DOD STANDARD DESIGN AW 78-24-27

ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

OCTOBER 2011

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CHIEF ENG/ARCH XXX

DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TITLE SHEET

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 1 OF 38

G.01

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\G\G.01 TITLE SHEET.dwg LAYOUT NAME: TITLE SHEET PLOTTED: Thursday, October 06, 2011 - 2:37pm USER: Guest

ABBREVIATIONS

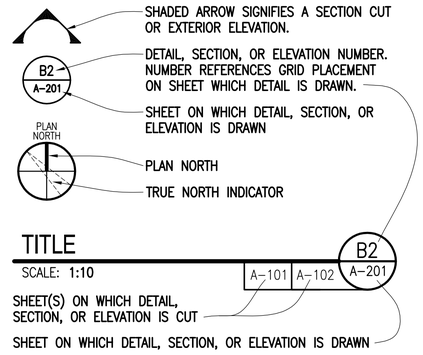
AAV	AUTOMATIC AIR VENT
ACI	AMERICAN CONCRETE INSTITUTE
AFFF	AQUEOUS FILM FORMING FOAM
AFHE	AUTOMATED FUEL HANDLING EQUIPMENT
API	AMERICAN PETROLEUM INSTITUTE
ATG	AUTOMATIC TANK GAUGE
AWG	AMERICAN WIRE GAUGE
BBL	BARREL
BE	BOTH ENDS
BS	BASKET STRAINER
BS&W	BOTTOM SEDIMENT AND WATER
CB	CATCH BASIN
CL	CLASS
CFR	CODE OF FEDERAL REGULATIONS
COE	CORPS OF ENGINEERS
CP	CATHODIC PROTECTION
CS	CARBON STEEL
CU	COPPER
CV	CHECK VALVE
EFSO	EMERGENCY FUEL SHUT-OFF
DBB	DOUBLE BLOCK AND BLEED PLUG VALVE
DIA	DIAMETER
ECC	ECCENTRIC
ETC	ET CETERA
FCC	FEDERAL COMMUNICATIONS COMMISSION
FB	FLAT BAR
FML	FLEXIBLE MEMBRANE LINER
FOB	FLAT ON BOTTOM
FRP	FIBERGLASS REINFORCED PIPE
F/S	FILTER/SEPARATOR
FS	FLOW SWITCH
FSC	FUEL SAMPLE CONNECTOR
FSCV	FILTER SEPARATOR CONTROL VALVE
FT	FOOT OR FEET
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
HHLA	HIGH-HIGH LEVEL ALARM
HHLS	HIGH-HIGH LEVEL SWITCH
HLA	HIGH LEVEL ALARM
HLS	HIGH LEVEL SWITCH
HLV	HIGH LIQUID LEVEL SHUT-OFF VALVE
HMWPE	HIGH MOLECULAR WEIGHT POLYETHYLENE
HPV	HIGH-POINT VENT
HS	HAND SWITCH
HSS	HOLLOW STRUCTURAL SECTION

ABBREVIATIONS

ID	INNER DIAMETER
KBBL	THOUSAND BARREL
LB	ELBOW
LLA	LOW LEVEL ALARM
LLLA	LOW-LOW LEVEL ALARM
LLLS	LOW-LOW LEVEL SWITCH
LLS	LOW LEVEL SWITCH
LPD	LOW-POINT DRAIN
MAX	MAXIMUM
MAV	MANUAL AIR VENT
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
NFPA	NATIONAL FIRE PROTECTION AGENCY
NPT	NATIONAL PIPE THREAD
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PDI	PRESSURE DIFFERENTIAL INDICATOR
PI	PRESSURE INDICATOR
PIV	POST INDICATOR VALVE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PSI	POUNDS PER SQUARE INCH
PST	PRODUCT SAVER TANK
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
REQ'D	REQUIRED
SCH	SCHEDULE
SRV	SAFETY RELIEF VALVE
SS	STAINLESS STEEL
STD WT	STANDARD WEIGHT
SV	SOLENOID VALVE
THRD	THREAD
THWN	THERMOPLASTIC HIGH WATER-RESISTANT NYLON-COATED
TRV	THERMAL RELIEF VALVE
TYP	TYPICAL
UFC	UNIFIED FACILITIES CRITERIA
UFGS	UNIFIED FACILITIES GUIDE SPECIFICATIONS
UON	UNLESS OTHERWISE NOTED
WNF	WELD NECK FLANGE
XXS	DOUBLE EXTRA STRONG
℄	CENTERLINE
ℙ	PLATE
@	AT
W/	WITH

LEGEND

	BALL VALVE
	CHECK VALVE
	CONTROL VALVE (IF PROVIDED, ARROW INDICATES INTEGRAL BYPASS RELIEF AND DIRECTION)
	DOUBLE BLOCK & BLEED VALVE (DBB) (IF PROVIDED, ARROW INDICATES INTEGRAL BYPASS RELIEF AND DIRECTION)
	BALL JOINT
	CAM TYPE CONNECTION WITH DUST PLUG/CAP
M	MOTORIZED VALVE
	SLIP ON FLANGE (SO)
OR	WELD NECK FLANGE (WNF)
OR	WELD NECK FLANGE WITH BLIND FLANGE
OR	REDUCER
	UNION
OR BS	BASKET STRAINER
	PIPE CAP
	PUMP
	PIPE SECTION
OR	RELIEF VALVE
J	JUNCTION BOX
	PERMANENT REFERENCE ELECTRODE
	NEW CATHODIC CABLE OR CONDUIT
	CONCRETE (SECTION)
	CONCRETE (PLAN) OR SAND
	GASKET OR NON-SHRINK GROUT
	EXISTING GRADE OR COMPACTED EARTH
	STEEL PLATE



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DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

LEGEND & ABBREVIATIONS

SCALE: AS NOTED

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SHEET 2 OF 38

G.02

DRAWFORM REVISION: 10 MARCH 2009

GENERAL NOTES

A. APPLICABILITY:

1. THIS STANDARD DESIGN APPLIES TO VERTICAL STEEL FUEL TANKS IN JP-5 OR JP-8 SERVICE BUT MAY BE ADAPTED FOR USE WITH OTHER PRODUCTS.
2. THIS STANDARD DESIGN APPLIES TO TANKS WITH FLOATING PANS. FLOATING PANS ARE REQUIRED FOR JP-5 AND JP-8 SERVICE ONLY WHEN REQUIRED BY UFC 3-460-01: DESIGN; PETROLEUM FUEL FACILITIES. FOR TANK DESIGNS WITHOUT FLOATING PANS, CONSIDER THE ISSUES MENTIONED IN THE NOTES TITLED "DESIGN CONSIDERATIONS FOR TANKS WITHOUT FLOATING PANS".
3. THE GENERAL INTENT OF THIS STANDARD IS FOR NEW CONSTRUCTION, BUT THE DETAILS CAN BE USED FOR TANK UPGRADES OR REHABILITATION.
4. THIS STANDARD APPLIES TO CONUS AND OCONUS LOCATIONS, UNLESS OTHERWISE INDICATED. WHERE THE TERMS LOCAL, STATE, OR FEDERAL ARE USED, THIS SHALL ALSO BE INTERPRETED TO MEAN "HOST NATION, IN ACCORDANCE WITH THE FINAL GOVERNING STANDARDS OF THE NATION THE TANK IS LOCATED IN."

B. NOTES ON USE OF THIS STANDARD:

1. ALL NOTES ON SHEETS G.03 AND G.04 ARE DESIGNER NOTES.
2. FOR THE PURPOSES OF THIS STANDARD, WHEN A TANK SIZE IS GIVEN, THAT TERM SHALL MEAN NOMINAL TANK SIZE, WHICH IS DEFINED AS THE VOLUME BETWEEN THE LOW LEVEL AND THE HIGH LEVEL ALARMS OF THE TANK. SEE THE TABLE ON DRAWING G.07.
3. THE TANK DESIGN DETAILS SHALL BE USED AS PROVIDED UNLESS THERE ARE SPECIFIC CONDITIONS (SAFETY OR ENVIRONMENTAL RELATED) THAT WARRANT A MODIFICATION. ANY MODIFICATION SHALL BE APPROVED BY SERVICE HEADQUARTERS.
4. THESE DRAWINGS ARE NOT CONSTRUCTION DRAWINGS. THE ENGINEER OF RECORD MUST INCLUDE APPURTENANCES AND ADDRESS OTHER ISSUES INCLUDING, BUT NOT LIMITED TO, AFFF, HIGH-POINT VENTS, LOW-POINT DRAINS, COATINGS, AND ELECTRICAL CODES. THE ENGINEER OF RECORD MUST ALSO SELECT THE APPLICABLE DRAWINGS AND DETAILS BASED UPON A SITE SPECIFIC INVESTIGATION AND DESIGN IN ACCORDANCE WITH THE FOLLOWING UNIFIED FACILITIES CRITERIA:

   UFC 3-301-01 STRUCTURAL ENGINEERING

   UFC 3-460-01 DESIGN: PETROLEUM FUEL FACILITIES

   UFC 3-600-01 FIRE PROTECTION ENGINEERING FOR FACILITIES

   THE INFORMATION SHOULD BE INCLUDED IN THE CONSTRUCTION DOCUMENTS PREPARED BY THE ENGINEER OF RECORD.
5. THIS STANDARD DOES NOT INCLUDE FINAL DETAILS FOR THE STRUCTURAL DESIGN OF THE TANK AND ITS APPURTENANCES. THE STRUCTURAL DESIGN ITEMS (FOUNDATION, TANK SHELL PLATE THICKNESSES, ROOF SUPPORT STRUCTURE, WIND GIRDERS, TANK ANCHORAGE, ORIENTATION OF THE NOZZLES AND MANHOLES, ETC), ARE SITE SPECIFIC AND CAN ONLY BE DETERMINED BY THE ENGINEER OF RECORD.
6. TANK DESIGN SHALL BE IN ACCORDANCE WITH API STANDARD 650, EXCEPT WHERE IT CONFLICTS WITH THIS STANDARD; IN THOSE CASES THIS STANDARD WILL GOVERN.
7. TANK FOUNDATION DESIGN SHALL BE IN ACCORDANCE WITH API STANDARD 650, EXCEPT WHERE IT CONFLICTS WITH THIS STANDARD; IN THOSE CASES THIS STANDARD WILL GOVERN. A GEOTECHNICAL REPORT SHALL BE REQUIRED FOR EVERY TANK FOUNDATION DESIGN. TANK FOUNDATION DESIGN SHALL, AT A MINIMUM, INCORPORATE A RINGWALL, AND SHALL EXCEED THAT MINIMUM WHEN REQUIRED BY THE GEOTECHNICAL REPORT.
8. MODIFY THE TANK HEIGHT AS REQUIRED WHERE THE SITE IS NEAR A FLIGHT LINE AND THE HEIGHT CONFLICTS WITH AVIATION FLIGHT LINE GUIDELINES AND REQUIREMENTS. RECALCULATE THE DIAMETER TO KEEP THE SAME USABLE VOLUME.
9. THE GOVERNMENT SHALL DETERMINE PRIOR TO DESIGN IF THE FACILITY HAS, OR WILL INCORPORATE, AN AUTOMATED FUEL HANDLING EQUIPMENT (AFHE) CONTROL SYSTEM. THE TYPE OF INSTRUMENTATION AND THE SEQUENCE OF OPERATION VARIES DEPENDING ON THE TYPE OF CONTROL SYSTEM.
10. ENSURE THAT THE DESIGN, INCLUDING THE LEVEL ALARM SETTINGS, LEVEL ALARM LOCATIONS, AND THE MATERIAL OF SECONDARY CONTAINMENT, COMPLIES WITH LOCAL, STATE, AND FEDERAL CODES AND REGULATIONS.
11. ENSURE THAT THE DESIGN COMPLIES WITH LOCAL, STATE, AND FEDERAL CODES AND REGULATIONS FOR AIR QUALITY. AT CERTAIN LOCATIONS THIS MAY REQUIRE THE TANK ROOF VENT BE FITTED WITH A PRESSURE VACUUM VENT, ESPECIALLY FOR TANKS WITHOUT FLOATING PANS, BUT ALSO, LESS OFTEN, FOR TANKS WITH FLOATING PANS.
12. SERVICE HEADQUARTERS IS DEFINED IN UFC 3-460-01 DESIGN: PETROLEUM FUEL FACILITIES.

C. DESIGN PARAMETERS/LIMITS:

THE FOLLOWING DESIGN PARAMETERS/LIMITS SHALL BE CONSIDERED BY THE ENGINEER OF RECORD AND SHALL BE INDICATED AS SUCH BY THE ENGINEER OF RECORD IN THE CONSTRUCTION DOCUMENTS IN ORDER TO CONSTRUCT THE TANK IN ACCORDANCE WITH API STANDARD 650, UFC 3-301-01 STRUCTURAL ENGINEERING, AND ASCE 7:

RISK CATEGORY IV

WIND SPEED

SNOW LOAD

Ss AND S1 SEISMIC SPECTRAL ACCELERATIONS

FUEL TYPE

SPECIFIC GRAVITY OF FUEL

DESIGN METAL TEMPERATURE

CORROSION ALLOWANCE

D. SPECIFICATIONS:

1. THE FOLLOWING GUIDE SPECIFICATIONS WERE DEVELOPED IN CONJUNCTION WITH THIS STANDARD:

   UFGS 33 56 13.13 STEEL TANKS WITH FIXED ROOFS

   UFGS 33 56 13.15 UNDERTANK INTERSTITIAL SPACE
2. THE FOLLOWING GUIDE SPECIFICATIONS SHOULD BE INCLUDED IN A COMPLETE DESIGN PACKAGE:

   UFGS 01 33 00 SUBMITTAL PROCEDURES

   UFGS 01 45 00.00 20 QUALITY CONTROL

   UFGS 01 78 23 OPERATION AND MAINTENANCE DATA

   UFGS 05 50 13 MISCELLANEOUS METAL FABRICATIONS

   UFGS 09 97 13.15 EPOXY/FLUOROPOLYURETHANE INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS.

   UFGS 09 97 13.17 THREE COAT EPOXY INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS

   UFGS 09 97 13.27 EXTERIOR COATING OF STEEL STRUCTURES

   UFGS 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS

   UFGS 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS

   UFGS 26 42 19.00 20 CATHODIC PROTECTION BY IMPRESSED CURRENT

   UFGS 33 52 43.00 20 AVIATION FUEL DISTRIBUTION AND DISPENSING

   UFGS 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT

   UFGS 33 52 43.14 AVIATION FUEL CONTROL VALVES

   UFGS 33 52 43.28 FILTER SEPARATOR, AVIATION FUELING SYSTEM

   THE FOLLOWING SPECIFICATION SECTIONS MAY ALSO APPLY:

   UFGS 32 13 15.20 CONCRETE PAVEMENT FOR CONTAINMENT DIKES.
3. AUTOMATIC TANK GAUGING (ATG) SPECIFICATION WILL BE PROVIDED BY THE GOVERNMENT.

E. NOTES:

1. ALL MATERIALS SHALL BE CARBON STEEL, UON.
2. BOTTOM PLATES SHALL BE 5/16"; ROOF PLATES SHALL BE A MINIMUM OF 1/4". A CORROSION ALLOWANCE OF 1/16" IS INCLUDED IN THESE THICKNESSES. PROVIDE CORROSION ALLOWANCE OF 1/16" FOR ALL SHELL AND COMPONENTS.
3. REQUIRE SLIP-RESISTANT COATING ON THE ROOF AT THE SAMPLE GAUGE WELL, THE ROOF MANHOLE, AND OTHER AREAS AS REQUESTED BY THE FACILITY.
4. ADD AVIATION OBSTRUCTION LIGHTS WHERE REQUIRED IN ACCORDANCE WITH FEDERAL AVIATION ADMINISTRATION AC 70/7460 1K, OBSTRUCTION MARKING AND LIGHTING (LATEST EDITION).
5. ROUTE ALL PIPING, TUBING AND CONDUITS FOR THE LLS, LLLS, HLS, HHLS, AND HLV FLOAT PILOT TOGETHER ON THE SAME SUPPORT. VERTICAL ROUTING UP THE TANK SHELL TO THE HLV FLOAT PILOT, HLS, AND HHLS SHALL BE ON THE SAME SUPPORT AND SHALL BE STRAIGHT UP AND THROUGH THE OPENING IN THE INTERMEDIATE PLATFORM. HORIZONTAL ROUTING BELOW INTERMEDIATE PLATFORM SHALL BE ALONG THE SIDE OF THE CONCRETE RING WALL, NOT ON THE TOP. DO NOT INTERFERE WITH ACCESS TO THE TANK CIRCUMFERENTIAL STAIRWAY. SUPPORT LEVEL SWITCHES AND HLV FLOAT PILOT CHAMBER ON SHELL AS INDICATED.
6. MOUNT HLV FLOAT PILOT CHAMBER AND HLS CHAMBER ON THE SHELL AND MAKE THEM ACCESSIBLE FROM THE INTERMEDIATE PLATFORM. PROVIDE AS INDICATED AND IN ACCORDANCE WITH UFGS 33 52 43.14. ARRANGE HLV FLOAT PILOT CHAMBER, LLS CHAMBER, HLS CHAMBER, AND ASSOCIATED SHELL SUPPORTED PIPING, FITTINGS, VALVES, AND CONDUIT SUCH THAT A 4" MINIMUM CLEARANCE WILL BE MAINTAINED FROM THE SHELL, AND SUCH ITEMS SHALL NOT EXTEND MORE THAN 1'-6" FROM SHELL.
7. IN CORROSIVE ENVIRONMENTS: ALL PIPING, VALVES, AND FITTINGS OUTSIDE THE TANK SHALL BE STAINLESS STEEL EXCEPT FOR THE DBB VALVES, THE TANK FILL LINE, THE TANK ISSUE LINE, THE TANK LOW SUCTION LINE, AND THE PIPING TO THE SIDESTREAM FILTRATION SYSTEM WHICH SHALL BE INTERIOR AND EXTERIOR COATED CARBON STEEL. PROVIDE STAINLESS STEEL HLV FLOAT PILOT CHAMBER, LEVEL SWITCH HOUSINGS, PROBE HOLDERS, AND ASSOCIATED PIPING, FITTINGS, VALVES, AND CONNECTIONS FOR HLV FLOAT PILOT AND LEVEL SWITCHES.
8. IN NON-CORROSIVE ENVIRONMENTS: ALL PIPING, VALVES, AND FITTINGS 2.5" AND LARGER SHALL BE INTERIOR AND EXTERIOR COATED CARBON STEEL. ALL PIPING, VALVES (EXCEPT DBB VALVES), AND FITTINGS 2" AND SMALLER SHALL BE STAINLESS STEEL. PROVIDE STAINLESS STEEL HLV FLOAT PILOT CHAMBER, LEVEL SWITCH HOUSINGS, PROBE HOLDERS, AND ASSOCIATED PIPING, FITTINGS, VALVES, AND CONNECTIONS FOR HLV FLOAT PILOT AND LEVEL SWITCHES.
9. UNLESS OTHERWISE INDICATED, ALL PIPING AND FITTINGS INSIDE THE TANK SHALL BE EXTERIOR AND INTERIOR EPOXY COATED CARBON STEEL, EXCEPT FOR PIPING 2.5" AND SMALLER, WHICH SHALL HAVE AN UNCOATED INTERIOR. MATERIALS FOR STILLING WELLS AND LADDERS SHALL BE AS INDICATED.
10. ALL END CONNECTIONS FOR VALVES, EQUIPMENT, PIPE, AND FITTINGS, INCLUDING PIPING FOR THE WATER DRAW-OFF SYSTEM, SIDESTREAM FILTRATION SYSTEM, DRAINS, THERMAL RELIEFS, HLV FLOAT PILOT CHAMBER, AND LEVEL SWITCHES SHALL BE WELDED OR FLANGED EXCEPT AS INDICATED: PIPING AND FITTINGS 2.5" AND LARGER SHALL BE BUTTWELDED. PIPING AND FITTINGS 2" AND SMALLER MAY BE BUTTWELDED OR SOCKETWELDED. THREADED CONNECTIONS SHALL NOT BE ALLOWED EXCEPT WHERE WELDED OR FLANGED CONNECTIONS TO APPURTENANCES ARE NOT AVAILABLE (IE, PRESSURE GAUGES, FUEL SAMPLE CONNECTIONS, LEVEL SWITCH PROBES, HLV FLOAT PILOT CHAMBER, ETC).
11. ORIENT MOTORIZED ACTUATORS, WHEN PROVIDED, WITH MOTOR HANGING DOWN, HAND WHEEL FACING UP AND LOCAL CONTROLS FACING AWAY FROM TANK SHELL.
12. PROVIDE HIGH-POINT VENTS AND LOW-POINT DRAINS ON PIPING IN ACCORDANCE WITH UFC 3-460-01.
13. COAT ALL CARBON STEEL SURFACES IN ACCORDANCE WITH UFC 3-460-01 AND THE FOLLOWING UFGS SPECIFICATION SECTIONS: COAT EXTERNAL CARBON STEEL SURFACES IN ACCORDANCE WITH UFGS SECTION 09 97 13.27; COAT INTERIOR CARBON STEEL SURFACES OF NAVY TANKS IN ACCORDANCE WITH UFGS SECTION 09 97 13.15: COAT INTERIOR CARBON STEEL SURFACES OF ALL OTHER TANKS IN ACCORDANCE WITH UFGS SECTION 09 97 13.17.
14. PROVIDE AND INSTALL ALL MATERIAL IN ACCORDANCE WITH THE MANUFACTURERS' INSTRUCTIONS AND RECOMMENDATIONS.
15. WHEN REQUESTED BY THE FACILITY AND APPROVED BY SERVICE HEADQUARTERS, PROVIDE A SIDESTREAM FILTRATION SYSTEM WITH A 100 GPM FILTER/SEPARATOR AND A 100 GPM PUMP IN ADDITION TO THE WATER DRAW-OFF SYSTEM. INCLUDE INSTRUCTIONS TO THE OPERATOR TO TURN OFF THE WATER DRAW-OFF SYSTEM AND SIDESTREAM FILTRATION SYSTEM PUMPS AND TO CLOSE RELATED ISOLATION VALVES BEFORE RECEIVING FUEL. THE INSTRUCTIONS SHOULD BE LOCATED ON A STAINLESS STEEL PLACARD ATTACHED TO THE WATER DRAW-OFF SYSTEM PRODUCT SAVER TANK AND THE SIDESTREAM FILTRATION SYSTEM FILTER/SEPARATOR.
16. THERE ARE TWO POSSIBLE TANK FOUNDATION TYPES: A TANK SIGNIFICANTLY ELEVATED TO ENSURE THAT EVERY PORTION OF THE TANK BOTTOM UNDERSIDE (INCLUDING THE SUMP) IS ELEVATED ABOVE GRADE AND OUT OF GROUNDWATER (THIS REDUCES RISK OF BOTTOMSIDE CORROSION), AND A TANK ELEVATED 12" ABOVE GRADE WHERE GROUNDWATER CONTACT WITH THE TANK BOTTOM UNDERSIDE IS NOT AS MUCH A CONCERN. THE ELEVATED TANK IS THE TYPE INDICATED ON DRAWING G.07 AND THROUGHOUT. THE TANK DESIGNS ARE SIMILAR; THE PRIMARY DIFFERENCE IS AS INDICATED BY DETAILS ON DRAWING D.01 AND D.02. SERVICE HEADQUARTERS APPROVAL IS REQUIRED FOR USING EITHER TYPE.
17. FOR BOTH ELEVATED AND NON-ELEVATED TANK FOUNDATIONS THERE ARE FOUR TYPES OF POSSIBLE FOUNDATION DESIGNS: RINGWALL WITH FOOTER; RINGWALL WITHOUT FOOTER; RINGWALL WITH SLAB MAT FOUNDATION; AND RINGWALL WITH SLAB MAT FOUNDATION, PILE SUPPORTED. IF ONE OF THE LATTER TWO TYPES ARE USED, SEE DETAIL A1/D.04.
18. UNLESS SPECIFICALLY DIRECTED WHERE TO PLACE AUDIBLE AND VISUAL ALARMS, REVIEW FACILITY SIZE AND OPERATING METHOD TO DETERMINE THE MOST DESIRABLE LOCATION; THIS WILL USUALLY BE OUT IN THE TANK FARM AND IN THE OPERATIONS BUILDING WHERE THE ALARM/CONTROL PANELS ARE LOCATED. WHERE MOUNTED REMOTE FROM THE TANK, CONSIDER ADDITIONAL LOCAL ALARM PANELS WHICH PROVIDE AUDIBLE AND VISUAL ALARMS TO WARN PERSONNEL IN THE IMMEDIATE VICINITY OF THE TANKS. CONSIDER MAKING ALL ALARMS AUDIBLE AT ALL LOCATIONS IN THE TANK FARM. AT A MINIMUM, PROVIDE AUDIBLE AND VISUAL ALARMS AT THE LOCATIONS WHERE OTHER ALARMS AND PANELS ARE LOCATED AND OUTSIDE IN THE FUEL FARM.
19. PLACE EMERGENCY FUEL SHUT-OFF (EFSO) PUSHBUTTON STATIONS WHERE DIRECTED AND IN ACCORDANCE WITH UFC 3-460-01.
20. PROVIDE OVERFILL PROTECTION WITH A HYDRAULICALLY OPERATED DIAPHRAGM CONTROL VALVE (HLV). WHERE DIRECTED, MAKE THE DOUBLE BLOCK AND BLEED (DBB) PLUG VALVE ON THE TANK RECEIPT LINE A MOTOR OPERATED VALVE (MOV). CONSIDER THE EFFECTS OF VALVE SHUTDOWN ON PIPELINE SURGING, ESPECIALLY TANKS CONNECTED TO OFF-BASE PIPELINES OR MARINE OFFLOAD SYSTEMS. SEE UFC 3-460-01 FOR GUIDANCE.

