shall share common tank modules as indicated on details, they are shown separated here for clarity. Maintain piping and tubing to hyl chamber and float chamber along the side of the cylindrical, prior to hooking up the tank shell.

5. Heat trace in cold climates check.

6. If Section 3 filtration system is not provided, provide outlet indicated with blue flange.

7. If Section 3 filtration system is provided, produce a suction hose to connect filter/separators drain to product tank to allow the filter/separators to be pumped down and emptied.

8. Operation full fill levels shall be determined by the user after the tank is in service.

Fuel Storage Tank Diagram

Scale: None
NOTES:
1. SYSTEM SHALL BE FACTORY ASSEMBLED, SKID MOUNTED, FACTORY RUN.
2. PROVIDE ONLY CLASS 1, DIVISION 1, RATED ELECTRICAL COMPONENTS.
3. HEAT TRACE DRAIN PIPING (AND SLOW FILL PIPING TO FIRST VALVE) IN COLD CLIMATES.
4. PIPING ARRANGEMENT SHOWN IS CONCEPTUAL ONLY.
5. COORDINATE LOCATION OF CONCRETE HOUSEKEEPING PAD WITH PAVING JOINTS TO PREVENT CRACKING.

OPTIONAL SIDESTREAM FILTERATION SYSTEM

SCALE: 1/2"=1'-0"
NOTES:

1. See nozzle equipment schedule on sheet 5.02 for size, elevation and orientation of nozzles and appurtenances.
2. Provide guardrail all around perimeter of roof except at stairway top platform.
3. Provide 6" x 1" opening in intermediate landing for piping and conduit.
4. Lap roof plate seams to shed water (inner plates on top).
5. See level set-point table A3.01 for elevations of alarms and controls.
6. Batters not shown for clarity.
7. Space internal pipe supports for interior pipe support A4.02.
8. Provide a roof with slope between 1 1/2:12 and 2:12,
NOTES:
1. 10K BBL TANK IS SHOWN. OTHER TANK SIZES ARE SIMILAR.
2. TANK BOTTOM FOUNDATION SEAL FOR ANCHORED TANK SHOWN.

ELEVATED RINGWALL
SCALE: 1"=1'-0"
NOTES:
1. 10 KBBL TANK IS SHOWN. OTHER TANK SIZES ARE SIMILAR.
2. TANK BOTTOM FOUNDATION SEAL FOR ANCHORED TANK SHOWN.

NON-ELEVATED RINGWALL

SCALE: 1"=1'-0"

GRAPHIC SCALE(S):

1/2"=1'-0"

1'=1'-0"

0'-0"

2'=1'-0"

1'-0"

3'=1'-0"
UFGS 33 56 63 Fuel Impermeable Liner System

- Flexible Membrane Liner (FML) or
- 60 Mil HDPE Liner
  - NOT Concrete Surface
  - NOT Clay / Bentonite

- Non-Woven Geotextile (Protective Layer)
- Walkway Materials (Slip-Resistant)
- Ballast Materials
  - Concrete
  - Gravel (River Rock)
  - Sand Tubes
  - Precast Concrete Block
Flexible Membrane Liner

- 30 mil Reinforced Liner with a 7.5 oz/sq yd Base Fabric Material
- Can be Exposed (with Ballast Material)
  - Wind Uplift Calculations are Required
  - Walkways are Required
HDPE Liner

- Non-Reinforced 60 mil High Density Polyethylene
- Susceptible to Thermal Expansion and Degradation from UV light
- Must be Completely Covered (Concrete or Gravel)
- Biggest Advantage is Economics
HDPE Liner
Liner Joints and Testing
Typical Dike Area Joint Layout Plan

1. Joint layout panels should be as close to square as possible with a maximum joint spacing of 10 feet.
2. Expansion joints shall be placed around the tank foundation at the dike footings. On each side of the concrete stairways, at the area inlet, and at the quarter sections of the basin, as indicated.
3. Odd shaped panels shall be reinforced with WWF.
4. Spot elevations shall be provided at the locations indicated and at other applicable changes of grade points.
5. The top of the tank foundation shall be one foot above the containment basin, as indicated.
6. Provide positive drainage away from the tank foundation perimeter.
7. Project specifications shall use UFGS 32 15 20 concrete pavement for containment dams.