F. DESIGN CONSIDERATIONS FOR TANKS WITHOUT FLOATING PANS:

THIS STANDARD IS INTENDED PRIMARILY FOR TANKS WITH FLOATING PANS BUT MAY BE USED TO DESIGN TANKS WITHOUT FLOATING PANS. PREVIOUS NOTES APPLY EXCEPT FOR THOSE DEALING SPECIFICALLY WITH FLOATING PANS. SOME OF THE DIFFERENCES IN DESIGN THAT SHALL BE CONSIDERED ARE AS FOLLOWS:

1. THE DIAMETER AND SHELL HEIGHT OF A TANK WITHOUT A FLOATING PAN SHALL BE THE SAME AS THAT FOR THE SAME NOMINAL SIZE TANK WITH A FLOATING PAN.
2. TANKS WITHOUT FLOATING PANS ARE NOT REQUIRED TO HAVE ROOF INSPECTION HATCHES, ROOF PERIMETER VENTS, COMBINATION ROOF PERIMETER VENT/INSPECTION HATCHES, OVERFLOWS, PAN INSTALLATION HATCHES, UPPER SHELL MANHOLES, LOWER STAIRWAY LANDINGS, OR MANHOLE COVERS WITH FILLER DRUMS.
3. CONSULT APPLICABLE FIRE CODES AND STANDARDS TO ADDRESS EMERGENCY VENTING. EMERGENCY VENTING FOR TANKS WITHOUT FLOATING PANS SHALL BE PROVIDED BY OPENINGS FITTED WITH EMERGENCY VENTING DEVICES; ALTHOUGH, TANK DESIGNS GREATER THAN 50' IN DIAMETER MAY MEET THE EMERGENCY VENTING REQUIREMENTS BY USE OF A FRANGIBLE ROOF-TO-SHELL ATTACHMENT AS ALLOWED BY API STANDARD 650.
4. TANKS WITHOUT FLOATING PANS MAY BE REQUIRED TO HAVE ADDITIONAL FIRE PROTECTION SUCH AS FIXED OR SEMI-FIXED AFFF SYSTEMS.
5. THE INTERNAL LADDER IN A TANK WITHOUT A FLOATING PAN SHALL BE MADE OF CARBON STEEL FLAT BAR AND ROUND ROD AND ATTACHED TO THE SHELL BY WELDING.
6. THE ABOVE MENTIONED INTERNAL LADDER IS NOT ATTACHED TO THE INSIDE OF A ROOF OPENING ON A NON-FLOATING PAN TANK. THE OSHA REQUIRED CLEARANCE BEHIND THE LADDER RUNGS IS NOT LIMITED BY THE NECK OF THE OPENING; THEREFORE, A STANDARD 36-INCH ROUND ROOF MANHOLE MAY BE PROVIDED TO ACCESS THE LADDER FROM THE ROOF RATHER THAN THE RECTANGULAR HATCH REQUIRED ON TANKS WITH FLOATING PANS.
7. TANKS WITHOUT FLOATING PANS DO NOT REQUIRE UPPER SHELL MANHOLES FOR ACCESSING THE TOP OF THE PAN. THERFORE, LOWER PLATFORMS ARE NOT REQUIRED. THE CIRCUMFERENTIAL LENGTH OF THE STAIRWAY WILL DIFFER FROM THAT FOR A TANK WITH A FLOATING PAN AND INTERFERENCE WITH OTHER TANK APPURTENANCES WILL NEED TO BE CONSIDERED.
8. THE LLLS SHOULD BE LOCATED SO THAT IT ACTUATES AT LEAST 1 MINUTE BEFORE THE LEVEL OF THE FUEL REACHES LOSS OF SUCTION WHEN ISSUING FUEL. LOSS OF SUCTION IS TYPICALLY CONSIDERED TO BE 6 INCHES ABOVE THE TOP OF THE SUCTION ELBOW INSIDE THE TANK. DO NOT MOUNT THE LLLS LOWER THAN THAT ALLOWED BY THE MOUNTING DETAIL INDICATED.
9. SET THE LLLS, THE HLS, THE HLV, AND THE HHLS SETPOINT ELEVATION SIMILARLY TO TANKS WITH FLOATING PANS. NOTE THAT THE RESULTING UNUSED HEIGHT OF THE SHELL ABOVE THE HHLS WILL BE SOMEWHAT GREATER THAN THAT FOR A TANK WITH A FLOATING PAN DUE TO THE LACK OF OVERFLOW PORTS.

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CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND - ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

GENERAL NOTES

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 3 OF 38

G.03

DRAWFORM REVISION: 10 MARCH 2009

GENERAL NOTES (CONTINUED)

G. TANK SIZING SEQUENCE/PROCEDURE (TANKS WITH FLOATING PANS):

1. THE TANK DESIGN WILL VARY WITH THE INLET AND OUTLET FLOWRATES AND NOZZLE SIZES, THE TANK HEIGHT (AIRFIELD HEIGHT RESTRICTIONS, ETC.), THE PRESENCE OR NON-PRESENCE OF A FLOATING PAN, AND OTHER FACTORS. THE FLOATING PAN ELEVATION, THE LEVEL SWITCHES, AND THE HLV SETPOINT ELEVATIONS IN PARTICULAR DEPEND ON THESE. THESE VALUES SHOULD BE CALCULATED FOR TANK SIZES, HEIGHTS, CONFIGURATIONS, AND/OR NOZZLE COMBINATIONS NOT SHOWN ON TABLE 1 ON SHEET G.07.

2. THE FOLLOWING IS THE PHILOSOPHY USED TO LAY OUT THE TANKS IN THIS STANDARD. IT CAN BE APPLIED TO TANK SIZES AND CONFIGURATIONS NOT INCLUDED HEREIN.

   a. CHOOSE THE NOMINAL TANK SIZE. FOR THE MOST COMMON TANK SIZES, THE TABLE ON DRAWING G.07 WILL SHOW THE SHELL HEIGHT (FIXED AS AN EVEN PRODUCT OF 8' SHELL COURSES) AND THE TANK DIAMETER. FOR OTHER SIZES, USE THE GENERAL PROPORTIONS SHOWN HEREIN AND EXTRAPOLATE OR INTERPOLATE AS REQUIRED; UNLESS IMPRACTICABLE, USE TANK HEIGHTS THAT ARE ALSO A PRODUCT OF 8' SHELL COURSES.

   b. THE FLOATING PAN LOW LEG POSITION IS BASED ON NOZZLE SIZES. LEVEL SWITCH SETPOINT ELEVATIONS ARE BASED ON THE FLOATING PAN LOW LEG POSITION AND NOZZLE FLOWRATES. NOZZLE SIZES FOR EACH TANK SIZE COVERED IN THIS STANDARD HAVE BEEN SELECTED BASED ON THE EXPECTED TYPICAL FLOWRATES AND NOZZLES SIZES FOR THAT SIZE TANK AND ARE AS INDICATED ON THE TABLE ON SHEET G.07. IF FLOWRATES ARE DIFFERENT THAN THOSE INDICATED, USE PIPING VELOCITIES IN UFC 3-460-01 TO SIZE THE NOZZLES. FOR LARGER NOZZLE SIZES THAN THOSE INDICATED, THE TANKS MAY HAVE TO BE RE-SIZED (INCREASED HEIGHT OR DIAMETER OR BOTH) TO ACCOMMODATE THE LARGER NOZZLES, OR A SMALLER USABLE VOLUME ACCEPTED. FOR SMALLER NOZZLE SIZES THAN THOSE INDICATED, USE THE SAME TANK DIMENSIONS, LOWER THE FLOATING PAN LOW LEG POSITION AND THE HLV, OVERFLOW PORT, AND LEVEL SWITCH SETPOINT ELEVATIONS.

   c. SET THE 0% ELEVATION AT THE BOTTOM OF THE SHELL.

   d. SET THE LOW LEG POSITION OF THE FLOATING PAN SUCH THAT THE BOTTOM OF THE PAN CLEARS THE LARGEST TANK NOZZLE INTERIOR FLANGE BY 6".

   e. USING THE DESIGN OUTLET FLOWRATE, SET THE ELEVATION OF THE LOW-LOW LEVEL SWITCH SUCH THAT IT ACTUATES 1 MINUTE BEFORE THE FLOATING PAN BOTTOMS OUT WHEN THE FLOATING PAN LEGS ARE SET IN THE LOW POSITION.

   f. USING THE DESIGN OUTLET FLOWRATE, SET THE ELEVATION OF THE LOW LEVEL SWITCH SUCH THAT IT ACTUATES 5 MINUTES BEFORE ACTUATING THE LOW-LOW LEVEL SWITCH.

   g. USING THE NOMINAL TANK VOLUME, CALCULATE THE DISTANCE BETWEEN THE LOW LEVEL AND HIGH LEVEL SWITCHES. THIS ELEVATION IS THE SETPOINT OF THE HIGH LEVEL SWITCH AND DEFINES THE 95% FUEL LEVEL. CONFIRM THE 95% WITH THE LOCAL AND/OR FEDERAL CODES AND REGULATIONS FOR THAT LOCATION AS THIS SOMETIMES VARIES.

   h. SET THE ELEVATION OF THE HIGH-HIGH LEVEL SWITCH SUCH THAT IT ACTUATES WHEN THE LEVEL OF THE FUEL REACHES THE CALCULATED 98% FUEL LEVEL. CONFIRM THE 98% WITH THE LOCAL AND/OR FEDERAL CODES AND REGULATIONS FOR THAT LOCATION AS THIS SOMETIMES VARIES.

   i. SET THE ELEVATION OF THE HLV FLOAT PILOT SUCH THAT IT ACTUATES WHEN THE LEVEL OF THE FUEL REACHES A POINT MIDWAY BETWEEN THE HIGH AND HIGH-HIGH LEVEL SWITCH SETPOINTS (TYPICALLY 96.5%).

   j. SET THE OVERFLOW/CIRCULATION VENT AT THE ELEVATION OF THE CALCULATED 100% FUEL LEVEL. CHECK THAT THE FLOATING PAN WILL ADEQUATELY CLEAR THE ROOF STRUCTURE. CONSIDER THE ROOF STRUCTURE DEPTH, ALLOWANCES AGAINST SLOSHING DURING A SEISMIC EVENT, THE HEIGHT OF THE FLOATING PAN PERIMETER SEALS, AND A REASONABLE CLEARANCE (6" MINIMUM) BETWEEN THE FLOATING PAN PERIMETER SEAL ASSEMBLY AND THE ROOF STRUCTURE. THE DISTANCE FROM THE OVERFLOW AND THE ROOF-TO-SHELL JOINT WILL VARY DEPENDING ON THE ABOVE AND OTHER FACTORS.

   k. USING THE DESIGN INLET FLOWRATE, CALCULATE THE NUMBER OF MINUTES BETWEEN ACTUATION OF THE HIGH LEVEL SWITCH AND THE HLV, THEN BETWEEN THE HLV AND THE HIGH-HIGH LEVEL SWITCH, AND THEN BETWEEN THE HIGH-HIGH LEVEL SWITCH AND THE OVERFLOW PORT. IT IS RECOMMENDED THAT THE TIME BETWEEN THESE EVENTS BE BETWEEN 5 AND 12 MINUTES APART.

3. THE FOLLOWING DESIGN PARAMETERS/LIMITS ARE A PARTIAL LIST OF THOSE OTHER ITEMS THAT WILL ALSO NEED TO BE TAKEN INTO ACCOUNT AT EACH SITE WHEN DESIGNING TANKS FOR A SPECIFIC PROJECT.

   LOCAL CODES (LEVEL ALARM SETPOINTS, SEISMIC DESIGN, AIR QUALITY)
   FLIGHT LINE CLEARANCES (TANK HEIGHT)
   ORIENTATION WITH SUN (MELT ICE ON STAIRWAYS AND LANDINGS)
   PREVAILING WINDS (ORIENT SHELL MANHOLES WITH)
   MAINTENANCE ACCESS

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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

GENERAL NOTES

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

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SHEET 4 OF 38

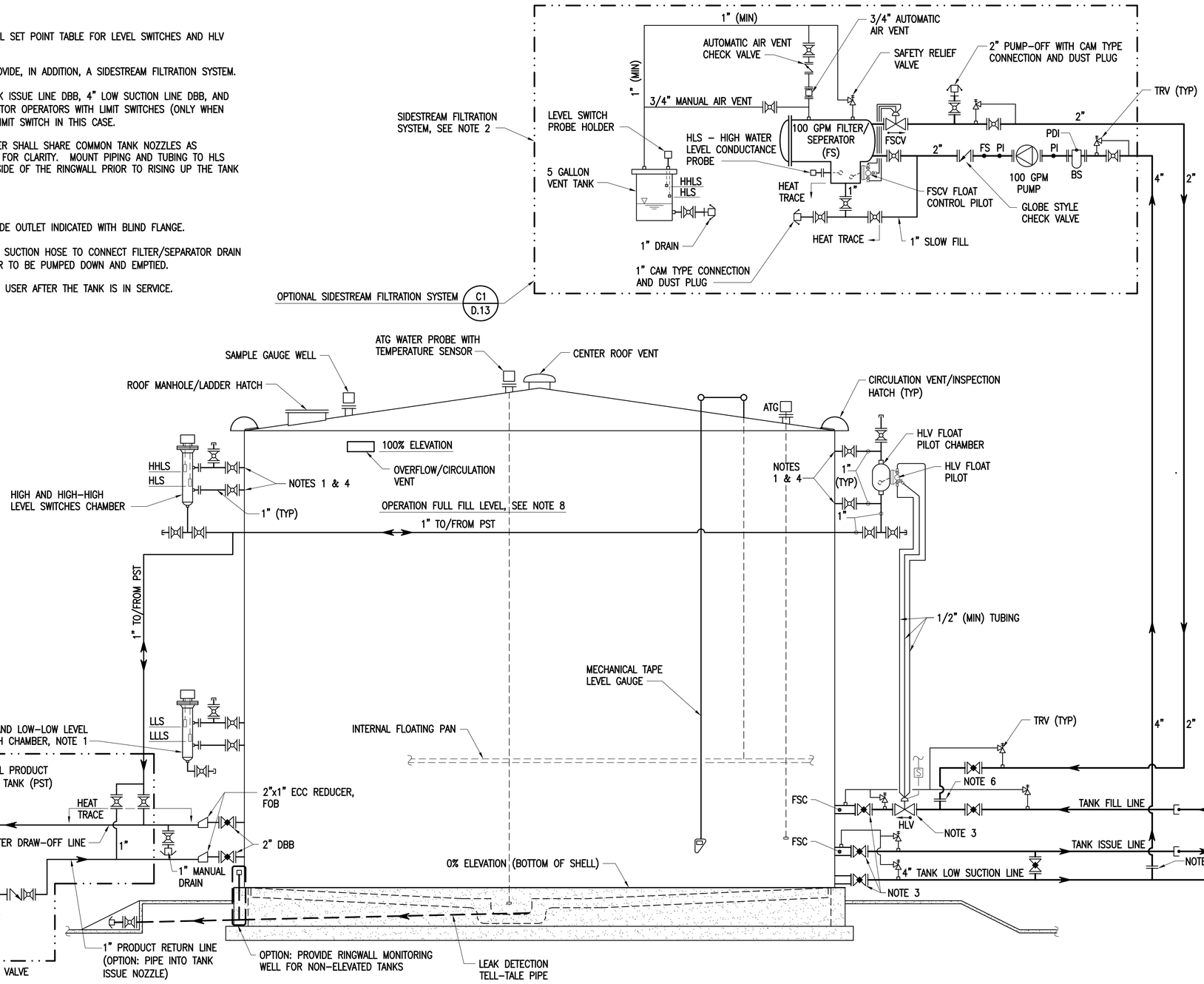
G.04

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Upgrade AST Standard\CAD\G\G.04 GENERAL NOTES.dwg LAYOUT NAME: G.04 GENERAL NOTES PLOTTED: Thursday, October 06, 2011 - 2:37pm USER: Guest

NOTES:

1. SEE DESIGNER NOTES, SEQUENCE OF OPERATION, AND LEVEL SET POINT TABLE FOR LEVEL SWITCHES AND HLV SETPOINT ELEVATIONS.
2. PROVIDE A WATER DRAW-OFF SYSTEM. AS AN OPTION, PROVIDE, IN ADDITION, A SIDESTREAM FILTRATION SYSTEM.
3. PROVIDE LIMIT SWITCHES ON THE TANK FILL LINE DBB, TANK ISSUE LINE DBB, 4" LOW SUCTION LINE DBB, AND HLV. AS AN OPTION, PROVIDE DBBs LISTED HERE WITH MOTOR OPERATORS WITH LIMIT SWITCHES (ONLY WHEN APPROVED BY SERVICE HEADQUARTERS); HLV RETAINS ITS LIMIT SWITCH IN THIS CASE.
4. HLS AND HHLS CHAMBER AND HLV CONTROL FLOAT CHAMBER SHALL SHARE COMMON TANK NOZZLES AS INDICATED ON DETAILS; THEY ARE SHOWN SEPARATED HERE FOR CLARITY. MOUNT PIPING AND TUBING TO HLS CHAMBER AND HLV CONTROL FLOAT CHAMBER ALONG THE SIDE OF THE RINGWALL PRIOR TO RISING UP THE TANK SHELL.
5. HEAT TRACE IN COLD CLIMATES ONLY.
6. IF SIDESTREAM FILTRATION SYSTEM IS NOT PROVIDED, PROVIDE OUTLET INDICATED WITH BLIND FLANGE.
7. IF SIDESTREAM FILTRATION SYSTEM IS PROVIDED, PROVIDE A SUCTION HOSE TO CONNECT FILTER/SEPARATOR DRAIN TO PRODUCT SAVER TANK TO ALLOW THE FILTER/SEPARATOR TO BE PUMPED DOWN AND EMPTIED.
8. OPERATION FULL FILL LEVEL SHALL BE DETERMINED BY THE USER AFTER THE TANK IS IN SERVICE.



FUEL STORAGE TANK DIAGRAM

SCALE: NONE

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DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

INSTRUMENTATION & CONTROL DIAGRAM

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

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SHEET 5 OF 38

G.05

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\G\G.05 INSTRUMENTATION & CONTROL DIAGRAM.dwg LAYOUT NAME: G.05 INSTRUMENTATION & CONTROL DIAGRAM PLOTTED: Thursday, October 06, 2011 - 2:37pm USER: Guest

A. GENERAL:

1. EVERY TANK HAS THE FOLLOWING WIRED INSTRUMENTATION: AUTOMATIC TANK GAUGING (ATG), LEVEL ALARM SYSTEM, LIMIT SWITCHES ON MAIN TANK DBB'S, AND A SOLENOID PILOT ON THE HIGH LEVEL VALVE. EVERY TANK HAS A WATER DRAW-OFF SYSTEM WITH AN INTEGRAL CONTROL PANEL. AS AN OPTION, TANKS MAY BE PROVIDED WITH MOTOR OPERATED DBB VALVES AND A SIDESTREAM FILTRATION SYSTEM WITH AN INTEGRAL CONTROL PANEL.

2. EVERY TANK OR GROUP OF TANKS SHALL HAVE A TANK ANNUNCIATOR PANEL, A LEVEL ALARM PANEL, AND AN EMERGENCY FUEL SHUT-OFF (EFSO) SYSTEM PANEL. TANKS WITH MOTOR OPERATED DBB VALVES (MOVs) SHALL HAVE AN MOV CONTROL PANEL. TANKS WITH MANUAL MAIN TANK SHUT OFF VALVES SHALL HAVE A VALVE POSITION INDICATOR PANEL. THESE FUNCTIONS SHOULD BE COMBINED INTO A SINGLE PANEL WHERE POSSIBLE.

3. ALARM AND ALARM/CONTROL PANEL(S) SHALL PROVIDE VISUAL AND AUDIBLE ALARMS. ALL ALARMS ON ANY ALARM OR ALARM/CONTROL PANEL MAY BE ACKNOWLEDGED TO SILENCE THE AUDIBLE ALARM. THE VISUAL ALARM SHALL REMAIN ACTIVE UNTIL THE CONDITION RETURNS TO A NON-ALARM STATE.

4. PUMP MOTORS, MOTORIZED VALVE ACTUATORS, OR ANY OTHER MOTORIZED EQUIPMENT THAT HAS BEEN DE-ENERGIZED BY AN ALARM SHALL NOT BE CAPABLE OF BEING RESTARTED UNTIL THE CONDITION RETURNS TO A NON-ALARM STATE AND THE EQUIPMENT IS MANUALLY RESTARTED. EQUIPMENT PROVIDED WITH A HAND-OFF-AUTO (HOA) SWITCH SHALL BE CAPABLE OF BEING RUN IN HAND MODE SUBJECT TO HARDWIRED CONTROL DEVICES (THERMAL OVERLOADS, EMERGENCY FUEL SHUT-OFF INTERLOCKS, ETC).

5. PROVIDE MINIMAL TIME DELAYS ON ALL LEVEL SWITCHES, FLOW SWITCHES, ETC, TO PREVENT NUISANCE ALARMS AND SHUTDOWNS DURING NORMAL OPERATION OF PUMPS, TANKS, ETC. IN ADDITION, ALARMS RELATED TO PUMP OPERATION SHALL ONLY BE ACTIVE WHILE THE PUMP IS IN OPERATION.

6. ALL PUMPS, WITH THE EXCEPTION OF THE PRODUCT RETURN PUMP, SHALL BE SHUT DOWN; ALL SOLENOID PILOTS SHALL BE DE-ENERGIZED; AND ALL MOTOR OPERATED VALVES (MOVs) SHALL CLOSE WHEN ANY EFSO PUSHBUTTON IS PRESSED. AN ALARM SHALL BE ANNUNCIATED AT THE ALARM PANEL. OPERATION OF ALL PUMPS, ENERGIZING OF ANY SOLENOID PILOTS, AND OPENING OF MOTOR OPERATED DBBs SHALL BE PREVENTED UNTIL ALL EFSO PUSHBUTTONS ARE CLEARED AND THE ALARM ACKNOWLEDGED.

7. INDIVIDUAL TANK, PUMPS, AND VALVE CONTROLS SHALL BE INDEPENDENT (AN ALARM ON ONE SYSTEM SHALL NOT AFFECT THE OPERATION OF ANOTHER), UNLESS OTHERWISE NOTED.

B. MAIN TANK SHUT-OFF VALVES:

1. MAIN TANK SHUT-OFF VALVES SHALL BE THE VALVES LOCATED CLOSEST TO THE TANK NOZZLE ON THE TANK ISSUE, RECEIPT, AND LOW SUCTION LINES. THESE VALVES SHALL BE DOUBLE BLOCK AND BLEED (DBB) PLUG VALVES. PROVIDE THESE VALVES WITH LIMIT SWITCHES TO INDICATE VALVE POSITION (WHETHER MANUAL OR MOTOR OPERATED).

2. MOTOR OPERATED DBB VALVES (MOVs) MAY BE PROVIDED IN LIEU OF MANUAL DBB VALVES WHERE APPROVED BY SERVICE HEADQUARTERS. MOVs SHALL BE SELF-CONTAINED WITH THE MANUFACTURER'S STANDARD CONTROL LOGIC FOR OPENING AND CLOSING OF THE VALVE. EACH VALVE SHALL HAVE A LOCAL CONTROL STATION WITH A LOCAL-OFF-REMOTE SWITCH. WHEN SWITCHED TO LOCAL, THE VALVE MAY ONLY BE OPERATED FROM THE LOCAL CONTROL STATION (MOV CONTROL PANEL HAS NO EFFECT). WHEN SWITCHED TO REMOTE, THE VALVE MAY BE OPERATED FROM THE MOV CONTROL PANEL OR FROM THE LOCAL CONTROL STATION. WHEN SWITCHED TO OFF, THE VALVE SHALL NOT OPERATE. IGNORE EMERGENCY FUEL SHUT-OFF (EFSO) FUNCTION SHALL BE HARDWIRED AND NOT AFFECTED BY LOCAL-OFF-REMOTE SWITCH SETTING.

3. REMOTE OPERATION OF THE MOV SHALL BE FROM THE MOV CONTROL PANEL. THE MOV CONTROL PANEL SHALL HAVE OPEN, CLOSE, AND STOP PUSH BUTTONS; AND OPEN AND CLOSE POSITION INDICATOR LIGHTS. INDICATOR LIGHTS SHALL INDICATE VALVE POSITION AT ALL TIMES.

3. EACH MANUAL DBB VALVE POSITION SHALL BE MONITORED ON A VALVE POSITION INDICATOR PANEL WHICH SHALL HAVE OPEN AND CLOSED LIGHTS FOR EACH VALVE.

4. LOCAL CONTROL STATION FOR EACH MOTOR OPERATED DBB SHALL BE READILY ACCESSIBLE AND MAY BE LOCATED ON THE MOTOR OPERATOR. IF THERE IS MORE THAN ONE MOV IN THE SAME AREA AND PREFERRED BY THE FACILITY, THE LOCAL CONTROL STATIONS MAY BE COMMONLY LOCATED.

5. WHEN AN MOV IS PROVIDED ON THE RECEIPT NOZZLE, AND THE LOCAL-OFF-REMOTE SWITCH IS IN THE REMOTE POSITION, THE MOV MAY BE OPENED, CLOSED, OR STOPPED AT ANY TIME WHEN THE LEVEL IN THE TANK IS BELOW THE HIGH-HIGH LEVEL. WHEN THE LEVEL IN THE TANK RISES TO THE HIGH-HIGH LEVEL, AS SENSED BY THE LEVEL ALARM SYSTEM, THE MOV SHALL CLOSE AND SHALL NOT BE ABLE TO BE OPENED UNTIL THE LEVEL IN THE TANK DROPS BELOW THE HIGH LEVEL AS SENSED BY THE LEVEL ALARM SYSTEM.

6. WHEN AN MOV IS PROVIDED ON THE ISSUE NOZZLE, AND THE LOCAL-OFF-REMOTE SWITCH IS IN THE REMOTE POSITION THE MOV MAY BE OPENED, CLOSED, OR STOPPED WHEN THE LEVEL IN THE TANK IS ABOVE THE LOW-LOW LEVEL. WHEN THE LEVEL IN THE TANK DROPS TO THE LOW-LOW LEVEL, AS SENSED BY THE LEVEL ALARM SYSTEM, THE MOV SHALL CLOSE AND SHALL NOT BE ABLE TO BE OPENED UNTIL THE LEVEL IN THE TANK RISES ABOVE THE LOW LEVEL AS SENSED BY THE LEVEL ALARM SYSTEM.

7. WHEN AN MOV IS PROVIDED ON THE LOW SUCTION NOZZLE THE MOV MAY BE OPEN, CLOSED, OR STOPPED AT ANY TIME BY EITHER THE LOCAL CONTROL STATION OR THE MOV CONTROL PANEL, DEPENDING ON THE SETTING OF THE LOCAL-OFF-REMOTE SWITCH.

C. ELECTRONIC AUTOMATIC TANK GAUGING (ATG) SYSTEM:

1. THE ATG SYSTEM CONSISTS OF THE ATG, AND THE TEMPERATURE, BOTTOM SEDIMENT, AND WATER (BS&W) PROBE MOUNTED IN SEPARATE STILLING WELLS. THE ATG SHALL TRANSMIT LEVEL AND TEMPERATURE DATA TO THE MONITORING SYSTEM WHICH WILL USE STORED STRAPPING CHART DATA TO CALCULATE GROSS AND NET VOLUMES.

D. LEVEL ALARM SYSTEM:

1. PROVIDE EACH TANK WITH A LEVEL ALARM SYSTEM WITH LOW, LOW-LOW, HIGH AND HIGH-HIGH LEVEL SWITCHES. ALARMS SHALL BE ANNUNCIATED ON THE LEVEL ALARM PANEL.

2. WHEN THE LEVEL IN THE STORAGE TANK DESCENDS TO THE LOW LEVEL SETPOINT AS SENSED BY THE LOW LEVEL SWITCH, AN ALARM SHALL BE ANNUNCIATED AT THE LEVEL ALARM PANEL. THE ALARM CONDITION SHALL REMAIN ON UNTIL THE LEVEL IN THE TANK RISES ABOVE THE LOW LEVEL SETPOINT AS SENSED BY THE LOW LEVEL SWITCH.

3. WHEN THE LEVEL IN THE STORAGE TANK DESCENDS TO THE LOW-LOW LEVEL SETPOINT AS SENSED BY THE LOW LEVEL SWITCH, AN ALARM SHALL BE ANNUNCIATED AT THE LEVEL ALARM PANEL. THE ALARM CONDITION SHALL REMAIN ON UNTIL THE LEVEL IN THE TANK RISES ABOVE THE LOW-LOW LEVEL SETPOINT AS SENSED BY THE LOW-LOW LEVEL SWITCH.

4. WHEN THE LEVEL IN THE TANK RISES TO THE HIGH LEVEL SETPOINT AS SENSED BY THE HIGH LEVEL SWITCH, AN ALARM SHALL BE ANNUNCIATED AT THE LEVEL ALARM PANEL. THE ALARM CONDITION SHALL REMAIN ON UNTIL THE LEVEL IN THE TANK DESCENDS BELOW THE HIGH LEVEL SETPOINT AS SENSED BY THE HIGH LEVEL SWITCH.

5. WHEN THE LEVEL IN THE TANK RISES TO THE HIGH-HIGH SETPOINT AS SENSED BY THE HIGH-HIGH LEVEL SWITCH, AN ALARM SHALL BE ANNUNCIATED AT THE LEVEL ALARM PANEL. THE ALARM CONDITION SHALL REMAIN ON UNTIL THE LEVEL IN THE TANK DESCENDS BELOW THE HIGH-HIGH LEVEL SETPOINT AS SENSED BY THE HIGH-HIGH LEVEL SWITCH.

E. HIGH LIQUID LEVEL SHUT-OFF VALVE (HLV):

1. WHEN THE LEVEL OF THE TANK RISES TO THE HLV SETPOINT AS SENSED BY THE FLOAT PILOT, THE HLV SHALL BEGIN CLOSING AND SHALL BE ADJUSTED TO FULLY CLOSE BEFORE THE LEVEL REACHES THE HIGH-HIGH LEVEL ALARM.

2. WHEN THE LEVEL OF THE TANK DESCENDS BELOW THE ACTUATION LEVEL OF THE FLOAT PILOT, THE HLV SHALL BEGIN OPENING AND SHALL BE ADJUSTED TO BE FULLY OPEN BY THE TIME THE LEVEL FALLS TO THE HIGH LEVEL ALARM.

3. PROVIDE HLV WITH DIFFERENTIAL PRESSURE SUSTAINING CONTROL AND WITH PRESSURE SENSITIVE CLOSING FEATURE FOR SURGE RELIEF (MANDATORY FOR ALL DOD AGENCIES EXCEPT THE AIR FORCE; PROVIDE FOR AIR FORCE WHEN DIRECTED BY COMMAND FUELS FACILITY ENGINEER).

4. PROVIDE HLV WITH QUICK OPENING SPEED CONTROL TO MINIMIZE THE EFFECT OF PUMPING INTO A CLOSED VALVE AT THE START OF RECEIPT.

5. PROVIDE SLOW CLOSING SPEED CONTROL FEATURE TO MINIMIZE PRESSURE SURGE WHEN HLV CLOSES.

6. PROVIDE DIFFERENTIAL PRESSURE CONTROL PILOT TO ENSURE VALVE HAS SUFFICIENT DIFFERENTIAL PRESSURE TO CLOSE WHEN CALLED UPON BY THE SOLENOID PILOT OR THE LEVEL CONTROL PILOT. (PARTICULARLY IMPORTANT BECAUSE LOW FLOWS DO NOT GENERATE SUFFICIENT DIFFERENTIAL PRESSURE TO CLOSE VALVE IN A REASONABLE AMOUNT OF TIME).

7. PROVIDE PRESSURE SENSITIVE CLOSING FEATURE TO MINIMIZE SURGING ON PIPELINE AND MARINE RECEIPTS ONLY WHEN APPROVED BY THE SERVICE HEADQUARTERS. (WHEN USING THIS VALVE FEATURE, SET PRESSURE SUCH THAT NORMAL PUMP OPERATION WILL NOT KEEP THE VALVE OPEN; FOR EXAMPLE SET HIGHER THAN TRANSFER PUMP DEADHEAD PRESSURE SO VALVE WILL CLOSE AT A PRESSURE HIGHER THAN DEADHEAD PRESSURE BUT LOWER THAN MAXIMUM ALLOWABLE SURGE PRESSURE).

8. THE HLV FLOAT PILOT SHALL BE BACKED-UP WITH A SOLENOID PILOT TO BEGIN CLOSURE OF THE CONTROL VALVE WHEN THE TANK LEVEL REACHES THE HIGH-HIGH LEVEL, AS SENSED BY THE LEVEL ALARM SYSTEM.

9. THE SOLENOID SHALL BE NORMALLY ENERGIZED ENABLING THE CONTROL VALVE TO OPEN ON A RISE IN UPSTREAM PRESSURE. WHEN THE LIQUID LEVEL REACHES THE HIGH-HIGH LEVEL, OR THERE IS A LOSS OF POWER, THE SOLENOID SHALL BE DE-ENERGIZED DISABLING THE CONTROL VALVE, CAUSING IT TO CLOSE. A MANUAL BYPASS VALVE SHALL BE PROVIDED TO BYPASS THE SOLENOID CONTROL, ENABLING THE CONTROL VALVE TO BE OPENED DURING A LOSS OF POWER. THE MANUAL BYPASS VALVE SHALL BE FITTED WITH A POSITION SWITCH THAT ACTIVATES A POSITION ALARM ON THE ALARM PANEL TO ALERT THE OPERATOR THAT THE SOLENOID BYPASS IS OPEN AFTER POWER IS RESTORED. EMERGENCY FUEL SHUT-OFF (EFSO) FUNCTION SHALL BE HARDWIRE INTERLOCKED WITH THE HLV SOLENOID VALVE.

F. ISSUE PUMP:

NOTE: OTHER CONTROLS NEEDED; ONLY TANK INTERLOCKS CONSIDERED HERE.

1. THE ISSUE PUMP MAY NOT BE OPERATED, EXCEPT IN HAND MODE, WHILE BOTH THE ISSUE DBB AND THE LOW SUCTION DBB ARE CLOSED.

2. THE ISSUE PUMP MAY NOT BE OPERATED, EXCEPT IN HAND MODE, WHEN THE LEVEL ALARM SYSTEM INDICATES A LOW-LOW LEVEL.

G. RECEIPT PUMP:.

NOTE: OTHER CONTROLS NEEDED; ONLY TANK INTERLOCKS CONSIDERED HERE.

1. THE RECEIPT PUMP MAY NOT BE OPERATED, EXCEPT IN HAND MODE, WHILE THE RECEIPT DBB IS CLOSED.

2. THE RECEIPT PUMP MAY NOT BE OPERATED, EXCEPT IN HAND MODE, WHEN THE LEVEL ALARM SYSTEM INDICATES A HIGH LEVEL.

H. WATER DRAW-OFF SYSTEM:

1. PROVIDE SYSTEM WITH AN INTEGRAL CONTROL PANEL WITH PUMP START/STOP PUSHBUTTONS AND WITH RED (RUN) AND GREEN (STOP) LIGHTS.

I. EMERGENCY FUEL SHUT-OFF (EFSO) SYSTEM:

NOTE: OTHER CONTROLS NEEDED; ONLY TANK INTERLOCKS CONSIDERED HERE.

1. DEPRESSION OF ANY EFSO PUSHBUTTON SHALL ACT TO CLOSE ALL MOVs, ALL HLVs, AND DE-ENERGIZE THE SIDESTREAM FILTRATION SYSTEM PUMP.

2. PROVIDE EFSO SYSTEM WITH KEY LOCKABLE BYPASS SWITCH.

I. SIDESTREAM FILTRATION SYSTEM (OPTIONAL):

1. PROVIDE SYSTEM WITH INTEGRAL SIDESTREAM FILTRATION CONTROL SYSTEM CONTROL PANEL WITH START/STOP PUSHBUTTONS, AUDIBLE HORN AND VISUAL ALARM LIGHTS, AND WITH ACKNOWLEDGE AND RESET PUSHBUTTONS.

2. MANUALLY START AND STOP PUMP WITH START/STOP PUSHBUTTONS.

3. UPON LOSS OF PUMP FLOW (AS INDICATED BY THE PADDLE TYPE FLOW SWITCH) A TROUBLE ALARM SHALL BE ANNUNCIATED ON THE TANK ANNUNCIATOR PANEL AND AN AUDIBLE AND UNIQUE VISUAL ALARM SHALL BE ANNUNCIATED ON THE SIDESTREAM FILTRATION SYSTEM CONTROL PANEL AND THE PUMP SHALL BE DE-ENERGIZED.

4. WHEN THE WATER LEVEL IN THE FILTER/SEPARATOR SUMP RISES TO THE HIGH LEVEL SETPOINT AS SENSED BY THE CONDUCTANCE PROBE IN THE FILTER/SEPARATOR SUMP, A TROUBLE ALARM SHALL BE ANNUNCIATED ON THE TANK ANNUNCIATOR PANEL AND AN AUDIBLE AND UNIQUE VISUAL ALARM SHALL BE ANNUNCIATED ON THE SIDESTREAM FILTRATION SYSTEM CONTROL PANEL AND THE PUMP SHALL BE DE-ENERGIZED. THE ALARM CONDITION SHALL REMAIN UNTIL THE LEVEL IN THE SUMP DROPS BELOW THE HIGH LEVEL.

5. WHEN THE LEVEL IN THE VENT TANK RISES TO THE HIGH LEVEL SETPOINT AS SENSED BY THE HIGH LEVEL SWITCH, A TROUBLE ALARM SHALL BE ANNUNCIATED ON THE TANK ANNUNCIATOR PANEL AND AN AUDIBLE AND UNIQUE VISUAL ALARM SHALL BE ANNUNCIATED ON THE SIDESTREAM FILTRATION SYSTEM CONTROL PANEL. THE ALARM CONDITION SHALL REMAIN UNTIL THE LEVEL IN THE TANK DROPS BELOW THE HIGH LEVEL.

6. WHEN THE LEVEL IN THE VENT TANK RISES TO THE HIGH-HIGH LEVEL SETPOINT AS SENSED BY THE HIGH-HIGH LEVEL SWITCH, A TROUBLE ALARM SHALL BE ANNUNCIATED ON THE TANK ANNUNCIATOR PANEL AND AN AUDIBLE AND UNIQUE VISUAL ALARM SHALL BE ANNUNCIATED ON THE SIDESTREAM FILTRATION SYSTEM CONTROL PANEL AND THE PUMP SHALL BE DE-ENERGIZED. THE ALARM CONDITION SHALL REMAIN UNTIL THE LEVEL IN THE TANK DROPS BELOW THE HIGH-HIGH LEVEL.

7. THE CONTROL PANEL SHALL BE INTERLOCKED WITH THE LIMIT SWITCHES ON THE 4" LOW SUCTION LINE DBB AND ON THE TANK FILL LINE DBB TO ALLOW THE PUMP TO BE STARTED ONLY IF BOTH LIMIT SWITCHES INDICATE THE VALVES ARE IN THE OPEN POSITION.

8. THE CONTROL PANEL SHALL BE INTERLOCKED WITH THE EMERGENCY FUEL SHUT-OFF SYSTEM TO DE-ENERGIZE THE PUMP IF ANY EFSO PUSHBUTTON IS DEPRESSED.

EMERGENCY STOP (R)		
TANK XXX HIGH-HIGH LEVEL (R)	TANK XXX HIGH-HIGH LEVEL (R)	VENT TANK HIGH-HIGH ALARM (R)
TANK XXX HIGH LEVEL (W)	TANK XXX HIGH LEVEL (W)	VENT TANK HIGH ALARM (W)
TANK XXX LOW LEVEL (W)	TANK XXX LOW LEVEL (W)	SPARE
TANK XXX LOW-LOW LEVEL (R)	TANK XXX LOW-LOW LEVEL (R)	SPARE
TANK XXX HLV SOLENOID BYPASS OPEN (R)	TANK XXX HLV SOLENOID BYPASS OPEN (R)	SPARE
PCP TEMPERATURE (W)	TANK SETUP ERROR (W)	SIDESTREAM FILTRATION SYSTEM TROUBLE (W)

NOTES:

1. WHITE (W) – WHITE WINDOW WITH BLACK LETTERS
2. RED (R) – RED WINDOW WITH WHITE LETTERS
3. RED WINDOW ALARMS (CRITICAL) SHALL STOP ALL PUMPS RUNNING IN AUTOMATIC MODE.
4. VENT TANK ALARMS ARE REQUIRED IF SIDESTREAM FILTRATION SYSTEM IS PROVIDED.

TYPICAL TANK ANNUNCIATOR PANEL LAYOUT

SCALE: NONE

APPR	DATE	DESCRIPTION	SYM

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APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO | DATE: DD/MM/YY

DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

SEQUENCE OF OPERATION

SCALE: AS NOTED

EPROJECT NO.:

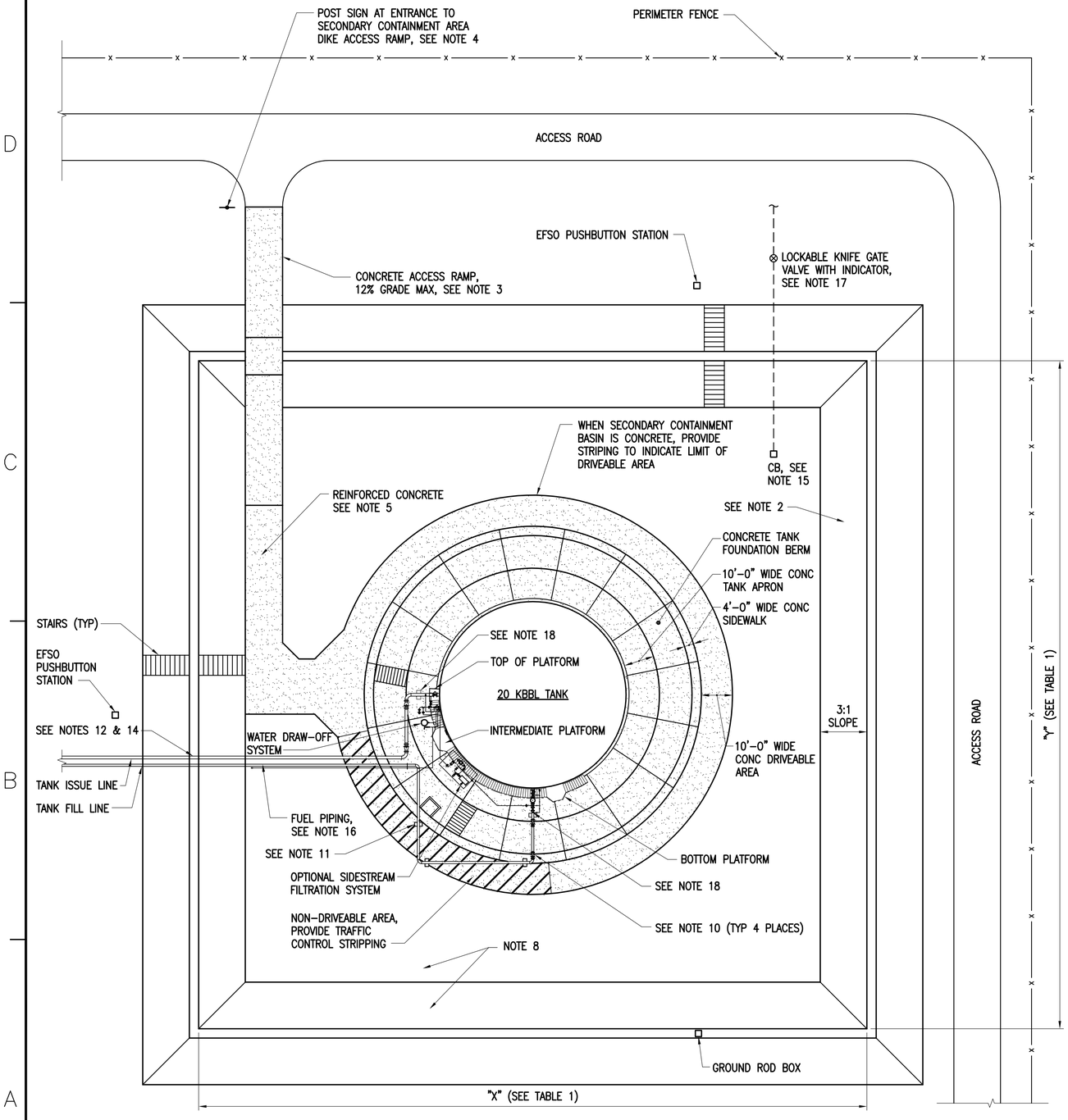
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 6 OF 38