 drewed by: Lt. Col. R. C. cronin

DESIGNER NOTES:

JOINT DETAIL A

JOINT DETAIL B

TYPICAL CONCRETE JOINT LAYOUT PLAN

SCALE: 1" = 10' 0"

LEGEND:
- Contraction joint
- Expansion joint
- Drainage joint
- Reinforced concrete
- Flow direction
- Spot elevation
Concrete Surfacing

- UFGS 32 13 15.20 Concrete Pavement for Containment Dikes
- 10’ Maximum Joint Spacing
- Synthetic Fiber Reinforcement
- Steel Reinforcement Discontinuous at Joints
- NOT Considered a Fuel Impermeable System on it’s Own
Concrete Dikes
Dike Details – Concrete Surfaced

**Typical Section - Spill Containment Dikes**

**General Notes:**

1. All concrete shall be reinforced with synthetic fiber reinforcement. Additional steel reinforcement shall be provided, where indicated on the joint layout plan. See specifications section 32.13.2 for concrete pavement for containment dikes for concrete and reinforcement requirements.

2. Provide a geonemembrane boot for all circular geonemembrane penetrations. All small liner penetrations shall be circular to accommodate a boot seal.

3. All joints shall be sealed per specifications section 32.13.18 for field molded sealants for sealing joints in fore pavements. See section 8.2 for the joint layout plan.

4. A geonemembrane shall be installed below and above the geonemembrane. See specification section 32.13.83 for fuel impermeable liner system. The geonemembrane and geonemembrane shall be protected from damage at all times, as specified.

5. The surface underlying the geonemembrane shall be smooth and free of rocks larger than 3 inch in diameter or any other material which could damage the geonemembrane liner.

6. Geonemembrane anchorage / geonemembrane strip materials and installation shall be as recommended by the manufacturer of the geonemembrane.

**Typical Liner Section**

**Dikes Interior and Basin (W/Liner)**

**Dike Exterior (W/O Liner)**

**Designer Notes:**

1. The geonemembrane layers are provided to protect the geonemembrane during and after construction. The bottom geonemembrane layer may be omitted if the subgrade soil is known to be free of rocks or other materials that could potentially damage the geonemembrane.
Walkway / Sand Tubes
Liner Fastening Details

**Typical Geomembrane Termination Detail - Existing Structure**

- Concrete Structure (i.e. Tank Footing)
- Geomembrane Anchor
- Aggregate Surfacings
- Geotextile
- Geomembrane

**Typical Geomembrane Termination Detail - New Structure**

- Concrete Structure (i.e. Tank Footing)
- Continuous Geomembrane Insert
- Extrusion Weld
- Geotextile
- Geomembrane

**Designer Notes**

1. The geotextile layers are provided to protect the geomembrane during and after construction. The bottom geotextile layer may be omitted if the subgrade soil is known to be free of rocks or other materials that could potentially damage the geomembrane.
Liner Termination Details

CONCRETE STRUCTURE (I.E. TANK FOOTING)

FUEL RESISTANT SEALANT

3/8" x 2" ALUMINUM OR 1/4" x 2"
SS STRIP W/ SLOTTED HOLES

3/8" SS EXPANSION ANCHOR
@ 12" O.C.

SS WASHER & NUT

3/8" X 2" NITRILE GASKETS

GEOMEMBRANE

NOTE: VARIANCES TO THIS DETAIL MAY BE MADE WHEN
RECOMMENDED BY THE GEOMEMBRANE MANUFACTURER.

TYPICAL GEOMEMBRANE TERMINATION DETAIL - EXISTING STRUCTURE

SCALE: NONE

CD.05  CD.05

TYPICAL GEOMEMBRANE TERMINATION DETAIL - NEW STRUCTURE

SCALE: NONE

CONTINUOUS GEOMEMBRANE INSERT

EXTRUSION WELD

NOTE: GEOMEMBRANE INSERT TO BE MANUFACTURER'S STANDARD
Embed Strips
Steel Stairway Details

- W-19.4 (1½ x 3½) STEEL METAL BAR GRATING
- 1½" O.D. POST FOR FIRE RAIL (TYP)
- CNX 13.4
- GRATING SPAN
- DKE WALL BELOW
- T32 x 4.5 (TYP)