G.06

DRAWFORM REVISION: 10 MARCH 2009



PLAN NORTH

TYPICAL SITE PLAN

SCALE: 1"=20'-0"

NOTES:

1. SITE PLAN SHOWN IS A TYPICAL 20,000 BBL TANK WITH AN ELEVATED TANK FOUNDATION AND IS PROVIDED FOR GENERAL PLANNING PURPOSES ONLY. DIMENSIONS SHOWN IN TABLE 1 ARE FOR PLANNING PURPOSES ONLY AND ARE INTENDED TO INDICATE THE AMOUNT OF AREA REQUIRED FOR SECONDARY CONTAINMENT IN GENERAL.
2. FOR PLANNING PURPOSES, THE SECONDARY CONTAINMENT AREA SIZE SHOWN HERE IS BASED UPON A 5'-0" HIGH TRAPEZOIDAL DIKE BERM INCLUDING 1'-0" OF FREEBOARD. THE DIKE HEIGHT SHOWN HERE IS NOT STANDARD BUT ONLY AN ASSUMED DIKE HEIGHT TO ALLOW FLEXIBILITY IN PLANNING. FOR DESIGN, DIKES MAY BE TALLER BUT ARE NOT PERMITTED TO BE TALLER THAN 6'-0" OR SLOPED STEEPER THAN 3 TO 1. VERTICAL CONCRETE DIKE WALLS ARE AN ACCEPTABLE ALTERNATIVE WHEN THERE IS NOT ENOUGH LAND AVAILABLE FOR TRAPEZOIDAL BERMS. SECONDARY CONTAINMENT AREA DESIGN SHALL COMPLY WITH UFC 3-460-01, 29 CFR 1910.106, AND LOCAL REGULATIONS.
3. CONCRETE ACCESS RAMP IS OPTIONAL IN DIKE AREAS OF 20,000 BBL TANKS OR GREATER, BUT IS NOT PERMITTED FOR SMALLER TANKS. VEHICLE ACCESS TO THE INTERIOR OF THE SECONDARY CONTAINMENT SHOULD BE STRICTLY CONTROLLED.
4. PROVIDE SIGN AT ENTRANCE TO DIKE AREA RAMP TO READ AS FOLLOWS: "ACCESS IS RESTRICTED TO AUTHORIZED VEHICLES NOT HEAVIER THAN A 1-TON PICKUP TRUCK AND RATED FOR USE IN CLASS 1, DIVISION 2 HAZARDOUS LOCATIONS".
5. DESIGN DIKE ACCESS AND BASIN/FLOOR TO WITHSTAND THE VEHICLE TRAFFIC INDICATED ABOVE.
6. LOCATION AND CONFIGURATION SHOWN FOR PIPING IS GENERAL AND IS NOT INTENDED TO LIMIT OR RESTRICT PIPING LOCATION, CONFIGURATION, OR PIPE SUPPORT ARRANGEMENT.
7. PROVIDE LIGHTING AND ACCESS TO LIGHTING IN ACCORDANCE WITH REFERENCED CRITERIA.
8. DIKE SECONDARY CONTAINMENT SHALL BE A FLEXIBLE MEMBRANE LINER. REINFORCE ANY CONCRETE PLACED OVER THE LINER WITH SYNTHETIC FIBER. LOCATE CONCRETE CONTROL JOINTS NO GREATER THAN 10 FEET APART AND SEAL THE JOINTS USING JET FUEL RESISTANT JOINT SEALANT (NON-SAG ON THE SLOPES).
9. PROVIDE FIRE HYDRANTS IN ACCORDANCE WITH APPLICABLE CODES AND REFERENCED CRITERIA.
10. PROVIDE BALL JOINTS. BALL JOINTS MAY BE USED IN EXTREME NORTHERN CLIMATES (E.G. ALASKA) PROVIDED SUITABLE SEAL MATERIALS FOR LOW TEMPERATURES ARE SPECIFIED. DISTANCE BETWEEN BALL JOINTS SHALL BE BASED ON ESTIMATED TANK SETTLEMENT.
11. LOCATE EXTERIOR PIPE SUPPORTS TO PROVIDE ADEQUATE PIPE FLEXIBILITY FOR TANK SETTLEMENT, SEISMIC DESIGN AND THERMAL EXPANSION. EXCEPT FOR THE FIRST PIPE SUPPORT OFF OF THE TANK SHELL, SPRING PIPE SUPPORTS MAY BE USED IN HIGH SEISMIC AREAS WHEN DIRECTED BY SERVICE HEADQUARTERS, SEE DETAIL C3/D.13.
12. ALL FUEL PIPING SHALL BE ABOVE GRADE (EXCEPT PIPING SHALL NOT RUN UP AND OVER DIKE WALLS). PENETRATIONS THROUGH DIKE WALLS SHALL BE MADE THROUGH PIPE SLEEVES WITH BUNA-N COMPRESSION SEALS. FACILITY REQUIREMENTS (FORCE PROTECTION, VANDALISM, BLAST DAMAGE, FIRE PROTECTION, ETC.) MAY REQUIRE UNDERGROUND PIPING.
13. IN LOCATIONS SUBJECT TO ICE AND SNOW, ORIENT STAIRWAYS AND HIGH LEVEL PIPING TO RECEIVE WINTER SUN SO AS TO MINIMIZE ACCUMULATIONS. IF PIPING AT TANK IS NOT BELOW STAIRWAY, PROVIDE ICE SHIELDS OVER PRODUCT PIPING AND VALVES AT TANK; ENSURE ICE SHIELDS HAVE SUFFICIENT CLEARANCE ABOVE VALVES TO ALLOW MAINTENANCE OF VALVES AND VALVE OPERATORS OR PROVIDE MEANS TO MOVE SHIELDS OUT OF THE WAY AND PROVIDE CANOPIES OVER OTHER VALVES AND EQUIPMENT.
14. DIKE PENETRATIONS THROUGH BERMS SHALL BE MADE THROUGH PIPE SLEEVES WITH BUNA-N COMPRESSION SEALS. SLEEVES SHALL BE PROVIDED WITH LEAK TESTING CAPABILITY. PENETRATIONS THROUGH THE FML SHALL BE MADE WITH A BOOT MADE BY THE MANUFACTURER OF THE FML FOR THAT PURPOSE AND SEALED TO THE PENETRATION SLEEVE.
15. SLOPE DIKE BASIN TO CATCH BASIN DROP INLETS AT A SLOPE OF 1% AND ADJUST THE NUMBER OF DROP INLETS SO AS TO AVOID EXCESSIVE LOSS OF SECONDARY CONTAINMENT VOLUME THAT MAY RESULT FROM BASIN ELEVATION DIFFERENTIALS OF MORE THAN ONE FOOT. NUMBER AND LOCATION OF CATCH BASIN IS DIAGRAMMATIC ONLY AND SHALL BE LOCATED BY THE DESIGNER.
16. WHEN THE TANK FOUNDATION IS ELEVATED AS SHOWN AT LEFT, 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 THE NON-ELEVATED TYPE WITH A BURIED LEAK DETECTION MONITORING WELL, MAINTAIN ELEVATION OF PIPING IN DIKE AREA SO THAT PIPING IS SLOPED CONTINUOUSLY TO THE TANK NOZZLES AND PERSONNEL MAY STEP MORE EASILY OVER PIPING. WHEN THIS REQUIRES PIPING TO PENETRATE THE DIKE BERM, PENETRATIONS SHALL BE CONSTRUCTED PER NOTE 14.
17. DO NOT USE BURIED KNIFE GATE VALVES IN CLIMATES WITH LOWEST ONE-DAY MEAN TEMPERATURE BELOW -15°F PER API STANDARD 650 FIGURE 4-2. PROVIDE MEANS TO CONTROL DRAINAGE THAT WILL NOT NORMALLY REMAIN FROZEN AFTER THAW OF SECONDARY CONTAINMENT CONTENTS. CONTAINMENT DRAIN VALVE OR OTHER CONTROL MEANS, WHEN PROVIDED, SHALL BE LOCKABLE.
18. PIPING DESIGN SHALL ADDRESS SEISMIC. THE FIRST PIPE SUPPORT OF THE TANK SHALL BE AN ANCHOR WITH THE CONCRETE PIER TIED TO THE RINGWALL.
19. AT LOCATIONS EXPERIENCING FREEZING CONDITIONS, ALL DRAIN PIPING ON THE PRODUCT SAVER TANK AND FILTER SEPARATOR, IF PROVIDED, SHALL BE HEAT TRACED WITH APPROPRIATE HAZARD RATED TAPE AND INSULATED.

TABLE 1

NOMINAL TANK SIZE (KBBL)*	NOMINAL DIAMETER (FT)	NOMINAL SHELL HEIGHT (FT)*	FLOWRATE FILL/ISSUE (GPM)	NOZZLE SIZE FILL/ISSUE (INCHES)	SHELL VOLUME (KBBL)***	USABLE VOLUME (KBBL)	LLLA VOLUME (BBL)**	SECONDARY CONTAINMENT DIMENSIONS	
								"X" (FT)	"Y" (FT)
5	39	32	1200/1200	8"/12"	6.8	5.0	625	130	130
10	49	40	1200/3000	8"/16"	13.4	10.0	1175	170	170
20	61	48	1200/3000	8"/16"	25.0	20.0	1825	220	220
30	73	48	1200/3000	8"/16"	35.8	28.9	2675	255	255
40	89	48	7000/7000	18"/24"	53.2	41.1	5300	305	305
50	90	56	7000/7000	18"/24"	63.5	50.6	5425	330	330
80	113	56	7000/7000	18"/24"	100.1	80.1	8825	405	405
100	126	56	7000/7000	18"/24"	124.5	100.1	11150	450	450

* NOMINAL TANK SIZE = APPROXIMATE USABLE VOLUME = VOLUME FROM LLA TO HLA.
** APPROXIMATE VOLUME BETWEEN SUMP AND LLLA.
*** SHELL VOLUME = VOLUME INSIDE ALL OF THE SHELL

GRAPHIC SCALE(S):
1"=20' 0' 20' 40' 60'

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<<PM/DM>> XXXX
BRANCH MANAGER XX
CHIEF ENG/ARCH XXX
DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

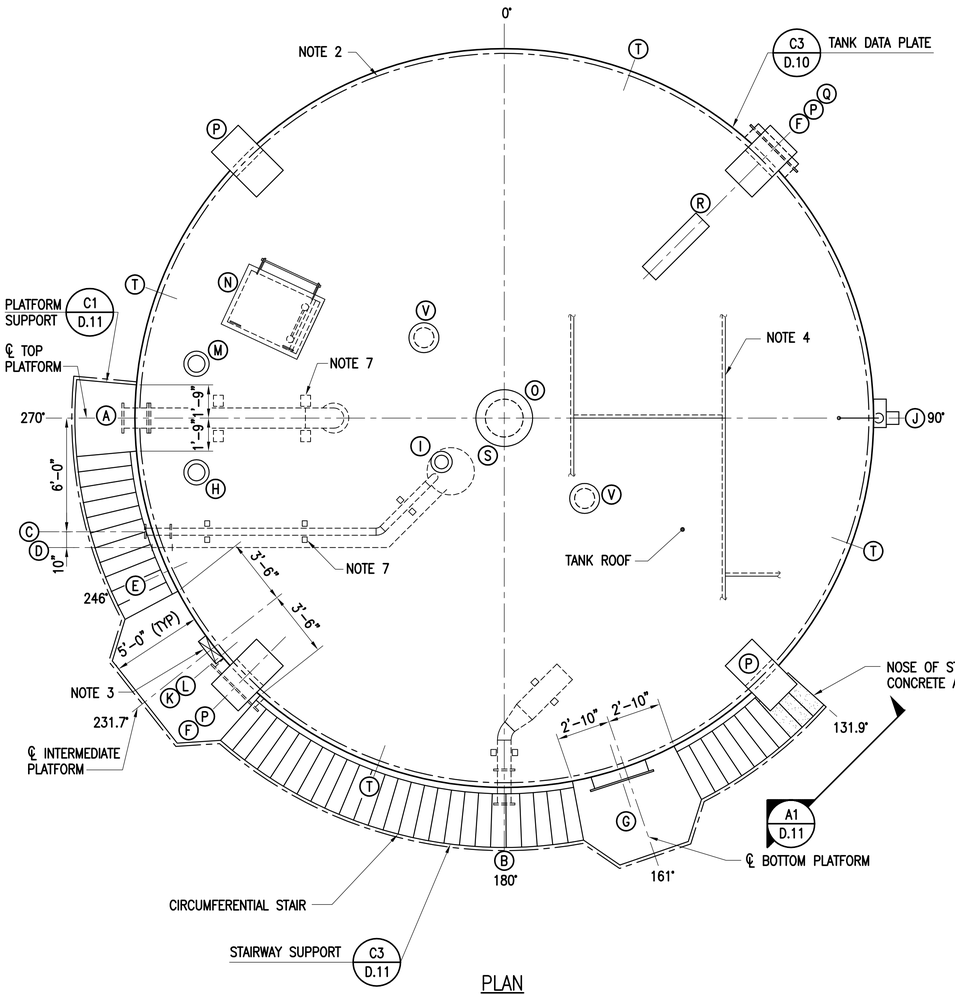
DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL SITE PLAN & NOTES

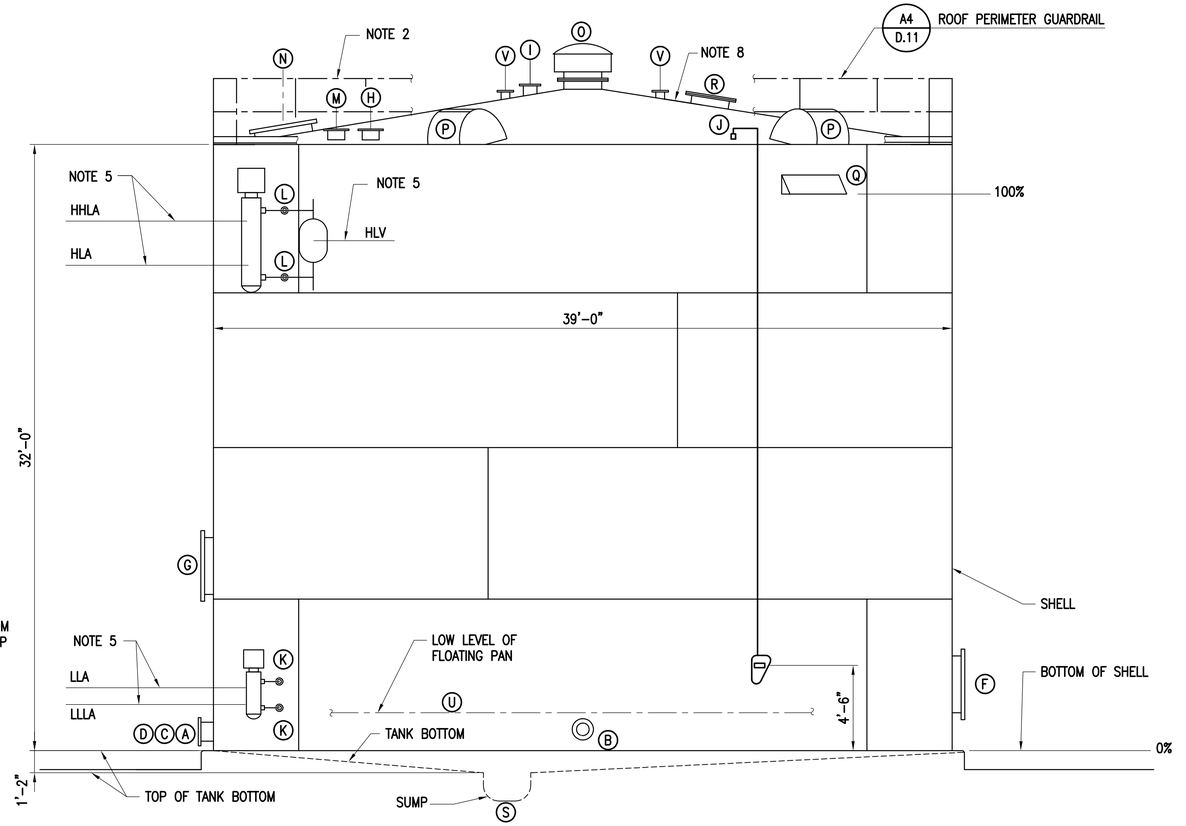
SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 7 OF 38

G.07

DRAWFORM REVISION: 10 MARCH 2009



PLAN



NOTE:

CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

ELEVATION

5K BBL TANK

SCALE: 1/4"=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"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE A ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):

1/4"=1'-0" 1' 0' 1' 5' 11'

APPR | DATE | DESCRIPTION | SYM

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ACTIVITY: XXXXX

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DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

5K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 8 OF 38

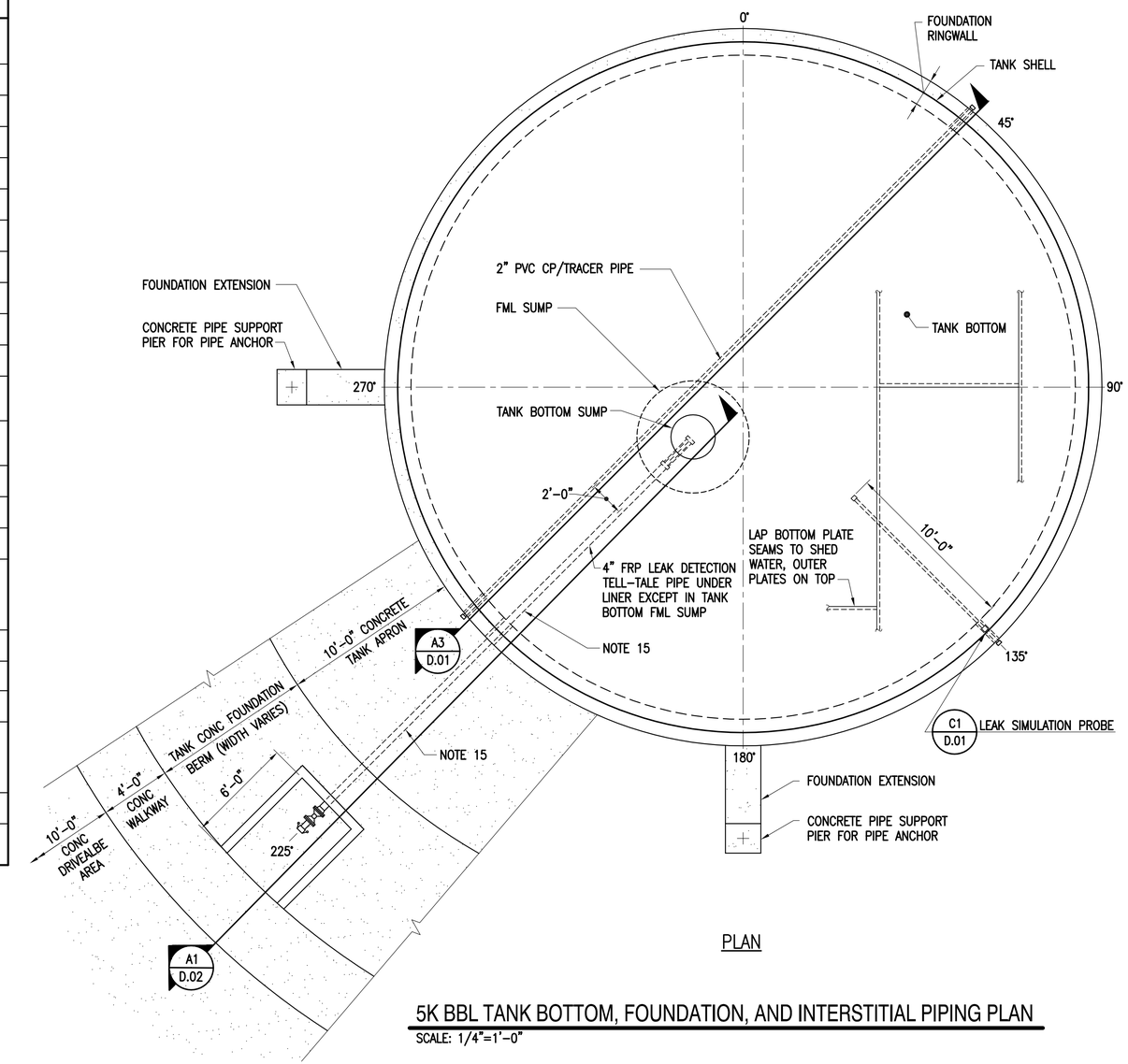
5.01

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\M\5.01 5K BBL TANK.dwg LAYOUT NAME: 5.01 5K BBL TANK PLOTTED: Thursday, October 06, 2011 - 2:37pm USER: Guest

5K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	12	270	1'–1 1/2"	A1/D.08	NOTES 4, 5, 10
B	FILL	8	180	1'–1 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	1'–1 1/2"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–0 1/2"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	246	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	162	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	259	16'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	90	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	230	3'–9" 2'–1"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND HLV NOZZLES	1	230	28'–1" 26'–3"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	280	16'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	295	13'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	45 135 225 315	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENT	12 x 36	45	28'–1"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	20 110 200 290	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	2'–5"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0'	–	



PLAN

5K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 1/4"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

1/4"=1'–0" 1' 0' 1' 5' 11'

APPR | DATE | DESCRIPTION | SYM

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CHIEF ENG/ARCH XXX

DATE OCTOBER 2011

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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN 4M 79–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

5K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED

EPROJECT NO.:

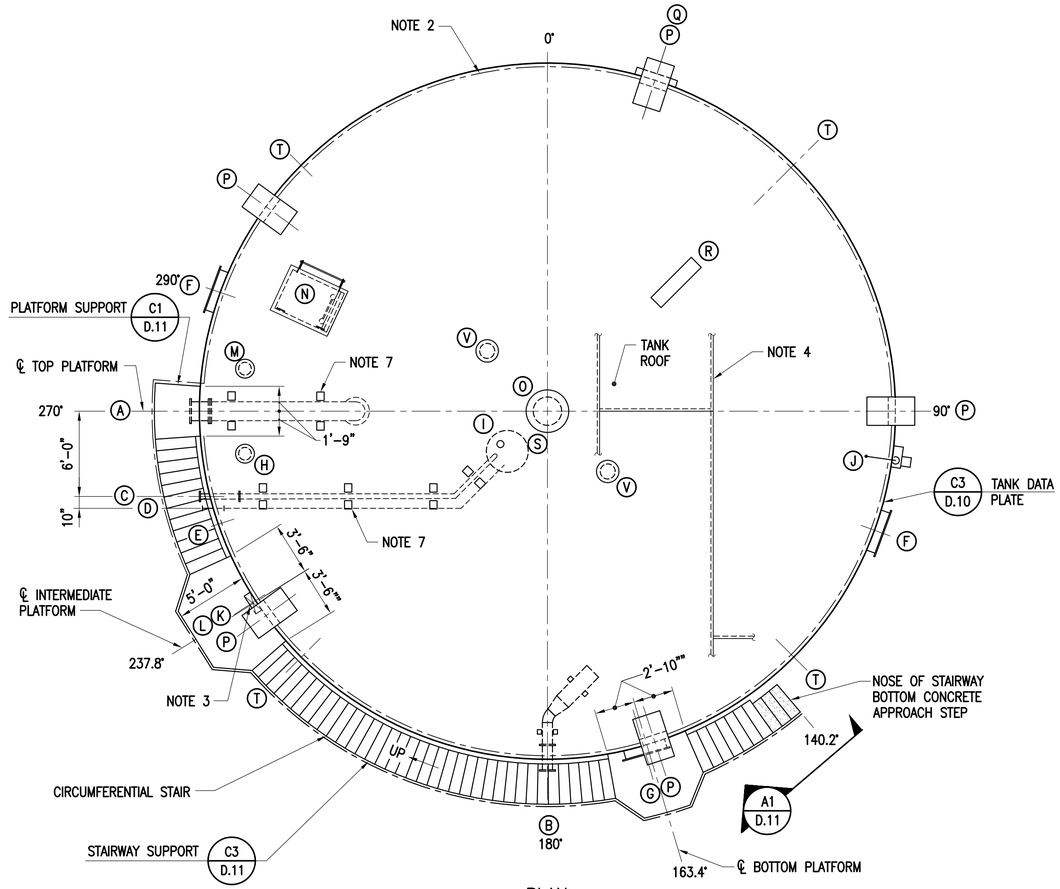
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

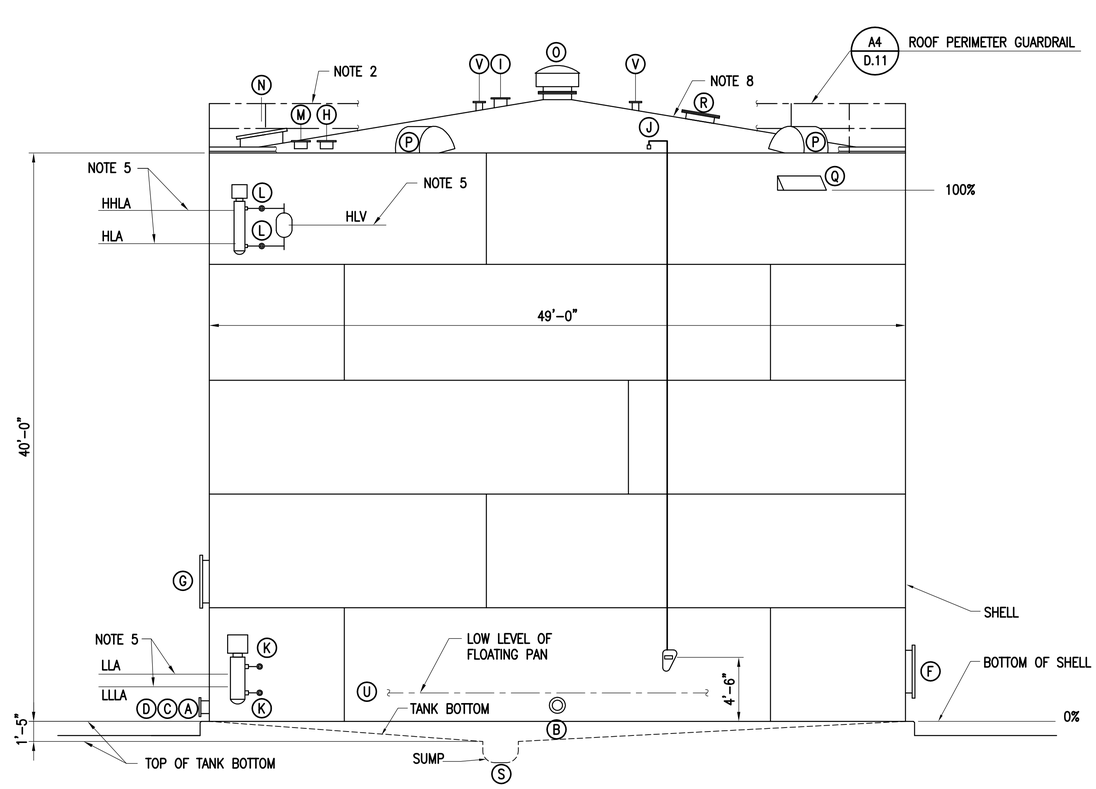
SHEET 9 OF 38

5.02

DRAWFORM REVISION: 10 MARCH 2009



PLAN



NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

ELEVATION

10K BBL TANK

SCALE: 3/16"=1'-0"

NOTES:

1. SEE NOZZLE/EQUIPMENT SCHEDULE ON SHEET 10.02 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"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE A ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):

3/16"=1'-0" 1' 0' 5' 10' 15'

SYM	DESCRIPTION	DATE	APPR

NAVFAC

SEAL

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A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO DRW: MHK CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

10K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

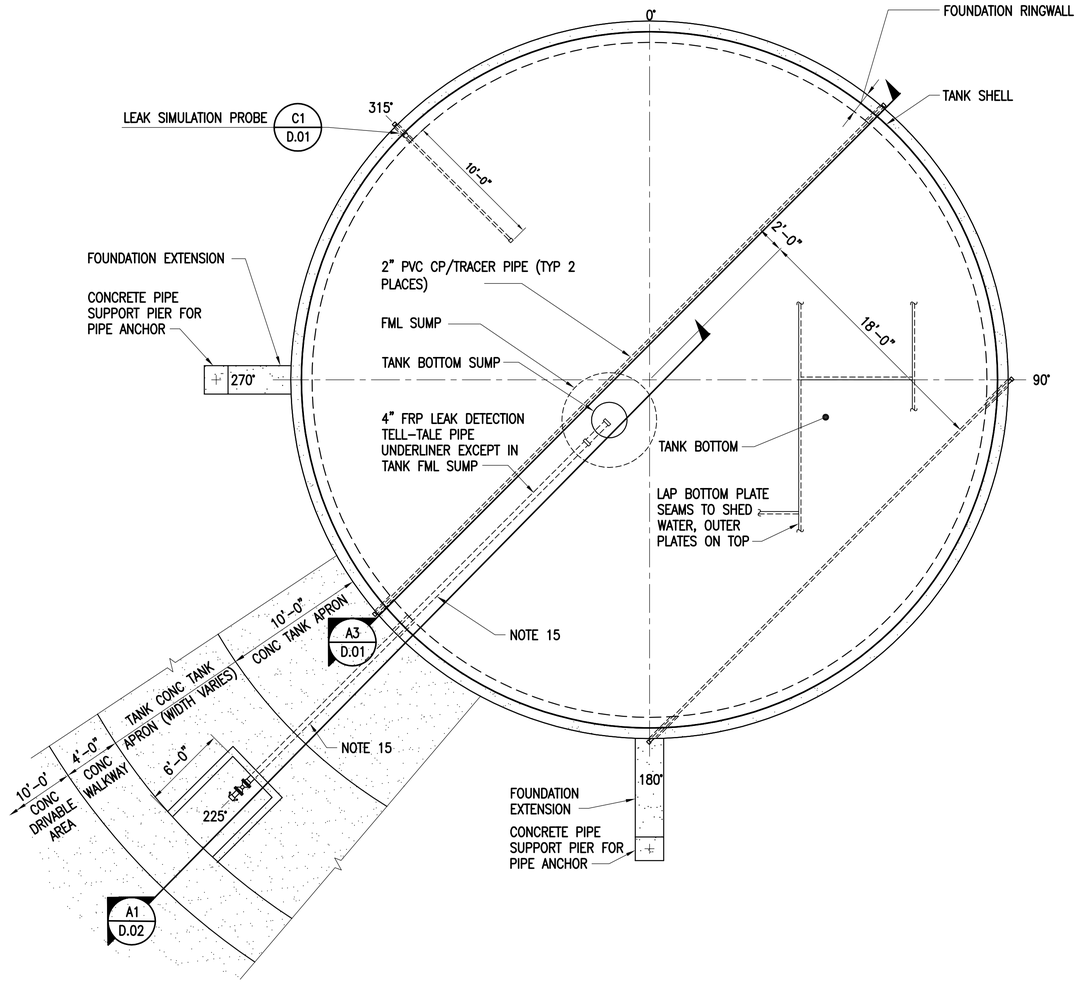
SHEET 10 OF 38

10.01

DRAWFORM REVISION: 10 MARCH 2009

10K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	16	270	1'–4 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	8	180	1'–1 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	1'–4 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–3 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	251	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	164	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	262	21'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	98	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	237	4'–8" 2'–7"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND HLV NOZZLES	1	237	35'–6" 33'–5"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	278	21'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	295	18'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	18 90 162 234 306	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENT	12 x 36	18	35'–8"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	45 135 225 315	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	2'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	



10K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 3/16"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

3/16"=1'–0" 0' 1' 5' 10' 16'

APPR | DATE | DESCRIPTION | SYM

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A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO DRW: MHK CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN NW 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

10K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED

EPROJECT NO.:

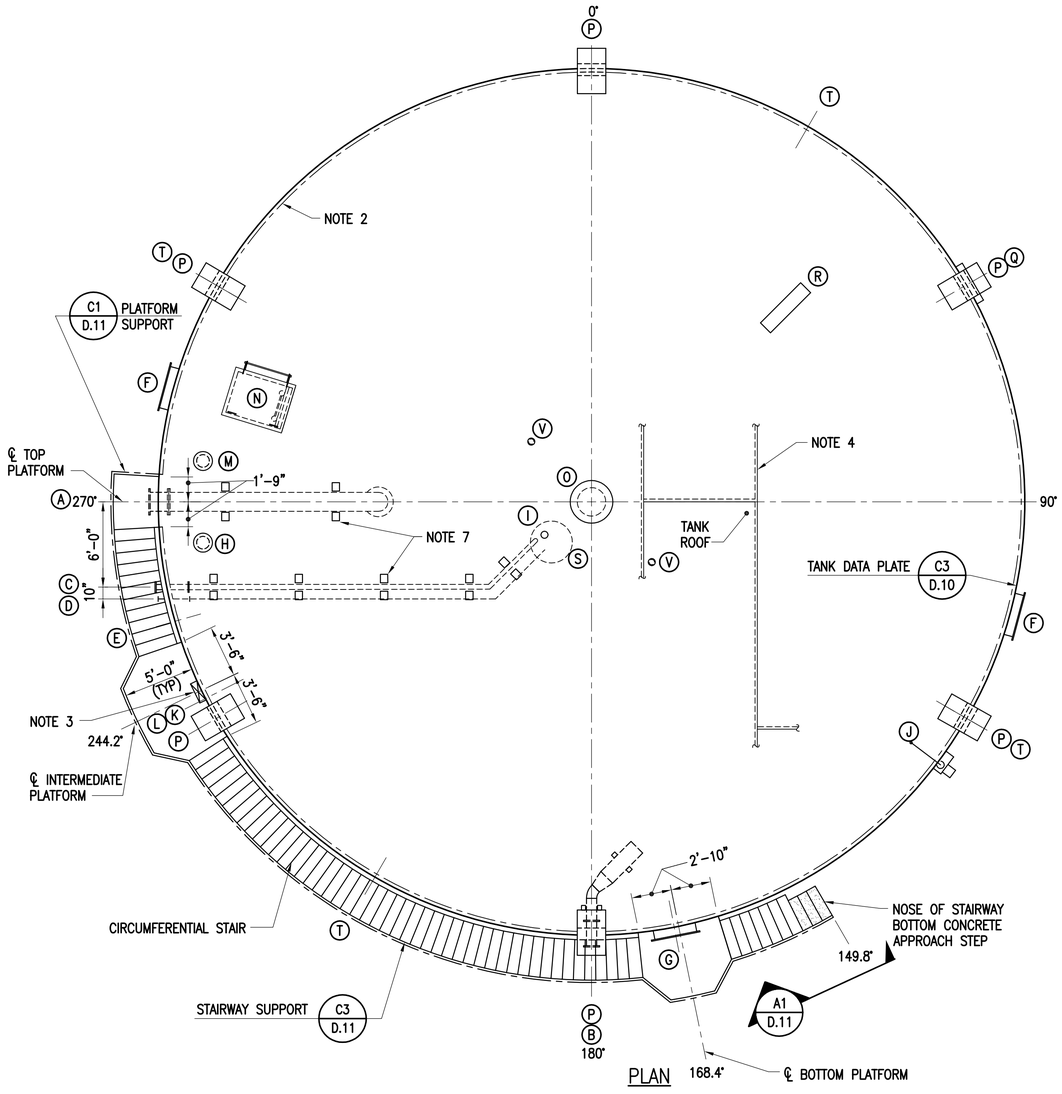
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

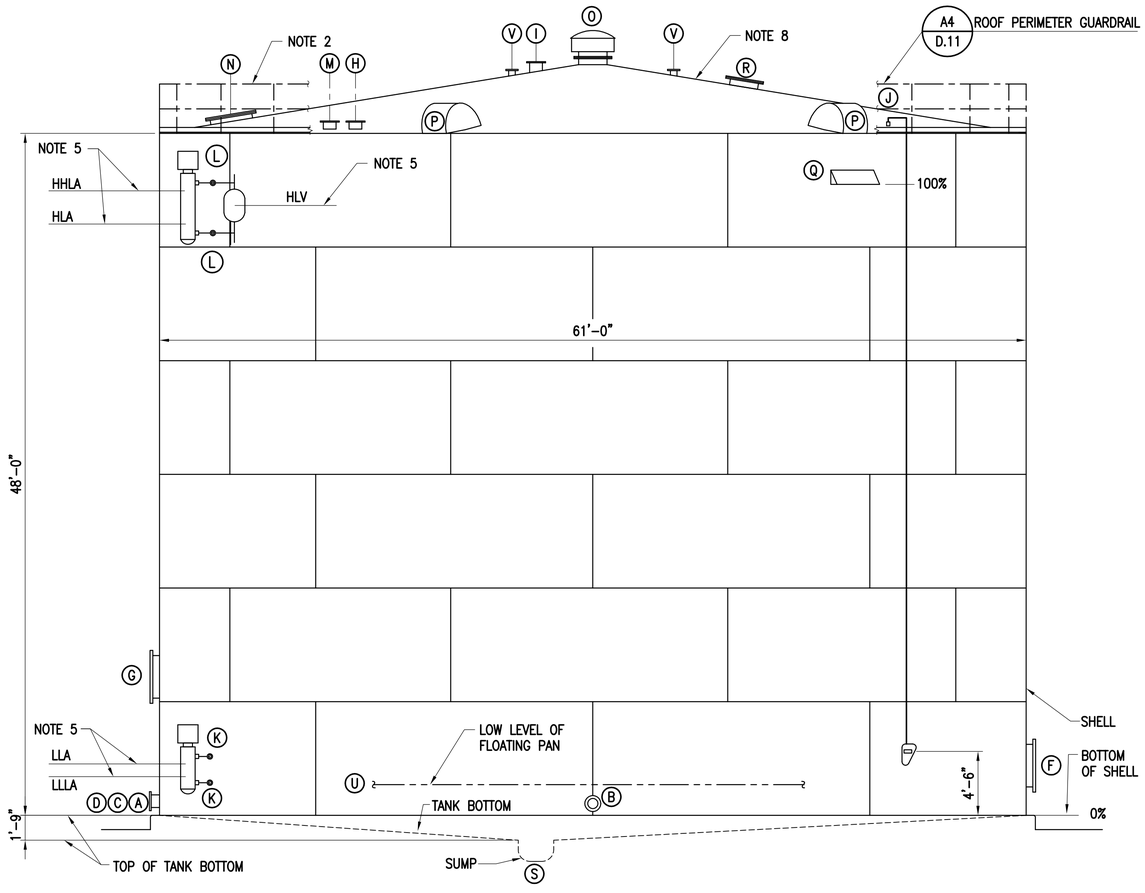
SHEET 11 OF 38

10.02

DRAWFORM REVISION: 10 MARCH 2009



PLAN



ELEVATION

NOTE:

CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 20.02 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"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE A ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

20K BBL TANK

SCALE: 3/16"=1'-0"

GRAPHIC SCALE(S):

3/16"=1'-0" 0' 5' 10' 16'

SYM	DESCRIPTION	DATE	APPR

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A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

20K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

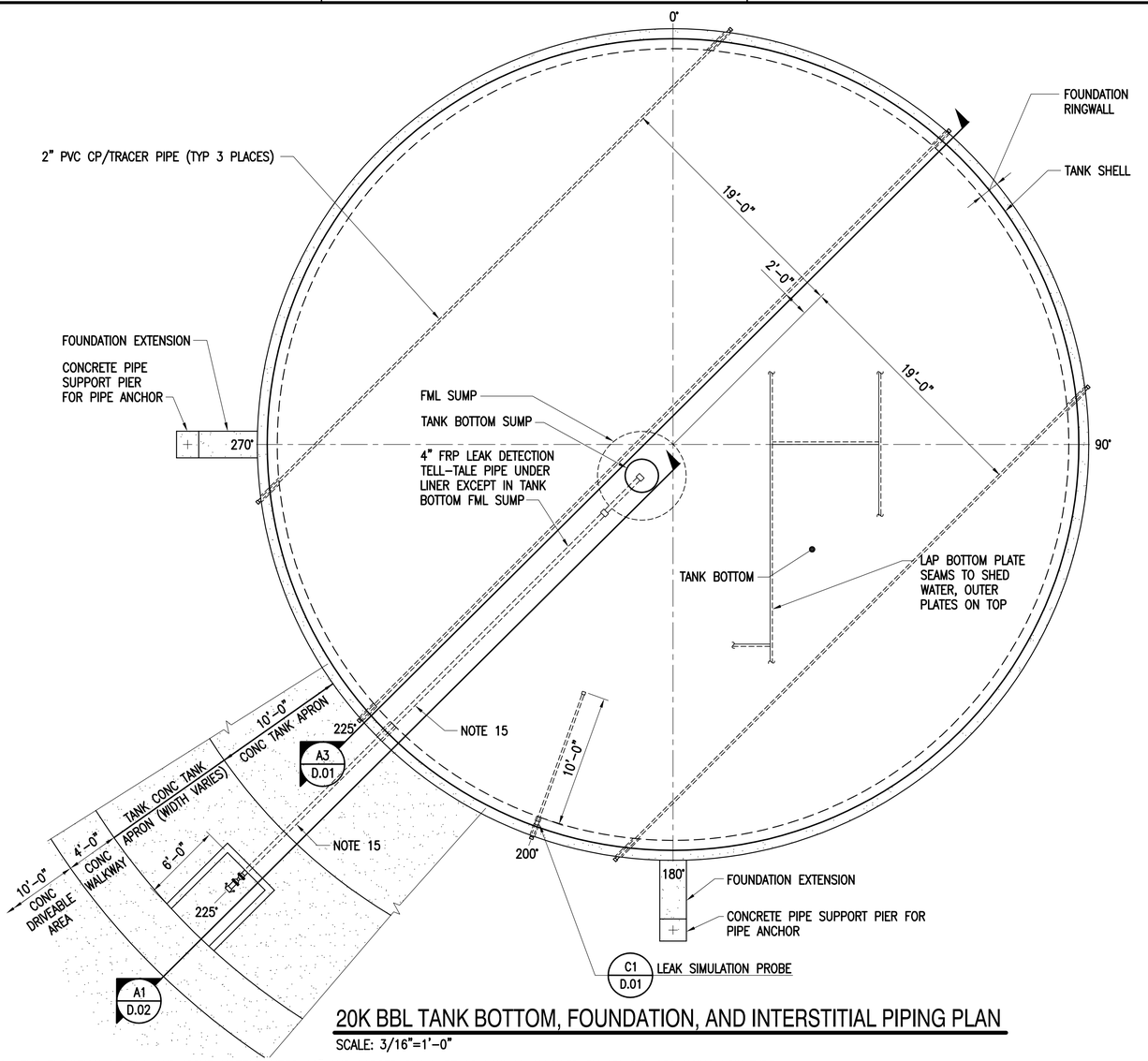
SHEET 12 OF 38

20.01

DRAWFORM REVISION: 10 MARCH 2009

20K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	16	270	1'–4 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	8	180	1'–1 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	1'–4 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–3 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	254	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	169	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	264	27'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	127	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	243	4'–2" 2'–6"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND HLV NOZZLES	1	243	43'–11" 41'–7"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	276	27'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	287	24'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	0 60 120 180 240 300	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENT	12 x 36	60	44'–4"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	30 120 210 300	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	2'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	



20K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 3/16"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

3/16"=1'–0" 0' 1' 5' 10' 16'

APPR | DATE | DESCRIPTION | SYM

NAVFAC

SEAL

Brockenbrough
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www.brockenbrough.com

A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO | DATE: DD/MM/YY

DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

20K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED

EPROJECT NO.:

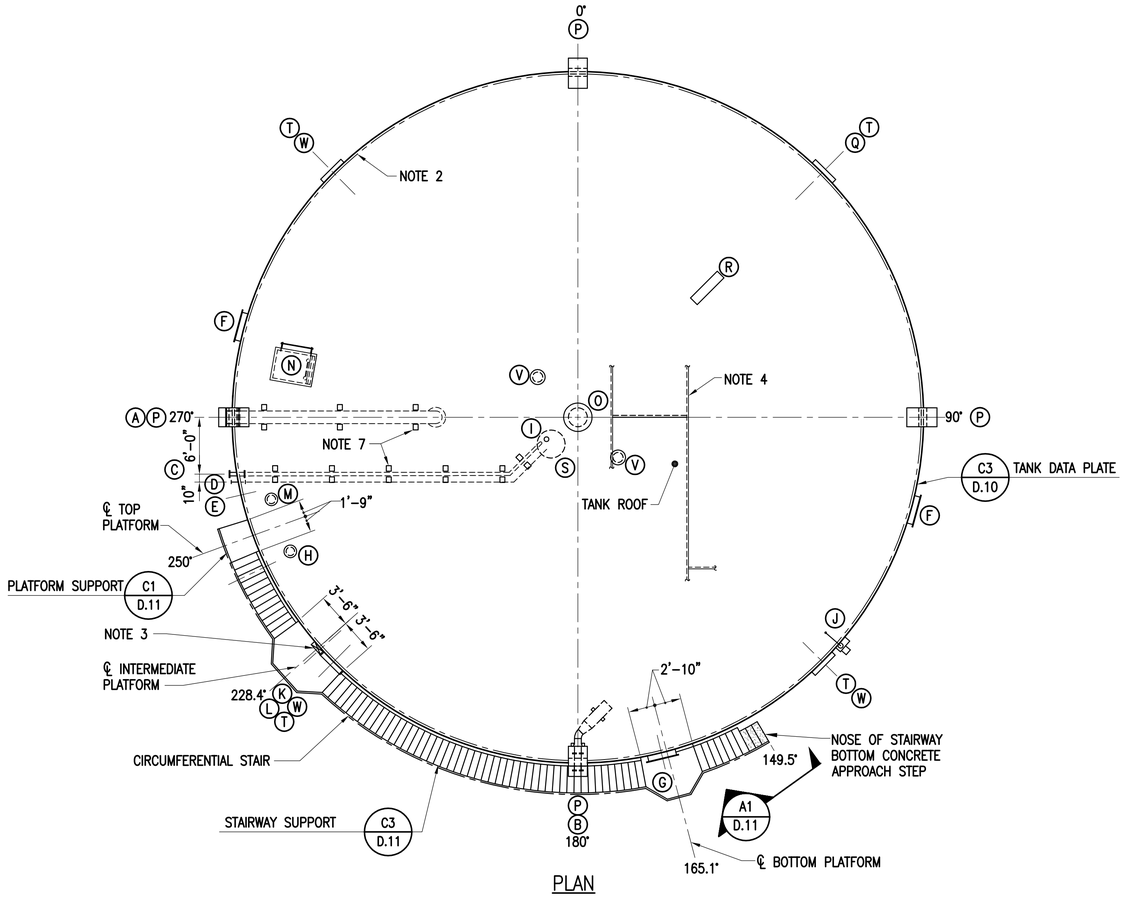
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