**Steel Stair Plan**

- ROUND EDGE
- BASE PLATE SEE DETAIL
- 1" GRAB (TYP)
- 4" x 1½ TOEPATE
- W-19.4 (1½ x 3½) STEEL METAL BAR GRATING TREAD, 11" x 2½, WELD OR BOLT TO STRINGERS
- ½" THICK BASE PLATE WELDED TO HANDRAIL & BOLTED TO STRINGER (TYP)
- ⅝" DIA. CAST-IN-PLACE ANCHOR BOLT, EMERGED (TYP)
- CONCRETE SLAB ON GRADE FOR DRE BASE
- THICKEN SLAB AT DKE BASE PLATES (TYP)

**Section 1**

- SCALE: NONE
- C.D. 00-04
- 11½ "w x 10" ¼ x 1½" Thk

**Section 2**

- SCALE: NONE
- C.D. 00-05
- 2½" ¼ x 2½" Thk

**Section 3**

- SCALE: NONE
- C.D. 00-06
- 2½" ¼ x 2½" Thk

**Notes:**

1. METAL GRATING FOR LANDINGS AND STAIR TREADS SHALL BE W-19.4, WITH BAR WELDS AS INDICATED. TREADS AND LANDINGS SHALL HAVE CHECKED PLATE NOSING. GRATING SHALL BE ANCHORED WITH ½" DIA. CAST-IN-PLACE ANCHOR BOLT, EMBEDDED IN CONCRETE. ALL BOLTS SHALL BE BANDED. TREADS SHALL BE FABRICATED WITH GARNER PLATES AT ENDS.

2. ALL GRATINGS, HANDRAILS, STRINGERS, ANGLES, PLATES AND BOLTS FOR STAIRS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123.
Basin Floor Penetration Detail

NOTE: FOR PIPES 2" IN DIAMETER OR LESS, SEE DETAIL ON SHEET CD.01.

BASIN FLOOR LARGE PIPE PENETRATION DETAIL

SCALE: NONE
Containment Wall Penetration Detail

CONCRETE WALL PENETRATION DETAIL

SCALE: NONE
Containment Wall Penetration
Containment Wall Control Joint
Inlet Section

WEEP DRAIN (2 EA), 1-1/2" DIA. HDPE WITH END CAP. BLANKET WITH GEOTEXTILE PRIOR TO PLACEMENT OF ROCK BALLAST

1/2" PERFORATIONS, 1" O.C.

GRATE AND FRAME

#4 @ 12" O.C. EACHWAY

EXTRUSION WELD

ROCK BALLAST GEOTEXTILE FUEL IMPERMEABLE GEOMEMBRANE LINER GEOTEXTILE

(2) - #5 x 1'-0" AROUND PIPE

SLEEVE W/ WATERSTOP

DIP

NITRILE BOOT SEAL W/ SS CLAMPS

SEGMENTED ELASTOMERIC SEAL (TYP OF 2)

6" NITRILE WATERSTOP (TYP. ALL SIDES)

8" 19 1/2" 8"

35 1/2"

(2) - #4 EACH WAY
Precast Inlet
Containment Drain Valve Detail

NOTE: 100% PORT ECCENTRIC PLUG VALVE SHALL CONFORM TO AWWA C517 AND BE RESISTANT TO HYDROCARBONS (NITRILE RUBBER SEALS). GEAR ACTUATOR BOX WITH HANDWHEEL SHALL BE LOCKABLE.
Typical Piping Layout

DESIGNER NOTES:

1. LOCATION AND CONFIGURATION SHOWN FOR PIPING IS GENERAL AND IS NOT INTENDED TO LIMIT OR RESTRICT PIPING LOCATION, CONFIGURATION OR PIPE SUPPORT ARRANGEMENT.

2. PIPE SUPPORT TYPES SHOWN ARE TYPICAL. IN GENERAL, WITHIN CONTAINMENT UNIT THE FIRST SUPPORT IS AN ANCHOR SUPPORT. USE OF AN ADJUSTABLE PIPE SADDLE SUPPORT (SEE SHEET CD-1) OR PIPING SUPPORT (SEE SHEETS CD-12 & CD-13) IS COMMON. ON THE PEAK OF THE DOME USE OF A GUIDED SUPPORT (SEE SHEETS CD-12 & CD-13) IS COMMON. ACTUAL PIPE LAYOUT, SITE CONDITIONS, RESULTS OF PIPING STRESS ANALYSES, AND HYDRAULIC TRANSIENT ANALYSIS SHALL DICTATE ACTUAL SUPPORT TYPES AND LOCATIONS.