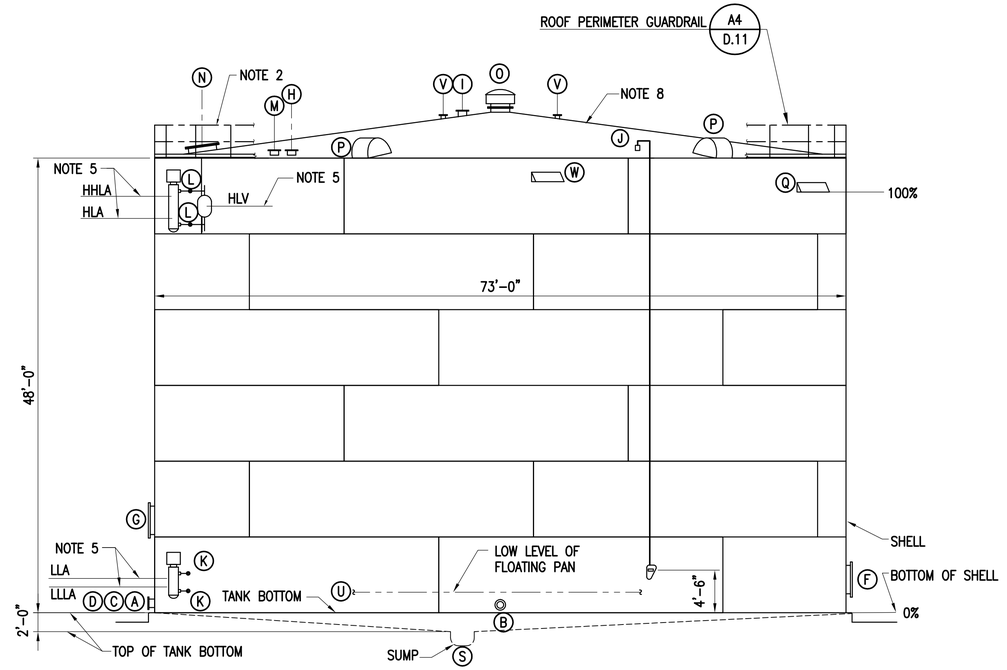
SHEET 13 OF 38

20.02

DRAWFORM REVISION: 10 MARCH 2009



PLAN



NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION, ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

ELEVATION

30K BBL TANK

SCALE: 1/8"=1'-0"

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 30.02 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"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE A ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):

1/8"=1'-0" 0' 5' 10' 15' 24'

SYM	DESCRIPTION	DATE	APPR

NAVFAC

SEAL

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A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY
XXXXX

SATISFACTORY TO	DATE	DD/MM/YY	
DES MSO	DRW MHK	CHK	WVB
<<PM/DM>>	XXXX		
BRANCH MANAGER	XX		
CHIEF ENG/ARCH	XXX		
DATE	OCTOBER 2011		

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

30K BBL TANK

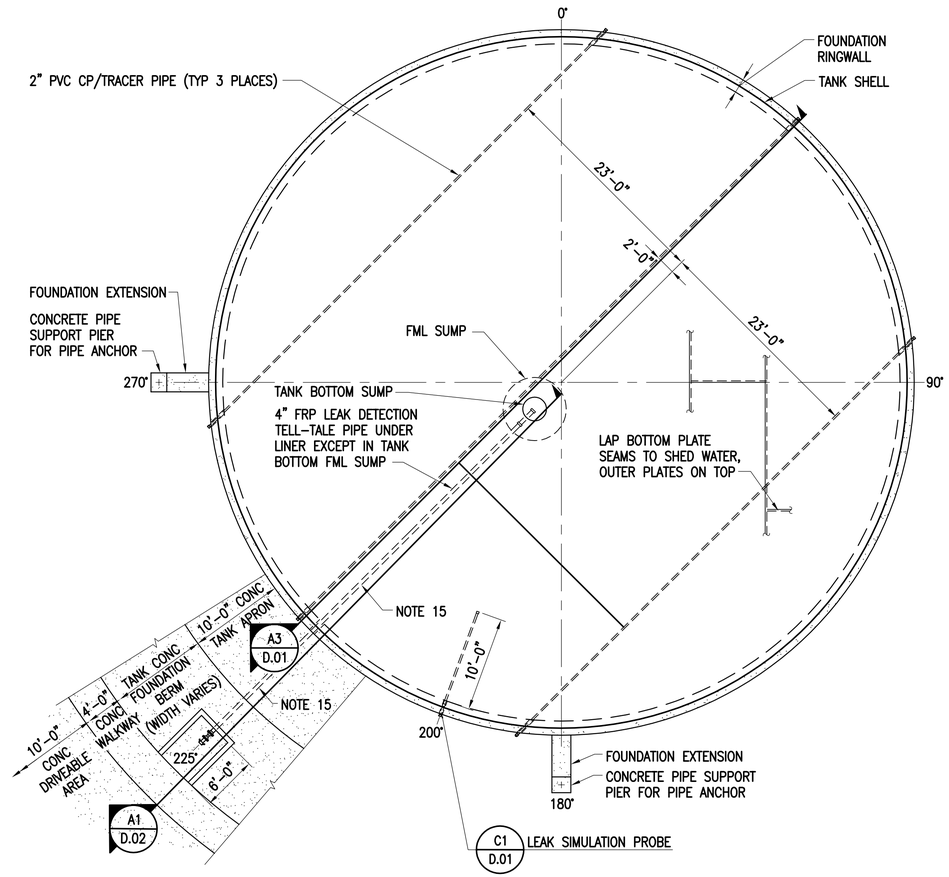
SCALE:	AS NOTED
EPROJECT NO.:	
CONSTR. CONTR. NO.	
NAVFAC DRAWING NO.	
SHEET	14 OF 38

30.01

DRAWFORM REVISION: 10 MARCH 2009

30K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	16	270	1'–4 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	8	180	1'–1 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	1'–4 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–3 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	257	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	166	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	245	33'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	131	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	228	3'–11" 2'–6"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND HLV NOZZLES	1	228	44'–1" 41'–9"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	255	33'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	280	30'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	0 90 180 270	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENT	12 x 36	45	44'–6"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCHES	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	45 225 135 315	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	2'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	
W	SHELL CIRCULATION VENTS	12 x 36	135 225 315	45'–6"	A4/D.07	NOTE 12



30K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 1/8"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

1/8"=1'–0" 0' 5' 10' 15' 24'

APPR | DATE | DESCRIPTION | SYM

NAVFAC

SEAL

Brockenbrough
ENGINEERING · CONSULTING
1011 Boulder Springs Drive, Suite 200 | Richmond, Virginia 23225
804.560.5600 main | 804.560.3901 fax
www.brockenbrough.com

A/E INFO

APPROVED
FOR COMMANDER NAVFAC
ACTIVITY
XXXXX
SATISFACTORY TO DATE DD/MM/YY
DES MSO DRW MHK CHK WVB
<<PM/DM>> XXXX
BRANCH MANAGER XX
CHIEF ENG/ARCH XXX
DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS
NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

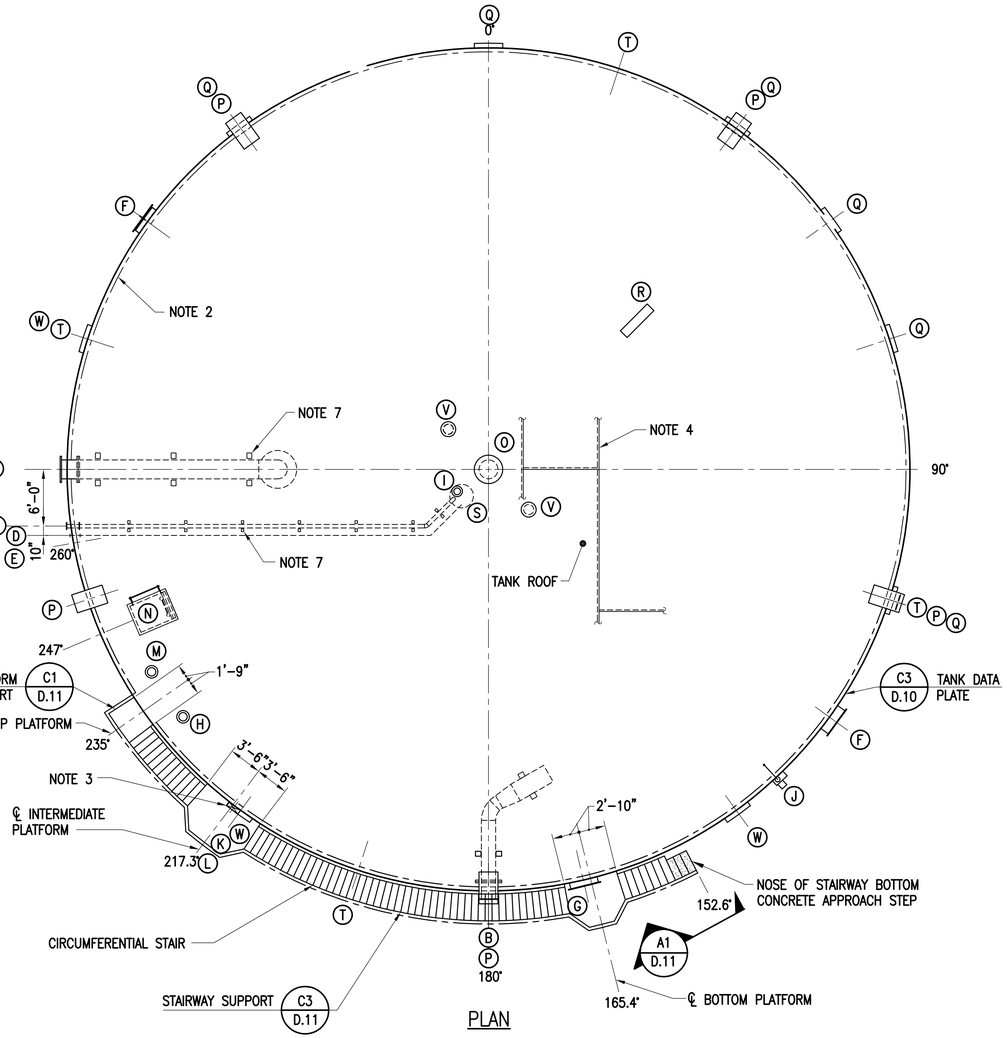
DOD STANDARD DESIGN AW 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

30K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

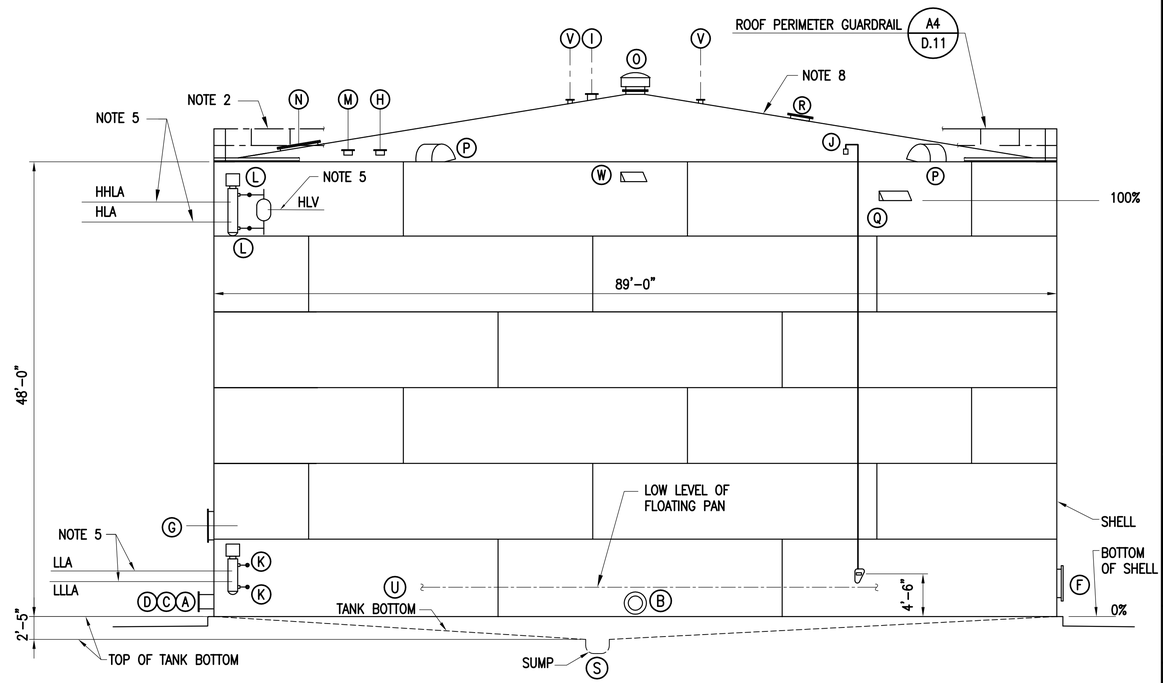
SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 15 OF 38

30.02

DRAWFORM REVISION: 10 MARCH 2009



PLAN



ELEVATION

NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION, ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

40K BBL TANK

SCALE: 1/8"=1'-0"

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 40.02 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"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE A ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):
1/8"=1'-0" 0' 5' 10' 15' 24'

APPR | DATE | DESCRIPTION | SYM

NAVFAC

SEAL

Kimley»Horn Brockenbrough
ENGINEERING · CONSULTING
1011 Boulder Springs Drive, Suite 200 | Richmond, Virginia 23225
804.560.3900 main | 804.560.3901 fax
www.brockenbrough.com

A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE DD/MM/YY

DES MSO | DRW MHK | CHK WVB

<<PM/DM>> XXXX

BRANCH MANAGER XX

CHIEF ENG/ARCH XXX

DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

40K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

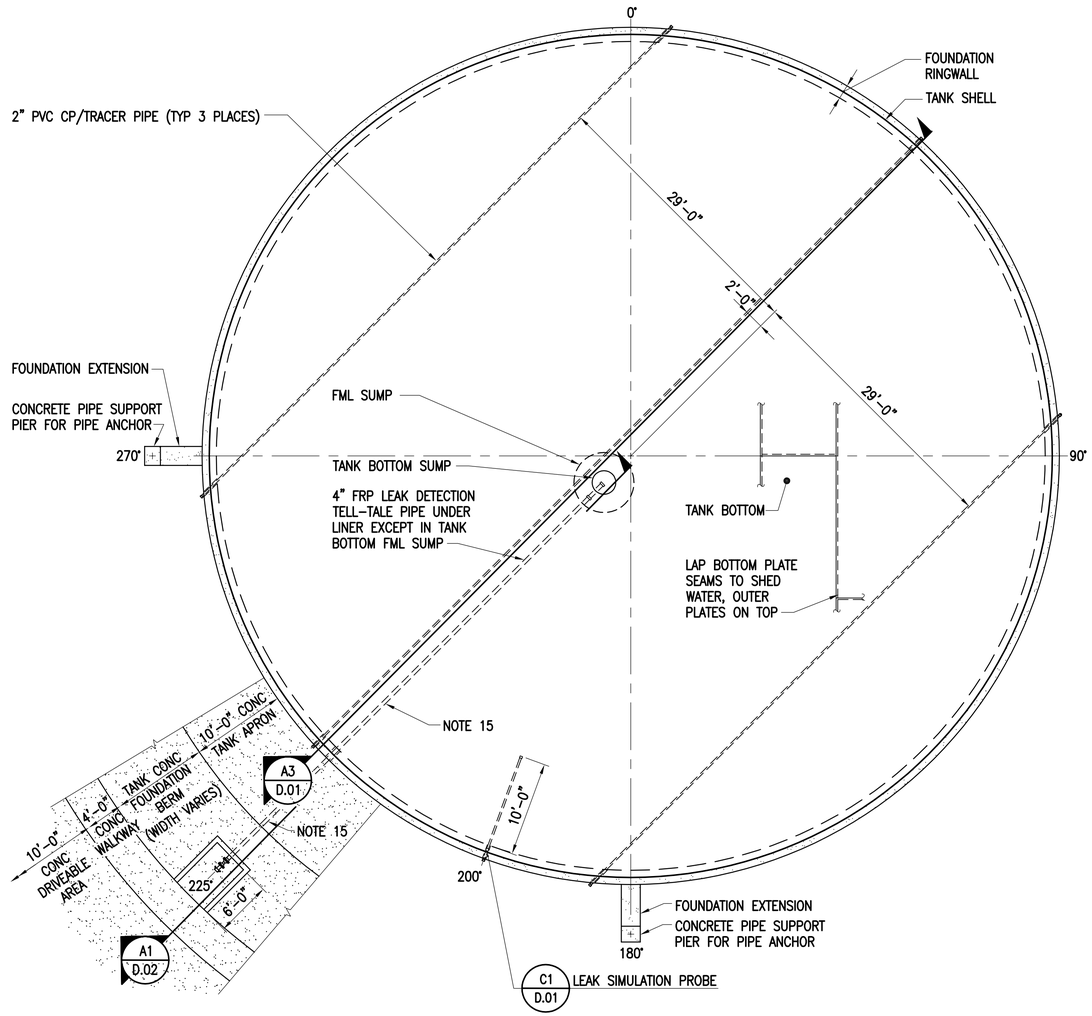
SHEET 16 OF 38

40.01

DRAWFORM REVISION: 10 MARCH 2009

40K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	24	270	2'–0 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	18	180	1'–6 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	2'–0 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–11 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	260	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	167	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	231	41'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	137	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	217	5'–4" 3'–7"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND LCV NOZZLES	1	217	43'–8" 41'–4"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	239	41'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	247	38'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	36 108 180 252 324	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENTS	12 x 36	0 36 54 72 108 324	44'–0"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	18 108 198 288	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	3'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	
W	SHELL CIRCULATION VENTS	–	144 216 288	52'–8"	A4/D.07	



40K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 1/8"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

1/8"=1'–0" 0' 5' 10' 15' 24'

APPR | DATE | DESCRIPTION | SYM

NAVFAC

SEAL

Kimley»Brockenbrough
ENGINEERING · CONSULTING
1011 Boulder Springs Drive, Suite 200 | Richmond, Virginia 23225
804.560.3600 main | 804.560.3601 fax
www.brockenbrough.com

A/E INFO

APPROVED
FOR COMMANDER NAVFAC
ACTIVITY
XXXXX
SATISFACTORY TO DATE DD/MM/YY
DES MSO DRW MHK CHK WVB
<CPM/DM>: XXXX
BRANCH MANAGER XX
CHIEF ENG/ARCH XXX
DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS
NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

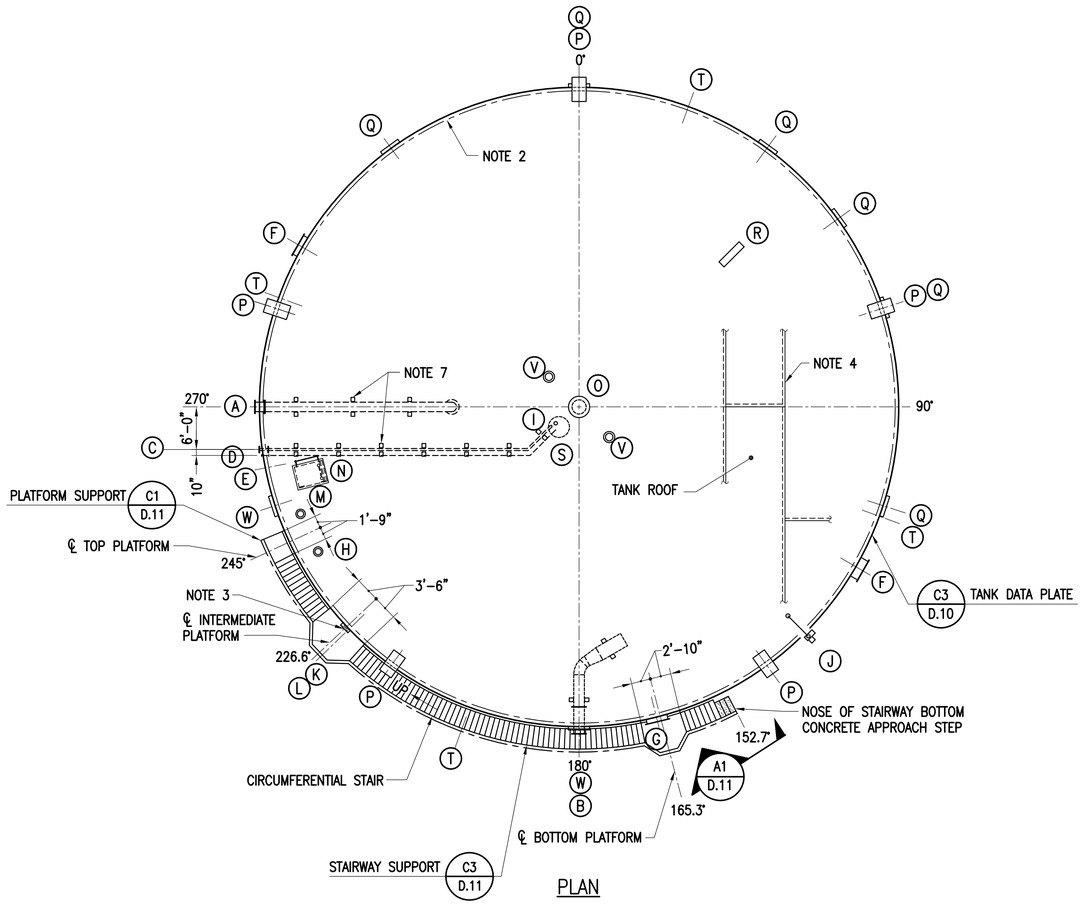
40K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 17 OF 38

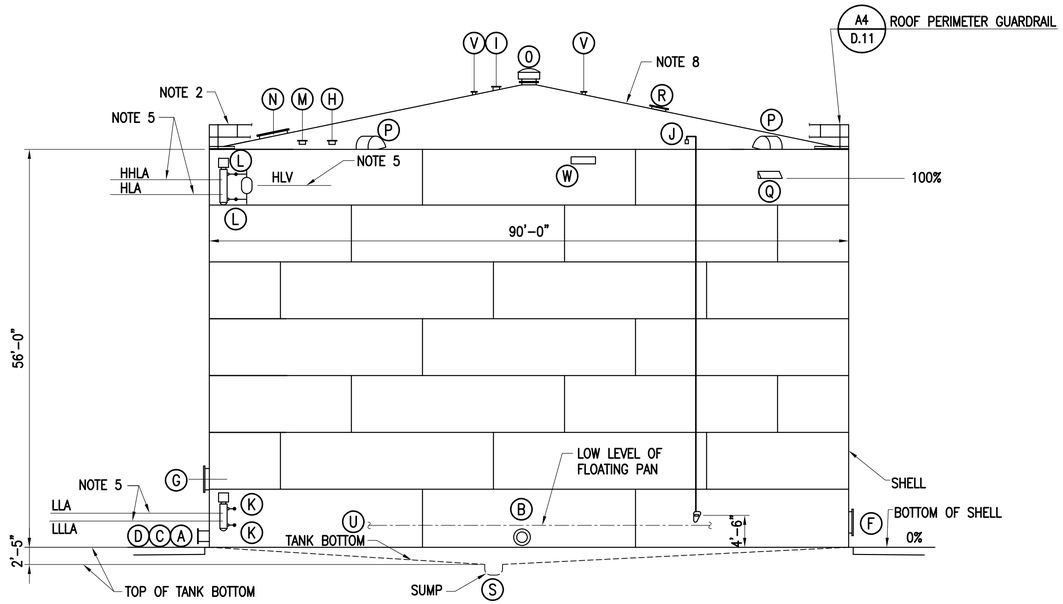
40.02

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\M\40.02 40K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN.dwg LAYOUT NAME: 40.02 40K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN PLOTTED: Thursday, October 06, 2011 – 2:38pm USER: Guest