3. PROVIDE BALL JOINTS. BALL JOINTS MAY BE USED IN EXTREME NORTHERN CLIMATES (BUT ABARAN PROVIDES SUBARZER SEAL). MATERIALS FOR LOW TEMPERATURES ARE SPECIFIED. A PAIR OF BALL JOINTS SHOULD BE PLACED INTO THE PIPING RUN AND SHALL BE A MINIMUM OF 1' APART. PLACE A THIRD BALL JOINT IN THE PIPING RUN SUCH THAT LINEAR MOVEMENT FROM THE PIPING WITH THE TWO BALL JOINTS CONNECTED IS NOT ALLOWED. A BALL JOINT SETTEE SHALL BE MOUNTED IN PIPING RUNNING PERPENDICULAR TO THE PIPING WITH THE TWO BALL JOINTS SEPARATED BY 90°. SEE FLEXIBLE BALL JOINT DETAIL ON SHEET CD-11.

4. AT LOCATIONS EXPERIENCING FREEZING CONDITIONS, ALL DRUM PIPING ON THE PRODUCT SIDE TANK AND TANK SEPARATOR, IF EXIST, SHALL BE INSULATED WITH APPROPRIATE HAZARD RATED TAPE AND INSULATION.

5. LOCATE EXTERIOR PIPING SUPPORTS TO PROVIDE ADEQUATE PIPE FLEXIBILITY FOR TANK SETTLEMENT. SEismic DESIGN AND THERMAL EXPANSION EXCEPT FOR THE FIRST PIPE SUPPORT OF THE TANK SHELL, SPRING PIPING SUPPORTS MAY BE USED IN HIGH SEISMIC AREAS AS DIRECTED BY SERVICE HEADQUARTERS. SEE DETAIL ON SHEET CD-13.

6. ALL FUEL PIPING SHALL BE ABOVE GRADE. ONLY ISSUE PIPING IS ALLOWED TO RUN THROUGH EXHAUST CHIMNEYS. FACILITY REQUIREMENTS FOR PROTECTION, VANDALISM, EARTHQUAKE DAMAGE, FIRE PROTECTION, ETC. MAY REQUIRE UNDERGROUND PIPING.

7. PENETRATION THROUGH DIKE WALLS SHALL BE MADE THROUGH PIPE SLEEVES WITH BUSHING COMPRESSION SEALS. SLEEVES SHALL BE PROVIDED WITH LEAK TESTING CAPABILITY. SEE SHEET CD-13.

8. PENETRATION THROUGH THE FIN SHAL BE MADE WITH A BACK MADE BY THE MANUFACTURER OF THE FIN FOR THAT PURPOSE AND SEALED TO THE PENETRATION SLEEVE. SEE CD-15.

9. ALL LOCATIONS SUBJECT TO ICE AND SNOW, ORIENT STAIRWAYS AND HIGH LEVELED PIPING TO RECEIVE WINTER SUN SO AS TO MELT ACCUMULATIONS. IF PENETRATION AT TANK IS NOT BELOW A STANDPIPE, PROVIDE ICE SHELVES OVER PRODUCT PIPING AND VALVES AT TANK. ENSURE ICE SHELVES HAVE SUITABLE CLEARANCE ABOVE VALVES TO ALLOW MAINTENANCE OF VALVES AND VALVE OPERATIONS OR PROVIDE MEANS TO MOVE SHELVES OUT OF THE WAY AND PROVIDE CAMPLINES OVER OTHER VALVES AND EQUIPMENT.

10. WHEN THE TANK FOUNDATION IS ELEVATED, MAINTAIN ELEVATION OF PIPING IN DIKE AREA SO THAT PIPING IS SLOPED CONTINUOUSLY TO THE TANK NOZZLES AND TO ALLOW PERSONNEL TO WALK UNDER PIPING. WHEN TANK FOUNDATION IS NOT ELEVATED, USE A SURVEYED LAWN DETECTION MONITORING (SDL). ENSURE PIPING IS INSULATED IN COLD WEATHER AREAS. PIPING IS SLOPED CONTINUOUSLY TO THE TANK NOZZLES AND PERSONNEL MAY STEP OVER CASING PIPING WHEN THIS REQUIREMENTS MAY BE CONSTRUCTED PER NOTE 7.

11. PIPING DESIGN SHALL ADDRESS ESDIC. THE FIRST PIPE SUPPORT OF THE TANK SHALL BE AN ANCHOR WITH THE CONCRETE PIER TIED TO THE BENTRIGGER.
Exterior Pipe Support Details

PIPE SUPPORT DETAIL
TYPE FS: FREE SUPPORT
SCALE: NONE

PIPE FIELD WELD TO TEE
TOP OF SUPPORT STEEL

PIPE SUPPORT DETAIL
TYPE GS: GUIDED SUPPORT
SCALE: NONE

PIPE FIELD WELD CONTINUOUS TO STEEL TEE
TOP OF SUPPORT STEEL

LESS THAN 8” DIA. PIPE SUPPORT SECTION
TYPE AS: ANCHORED SUPPORT
SCALE: NONE

6/8” PLATE
LOCKING NUT

GREATER THAN 8” DIA. PIPE SUPPORT DETAIL
TYPE AS: ANCHORED SUPPORT
SCALE: NONE

4” STEEL PLATE
LENGTH

GREATER THAN 8” DIA. PIPE SUPPORT SECTION
TYPE AS: ANCHORED SUPPORT
SCALE: NONE

1/4” O.D. TO O.S. SADDLES
1-1/2” PLATE

LESS THAN 8” DIA. PIPE SUPPORT DETAIL
TYPE AS: ANCHORED SUPPORT
SCALE: NONE

3/8” STEEL PLATE
10” X 10” X 5/8” STEEL PLATE

PIPE SUPPORT NOTES:
1. PROVIDE CARBON STEEL PIPE SUPPORTS, INCLUDING STRAPS, PLATES, GUIDES AND TEES WHERE CARBON STEEL PIPE IS USED. ALL CARBON STEEL PIPE SUPPORTS SHOULD BE IMPROVED WITH A STAINLESS STEEL CAP OR NUT.
2. PROVIDE STAINLESS STEEL PIPE SUPPORTS, INCLUDING STRAPS, PLATES, GUIDES AND TEES WHERE STAINLESS STEEL PIPE IS USED. ALL STAINLESS STEEL ELEMENTS SHALL HAVE THE SAME MECHANICAL PROPERTIES. DO NOT WELD CARBON STEEL PLATES OR TEES TO STAINLESS STEEL PIPE.
3. THE 1/4” O.D. X 1/2” HORIZONTAL PLATE BETWEEN SADDLES SHALL HAVE 7/8” X 1” TRIANGLES CUT OFF OF ALL 4 CORNERS. THE PLATE SHALL NOT BE SQUARE IN SHAPE SO AS TO AVOID 4 WELDS INTERSECTING IN THE CORNERS, WHICH CAUSES AREAS OF HIGH RESISTANT AND INCREASED POTENTIAL FOR CRACKING.

DAMP PACK BEDDING MORTAR

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Typical Electrical Details

1. See tank drawings for exact location of level switches and product return pump.
2. Weld conduit support structures (as required to equal) to tank wall.
3. Remote EPDS station to be placed immediately outside of containment area. See this sheet for details.
4. Cathodic protection terminal cabinet to be placed outside of containment and hazardous locations. It may be placed immediately outside of containment area or near recifier. See sheet Ed.01 for details.

DESIGNER NOTE:

1. If electronic-type level alarms are to be used instead of the mechanical float type depicted in the storage tank electrical elevation detail, tank man should detail with requirements appropriate to the electronic level alarms.
2. If an ATS system other than the D-Mark III system depicted herein is to be used, the storage tank electrical elevation detail shall be modified to accommodate the proper conductors and conductors for that type of ATS system.

EMERGENCY FUEL SHUT-OFF

CONDUIT BROWNS

CAUTION SIGN DETAIL

SCALE: NONE

EMERGENCY FUEL SHUT-OFF

RED LETTERS, WHITE FIELD

FRONT VIEW

REMOTE EPDS STATION

SCALE: NONE
Criteria Libraries

- UFCs and Specifications (UFGSs) available at:
  The Whole Building Design Guide
  http://www.wbdg.org

- Standard Designs available at:
  http://www.hnd.usace.army.mil/stddgn/
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