PLAN



NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION, ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

ELEVATION

50K BBL TANK

SCALE: 3/32"=1'–0"

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 50.02 FOR SIZE, ELEVATION AND ORIENTATION OF NOZZLES AND APPURTENANCES.
2. PROVIDE GUARDRAIL ALL AROUND PERIMETER OF ROOF EXCEPT AT STAIRWAY PLATFORM.
3. PROVIDE 6"x18" OPENING IN INTERMEDIATE LANDING FOR PIPING AND CONDUIT.
4. LAP BOTTOM PLATE SEAMS TO SHED WATER (INNER PLATES ON TOP).
5. SEE LEVEL SET-POINT TABLE A3/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):

3/32"=1'–0" 0' 5' 10' 15' 32'

APPR	DATE	DESCRIPTION	SYM

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Brockenbrough
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1011 Boulder Springs Drive, Suite 200 | Richmond, Virginia 23225
804.560.3900 main | 804.560.3901 fax
www.brockenbrough.com

A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO DRW: MHK CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

50K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

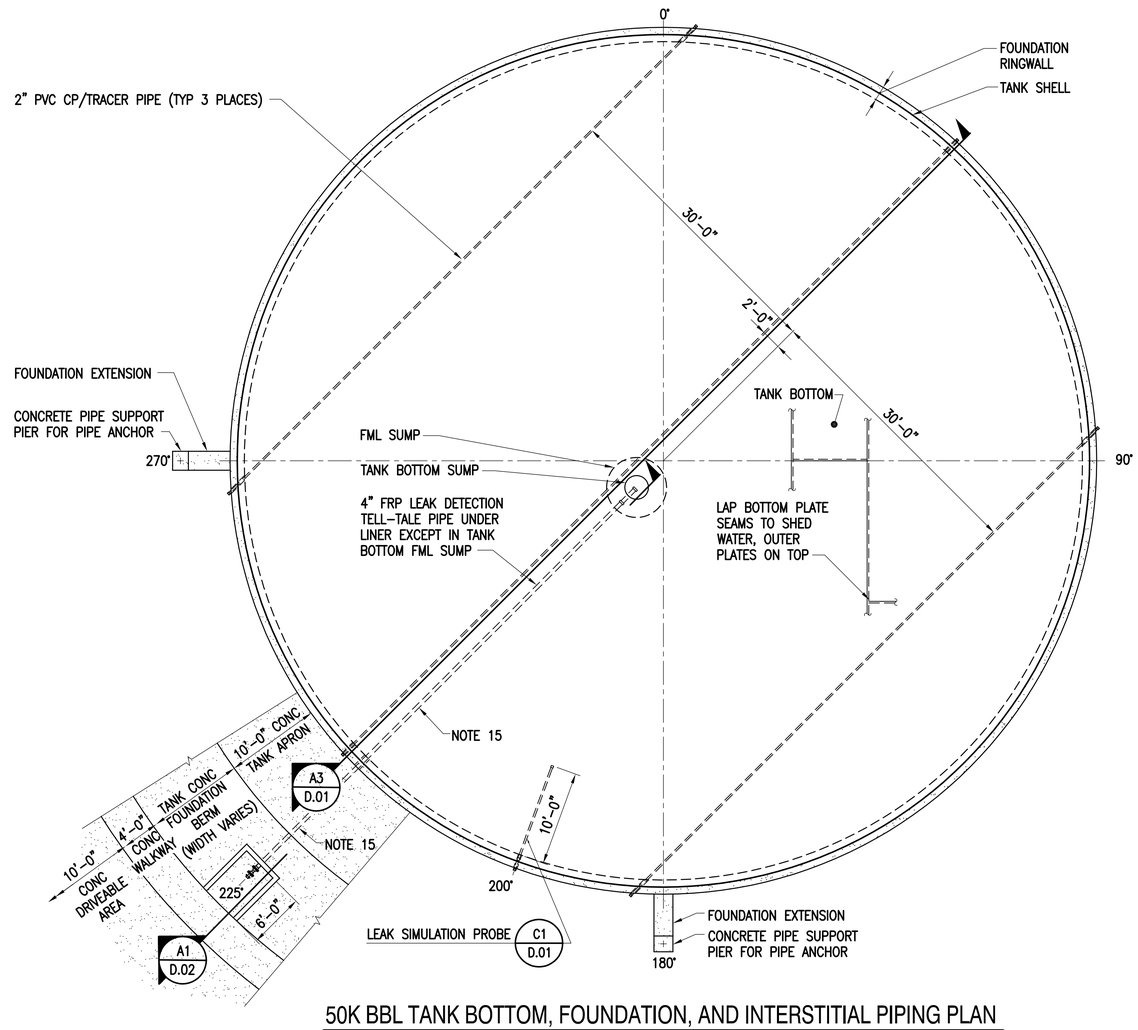
SHEET 18 OF 38

50.01

DRAWFORM REVISION: 10 MARCH 2009

50K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	24	270	2'–0 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	18	180	1'–6 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	2'–0 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–11 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	259	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	166	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	241	42'–0"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	135	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	226	5'–3" 3'–7"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND LCV NOZZLES	1	226	51'–5" 48'–10"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	249	42'–0"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	256	39'–0"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	0 72 144 216 288	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENTS	12 x 36	0 36 54 72 108 324	52'–0"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	20 110 200 290	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	3'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	
W	SHELL CIRCULATION VENTS	–	180 252	53'–0"	A4/D.07	NOTE 12



50K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 1/8"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

1/8"=1'–0" 0' 5' 10' 15' 24'

APPR | DATE | DESCRIPTION | SYM

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1011 Boulder Springs Drive, Suite 200 | Richmond, Virginia 23225
804.560.3900 main | 804.560.3901 fax
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A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

50K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

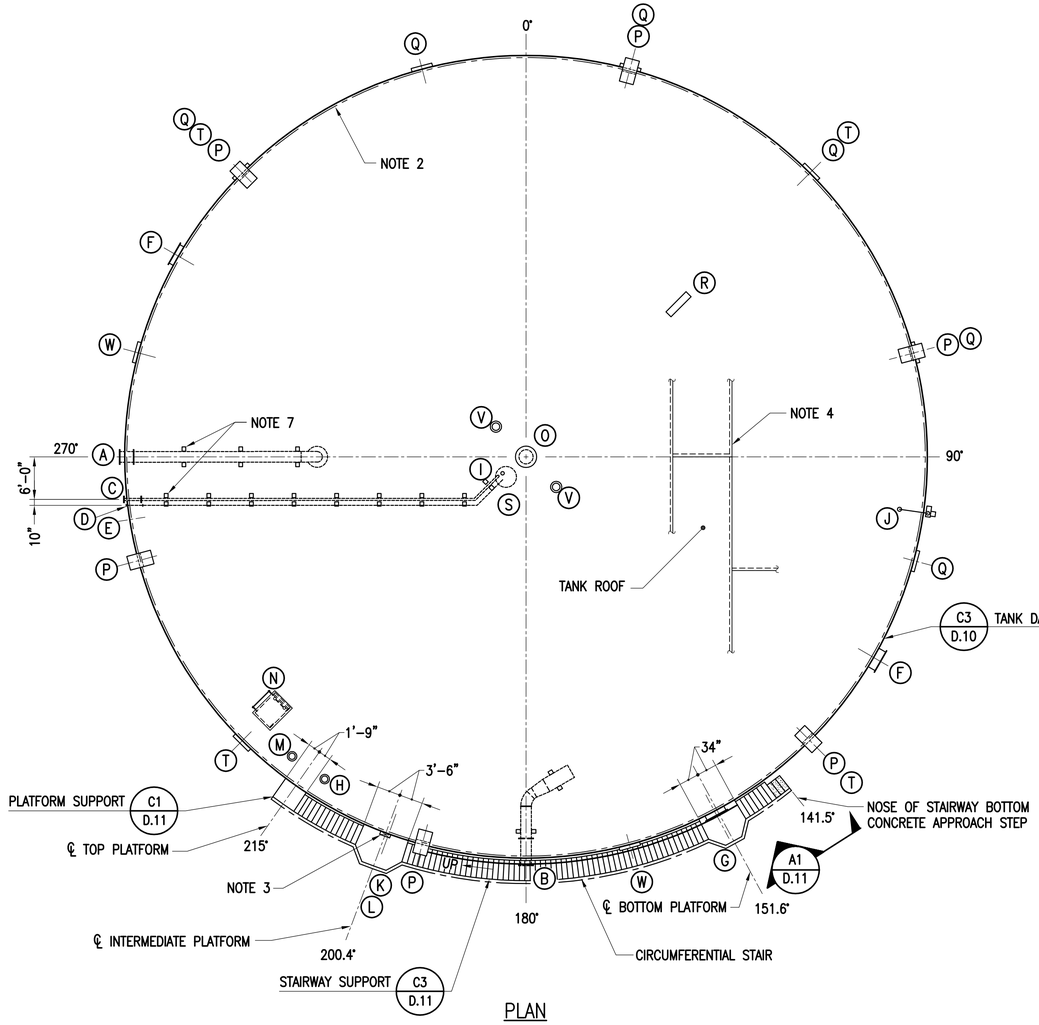
NAVFAC DRAWING NO.

SHEET 19 OF 38

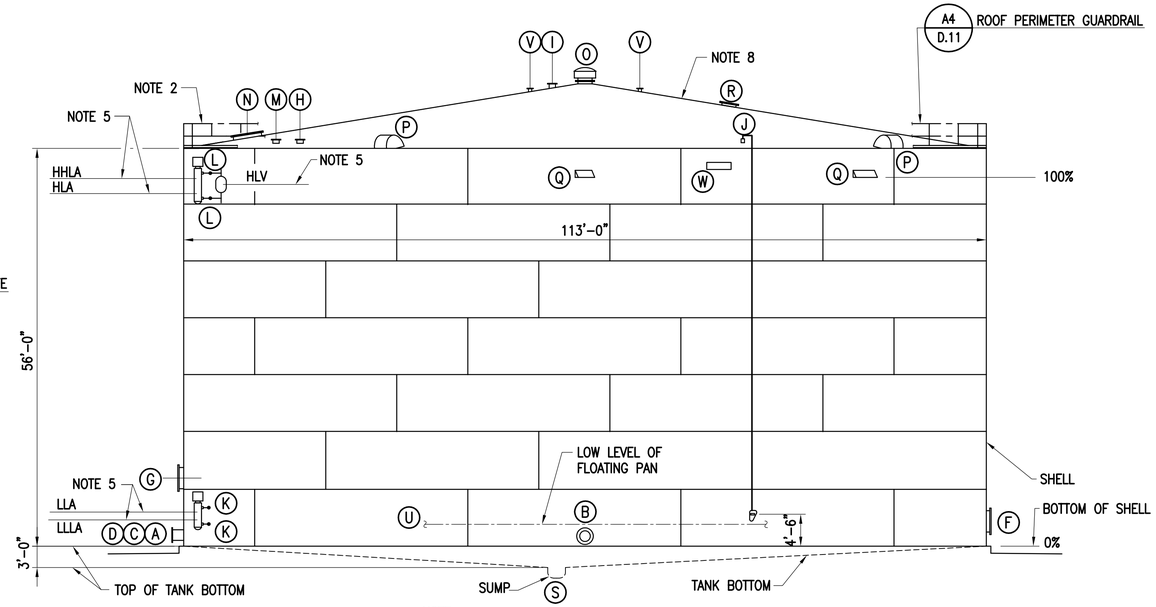
50.02

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\M\50.02 50K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN.dwg LAYOUT NAME: 50.02 50K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN PLOTTED: Thursday, October 06, 2011 – 2:38pm USER: Guest



PLAN



NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION, ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

ELEVATION

80K BBL TANK

SCALE: 3/32"=1'-0"

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 80.02 FOR SIZE, ELEVATION AND ORIENTATION OF NOZZLES AND APPURTENANCES.
2. PROVIDE GUARDRAIL ALL AROUND PERIMETER OF ROOF EXCEPT AT STAIRWAY PLATFORM.
3. PROVIDE 6"x18" OPENING IN INTERMEDIATE LANDING FOR PIPING AND CONDUIT.
4. LAP BOTTOM PLATE SEAMS TO SHED WATER (INNER PLATES ON TOP).
5. SEE LEVEL SET-POINT TABLE A3/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):
3/32"=1'-0" 0' 5' 10' 15' 32'

SYM	DESCRIPTION	DATE	APPR

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A/E INFO

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FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO	DATE	DD/MM/YY	
DES MSO	DRW MHK	CHK WVB	
<<PM/DM>>	XXXX		
BRANCH MANAGER	XX		
CHIEF ENG/ARCH	XXX		
DATE	OCTOBER 2011		

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

80K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 20 OF 38

80.01

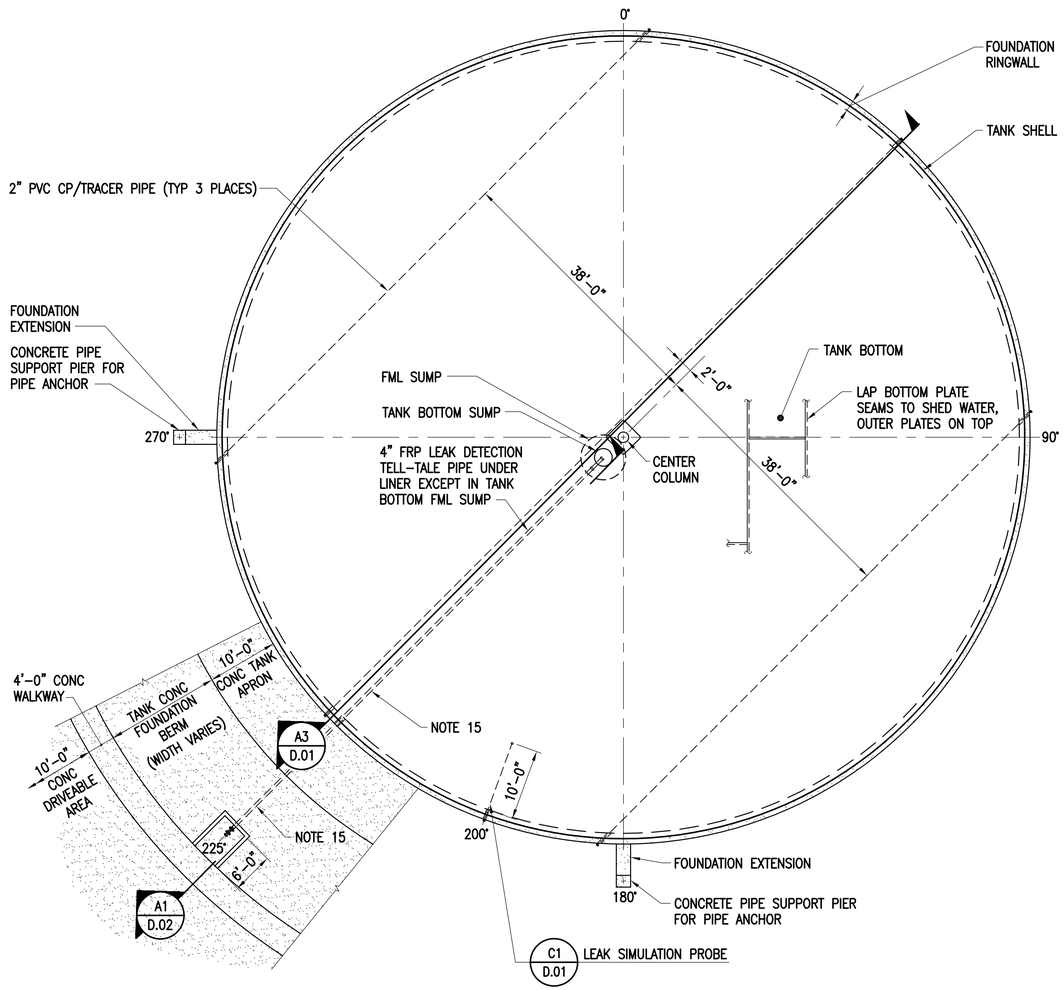
DRAWFORM REVISION: 10 MARCH 2009

80K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	24	270	2'–0 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	18	180	1'–6 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	2'–0 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–11 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	261	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	152	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	212	53'–6"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	98	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	200	4'–11" 3'–6"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM & HLV NOZZLES	1	200	51'–3" 48'–9"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	218	53'–6"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	225	50'–6"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	15 75 135 195 255 315	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENTS	12 x 36	15 45 75 105 315 345	51'–10"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	45 135 225 315	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	3'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	
W	SHELL CIRCULATION VENTS	12 x 36	165 285	52'–10"	A4/D.07	NOTE 12

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.



80K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 3/32"=1'–0"

10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
13. INSTALL LOW SUCTION AND WATER DRAW–OFF NOZZLES PARALLEL TO THE ISSUE NOZZLE.
14. ALL SHELL AND ROOF NOZZLES SHALL BE FLANGED UNLESS OTHERWISE INDICATED.
15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION AND INTERSTITIAL PIPING PLAN, SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

3/32"=1'–0" 0' 5' 10' 15' 32'

APPR | DATE | DESCRIPTION | SYM

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ACTIVITY
XXXXX
SATISFACTORY TO DATE DD/MM/YY
DES MSO | DRW MHK | CHK WB
<<PM/DM>> XXXX
BRANCH MANAGER XX
CHIEF ENG/ARCH XXX
DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS
NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

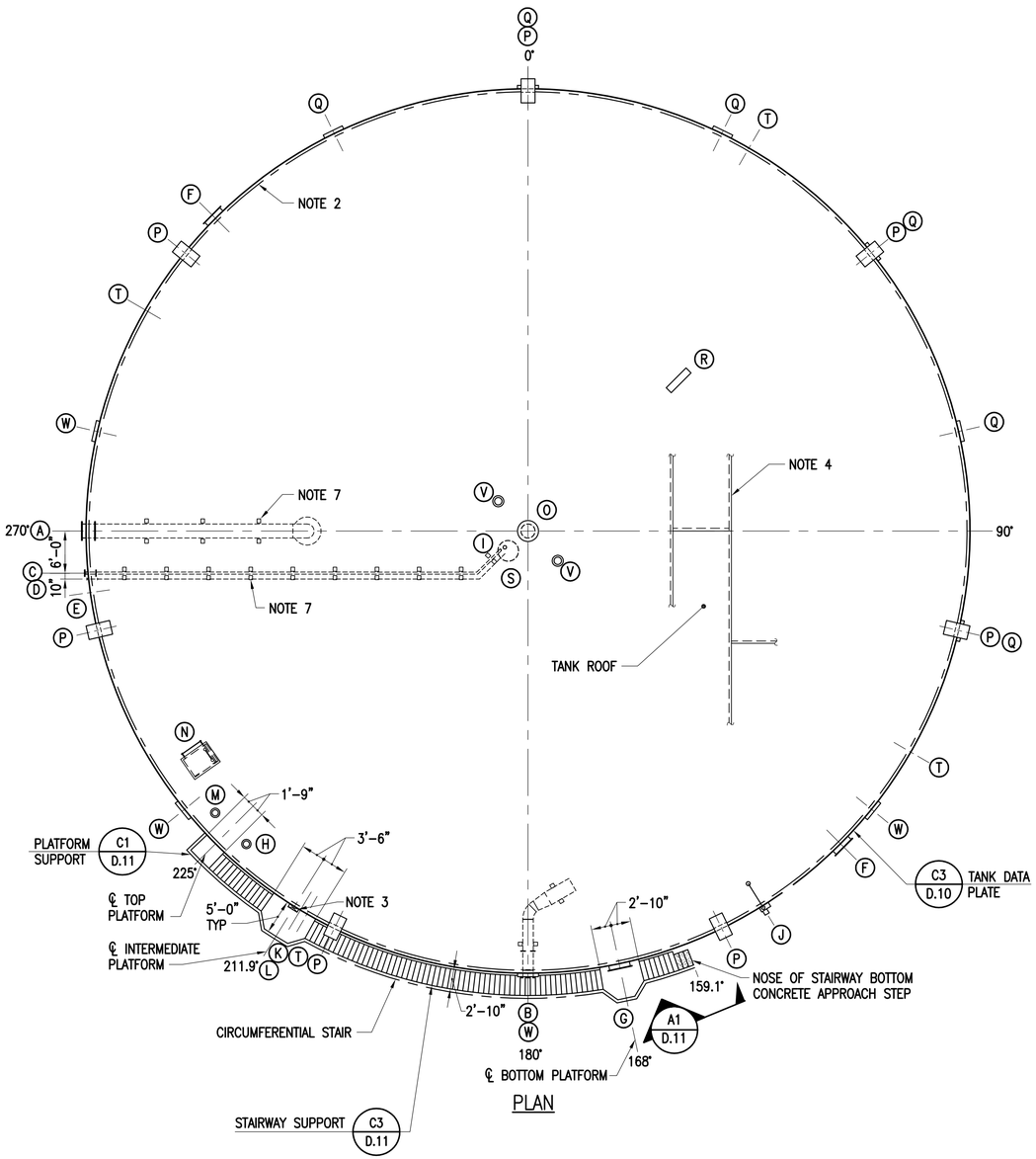
80K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 21 OF 38

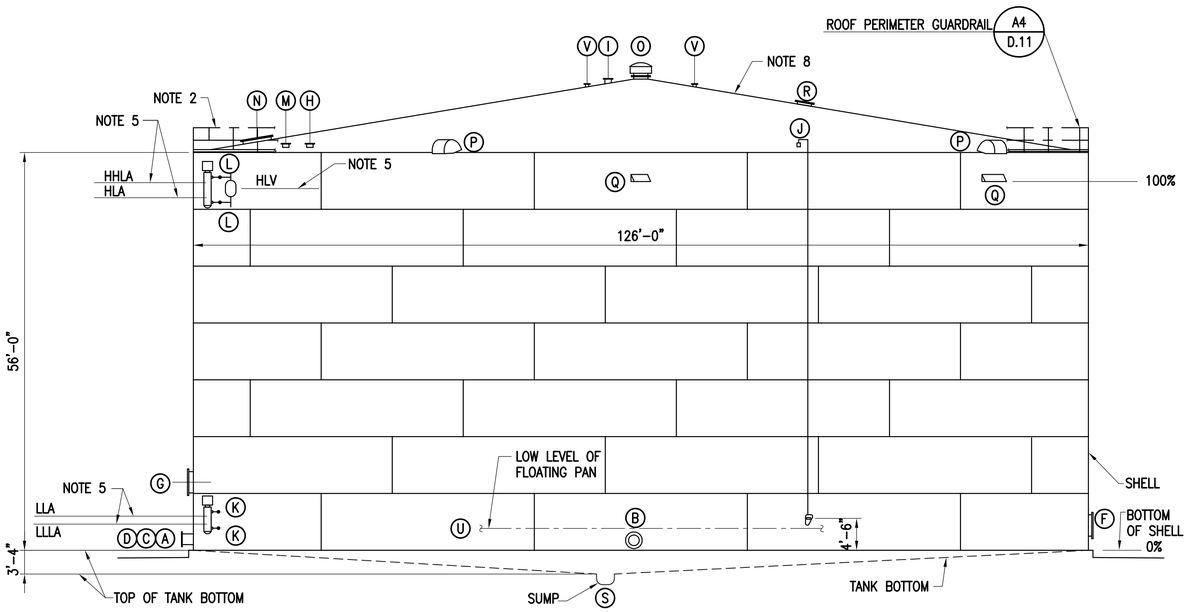
80.02

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\A\80.02 80K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN.dwg LAYOUT NAME: 80.02 80K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN PLOTTED: Thursday, October 06, 2011 – 2:38pm USER: Guest



PLAN



ELEVATION

NOTE:
CIRCUMFERENTIAL STAIRS NOT SHOWN FOR CLARITY. ITEMS SHOWN ON ELEVATION, ARE SHOWN WITHOUT REGARD TO ORIENTATION, SEE NOTE 1.

100K BBL TANK

SCALE: 3/32"=1'-0"

NOTES:

1. SEE NOZZLE EQUIPMENT SCHEDULE ON SHEET 100.02 FOR SIZE, ELEVATION AND ORIENTATION OF NOZZLES AND APPURTENANCES.
2. PROVIDE GUARDRAIL ALL AROUND PERIMETER OF ROOF EXCEPT AT STAIRWAY PLATFORM.
3. PROVIDE 6"x18" 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/D.12 FOR ELEVATIONS OF ALARMS AND CONTROLS.
6. RAFTERS NOT SHOWN FOR CLARITY.
7. SPACE INTERNAL PIPE SUPPORTS PER INTERIOR PIPE SUPPORT A4/D.08.
8. PROVIDE ROOF WITH SLOPE BETWEEN 1 1/2:12 AND 2:12.

GRAPHIC SCALE(S):
3/32"=1'-0" 0' 5' 10' 15' 32'

SYM	DESCRIPTION	DATE	APPR

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FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

SATISFACTORY TO DATE DD/MM/YY

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<<PM/DM>> XXXX

BRANCH MANAGER XX

CHIEF ENG/ARCH XXX

DATE OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

100K BBL TANK

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

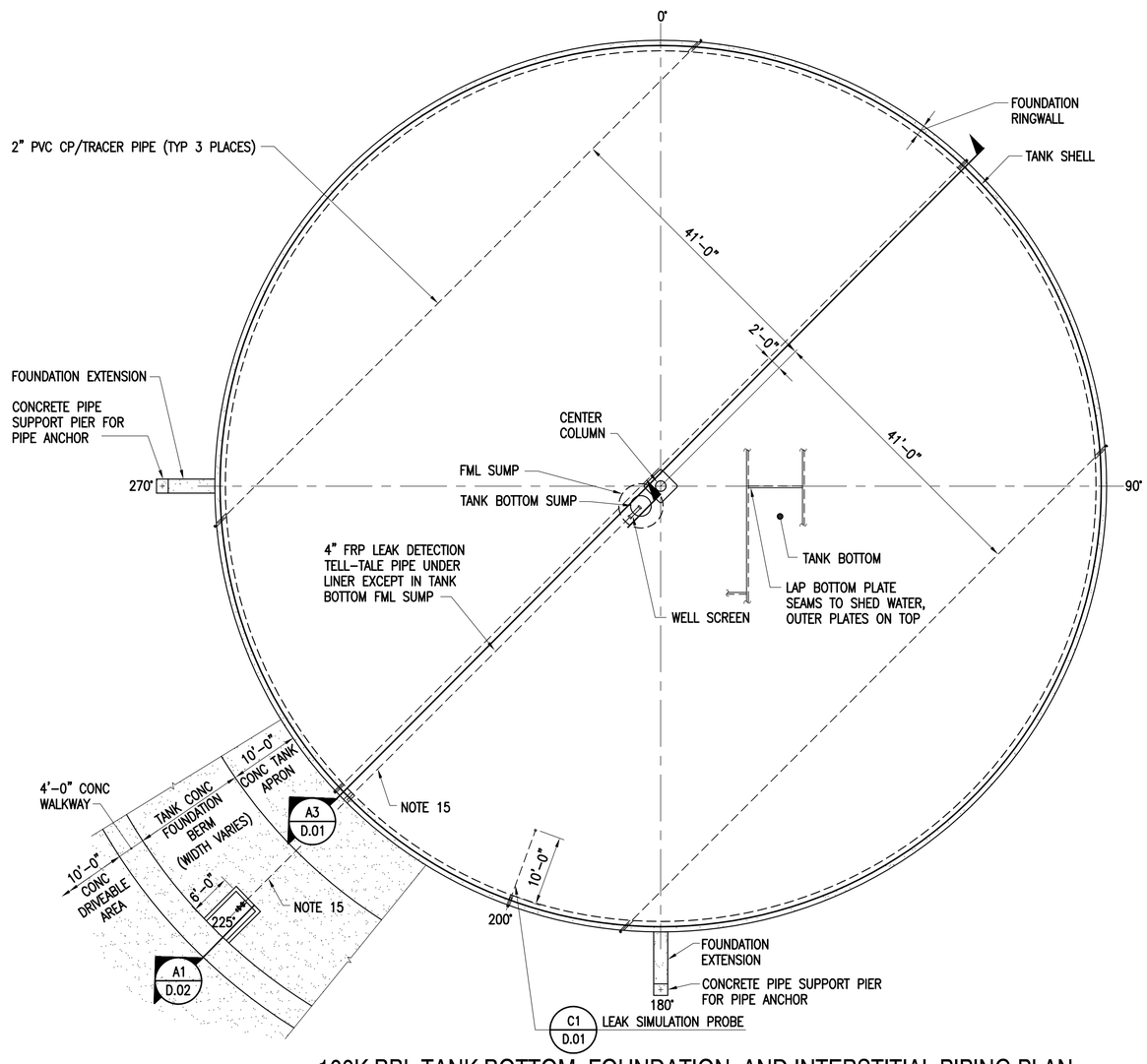
SHEET 22 OF 38

100.01

DRAWFORM REVISION: 10 MARCH 2009

100K BBL TANK NOZZLE/EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	SIZE (INCHES)	ANGLE (DEGREES)	DISTANCE (NOTE 1)	DETAIL (DETAIL/SHEET SHOWN)	NOTES
A	ISSUE	24	270	2'–0 3/4"	A1/D.08	NOTES 4, 5, 10
B	FILL	18	180	1'–6 3/4"	C1/D.08	NOTES 4, 5, 10
C	LOW SUCTION	4	–	2'–0 3/4"	A3/D.07, C1/D.10	NOTES 5, 13
D	WATER DRAW–OFF	2	–	1'–11 3/4"	A3/D.07, C1/D.10, A1/D.13	NOTES 9, 13
E	PRODUCT RETURN	2	262	7"	A1/D.13	
F	SHELL MANHOLES (LOWER)	36	–	3'–6"	C4/D.10, A4/D.10	NOTES 2, 17
G	SHELL MANHOLE (UPPER)	36	168	9'–9"	C4/D.10, A4/D.10	NOTES 6, 17
H	ATG GAUGE WELL	10	222	60'–0"	A1/D.07	NOTE 16
I	ATG WATER PROBE WELL	8	235	4'–0 1/2"	C4/D.07	NOTE 8
J	MECHANICAL TAPE LEVEL GAUGE	1 1/2	148	–	C1/D.07	
K	LOW & LOW–LOW LEVEL ALARM NOZZLES	1	211	4'–10" 3'–6"	C1/D.12	
L	HIGH & HIGH–HIGH LEVEL ALARM AND LCV NOZZLES	1	211	51'–5" 48'–10"	C3/D.12	NOTE 7
M	SAMPLE GAUGE WELL	10	228	60'–0"	C3/D.07	NOTE 16
N	ROOF MANHOLE/LADDER HATCH	36 x 48	235	57'–0"	A1/D.09	
O	CENTER ROOF VENT	24	–	–	C4/D.09	
P	CIRCULATION VENT/INSPECTION HATCHES	18 x 24	0 51 103 154 206 257 309	–	C1/D.09	
Q	OVERFLOW/CIRCULATION VENTS	12 x 36	0 26 51 77 103 334	52'–0"	A4/D.07	NOTE 12
R	PAN INSTALLATION HATCH	–	45	–	–	NOTE 3
S	SUMP	30	225	4'–0"	A3/D.07	
T	GROUNDING LUGS	3 x 3 x 3/8	30 120 210 300	1'–0"	A1/D.14	
U	FLOATING PAN LOW LEG LEVEL	–	–	3'–11"	–	NOTE 11
V	SCAFFOLD CABLE SUPPORTS	–	135 315	6'–0"	–	
W	SHELL CIRCULATION VENTS	12x36	129 180 231 283	53'–0"	A4/D.07	NOTE 12



100K BBL TANK BOTTOM, FOUNDATION, AND INTERSTITIAL PIPING PLAN

SCALE: 3/32"=1'–0"

NOTES:

1. DISTANCE VALUES SHOWN ON TABLE FOR SHELL NOZZLES ARE AS MEASURED FROM THE BOTTOM OF THE SHELL TO THE CENTERLINE OF SHELL NOZZLES. DISTANCE VALUES SHOWN ON TABLE FOR ROOF NOZZLES ARE AS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF ROOF NOZZLES. DISTANCE VALUE SHOWN ON TABLE FOR TANK BOTTOM SUMP IS MEASURED FROM THE CENTER OF THE TANK TO THE CENTERLINE OF THE SUMP.
2. ALIGN LOWER SHELL MANHOLES 180° APART AND PARALLEL WITH PREVAILING WINDS.
3. PROVIDE A PAN INSTALLATION HATCH ON THE FIXED ROOF IN ACCORDANCE WITH THE PAN MANUFACTURER'S REQUIREMENTS.
4. SIZE OF FILL AND ISSUE NOZZLES AND PIPING MUST BE DETERMINED BY THE DESIGNER. REFER TO UFC 3–460–01 FOR DESIGN FLOWRATES WHEN SIZING TANK PIPING.
5. ADJUST SIZE OF FILL, ISSUE AND LOW SUCTION NOZZLES TO SUIT SITE CONDITIONS SUCH AS DISTANCE TO PUMPS AND OPERATIONAL REQUIREMENTS.
6. LOCATE UPPER SHELL MANHOLE 3'–6" ABOVE UPPER SURFACE OF FLOATING PAN AT HIGH LEG POSITION.
7. HIGH LEVEL SHUT–OFF VALVE FLOAT PILOT ASSEMBLY, AS WELL AS HIGH AND HIGH–HIGH LEVEL ALARM SENSORS, SHALL BE ACCESSIBLE FROM SPIRAL STAIRWAY INTERMEDIATE PLATFORM.
8. MOUNT THE 6" ATG WATER PROBE WELL OVER THE TANK BOTTOM SUMP THROUGH AN 8" FLANGED ROOF NOZZLE PER THE INDICATED DETAILS.
9. THE 2" WATER DRAW–OFF NOZZLE SHOWN IN THIS STANDARD IS BASED ON THE SMALLEST DOUBLE BLOCK AND BLEED VALVE AVAILABLE AT THE TIME THIS STANDARD WAS WRITTEN. FOR TANKS THAT ARE EXPECTED TO RECEIVE A MINIMUM AMOUNT OF WATER AND EXPECTED TO PRODUCE MINIMUM CONDENSATE, PROVIDE INTERNAL WATER DRAW–OFF PIPING REDUCED TO 1" SIZE NEAR THE INTERNAL NOZZLE FLANGE TO LIMIT THE AMOUNT OF WATER THAT IS RETAINED IN THE INTERNAL PIPING.
10. THE ELEVATION OF FILL AND ISSUE NOZZLE SIZES 12" AND LARGER SHALL BE AS LOW AS ALLOWED BY API STD 650 USING LOW TYPE REINFORCING PLATES. FILL AND ISSUE NOZZLE SIZES SMALLER THAN 12" SHALL BE AS LOW AS ALLOWED BY API STD 650 USING REGULAR TYPE REINFORCING PLATES.
11. FLOATING PAN LOW–LEG LEVEL SHALL PROVIDE A MINIMUM OF 6" CLEARANCE FROM THE TOP OF ANY INTERNAL NOZZLE FLANGE TO THE BOTTOM OF THE FLOATING PAN.
12. PROVIDE AT LEAST ONE OVERFLOW FOR EVERY 1200 GPM OF RECEIPT. DO NOT LOCATE OVERFLOWS OVER STAIRS OR SHELL NOZZLE ISOLATION VALVES. WHERE THE PATTERN OF ROOF PERIMETER CIRCULATION VENTS WOULD RESULT IN AN OVERFLOW/CIRCULATION VENT OVER PRODUCT PIPING OR THE STAIRWAY, PROVIDE A SHELL CIRCULATION VENT CONSTRUCTED SIMILAR TO AN OVERFLOW CIRCULATION VENT BUT 1'–0" HIGHER IN ELEVATION AT THAT LOCATION AND ENSURE THE REMAINING OVERFLOWS ARE ADEQUATE.
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15. INTERSTITIAL PIPING FOR ELEVATED TANK FOUNDATION IS SHOWN, FOR NON–ELEVATED TANK BOTTOM, FOUNDATION AND INTERSTITIAL PIPING PLAN SEE SEE B3/D.01.
16. MOUNT THE 8" ATG AND SAMPLE GAUGE WELLS THROUGH 10" FLANGED ROOF NOZZLES PER THE INDICATED DETAILS.
17. THE MAXIMUM DISTANCE FROM THE SHELL MANHOLE REINFORCING PLATE TO THE BACKSIDE OF THE MANHOLE FLANGE, AS MEASURED HORIZONTALLY ON THE VERTICAL CENTERLINE, SHALL NOT BE MORE THAN 6".

GRAPHIC SCALE(S):

3/32"=1'–0" 0' 5' 10' 15' 32'

APPR | DATE | DESCRIPTION | SYM

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A/E INFO

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FOR COMMANDER NAVFAC

ACTIVITY: XXXXX

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DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78–24–27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

100K BBL TANK NOZZLE SCHEDULE & INTERSTITIAL PIPING PLAN

SCALE: AS NOTED

EPROJECT NO.:

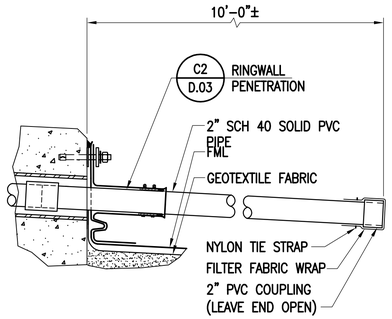
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 23 OF 38

100.02

DRAWFORM REVISION: 10 MARCH 2009

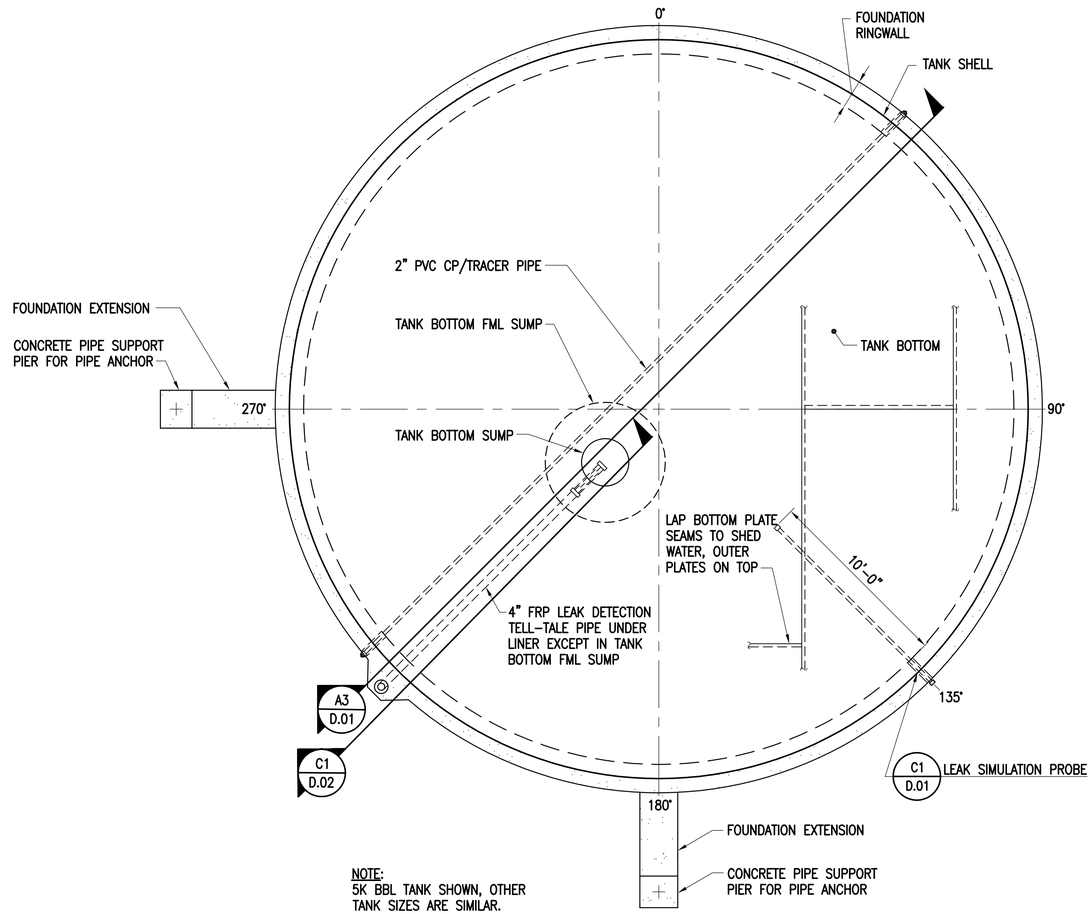


LEAK SIMULATION PROBE

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

C1 / D.01 *

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02, D.01



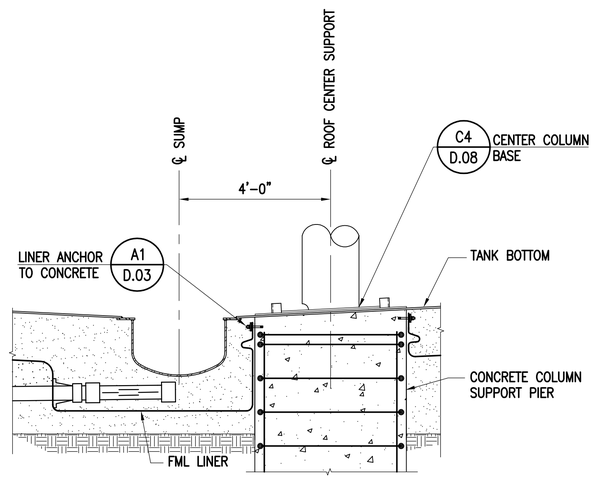
NOTE:
5K BBL TANK SHOWN, OTHER TANK SIZES ARE SIMILAR.

NON-ELEVATED TANK BOTTOM, FOUNDATION AND INTERSTITIAL PIPING PLAN

SCALE: 1/4"=1'-0"

B3 / D.01 *

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

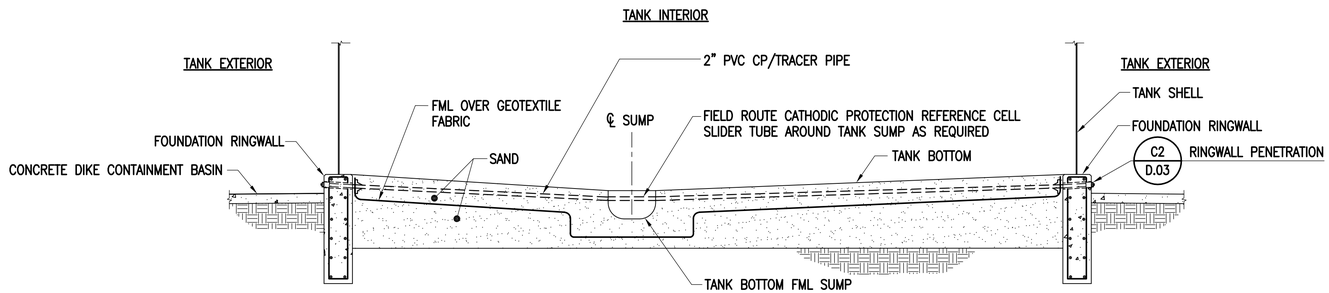


NOTE:
DETAIL APPLIES TO 80 AND 100 KBBL TANKS ONLY.

COLUMN FOUNDATION LINER ATTACHMENT

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

A1 / D.02 D.01



SECTION

SCALE: NONE

A3 / D.01 *

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02, D.01

GRAPHIC SCALE(S):

1/4"=1'-0" 1' 0' 1' 5' 11'

1/2"=1'-0" 1' 0' 1' 2' 3' 4' 5'

1 1/2"=1'-0" 0' 1' 2'

APPR	
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ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES	MSO	DRW	MHK	CHK	WVB
<<PM/DM>>		XXXX			
BRANCH MANAGER		XX			
CHIEF ENG/ARCH		XXX			
DATE		OCTOBER 2011			

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – INTERSTITIAL SPACE

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

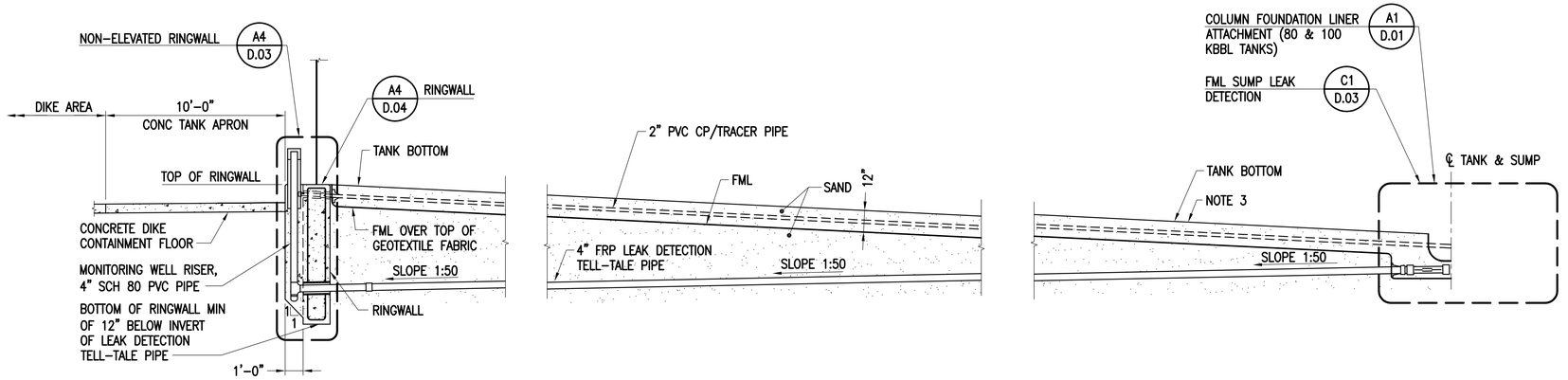
NAVFAC DRAWING NO.

SHEET 24 OF 38

D.01

DRAWFORM REVISION: 10 MARCH 2009

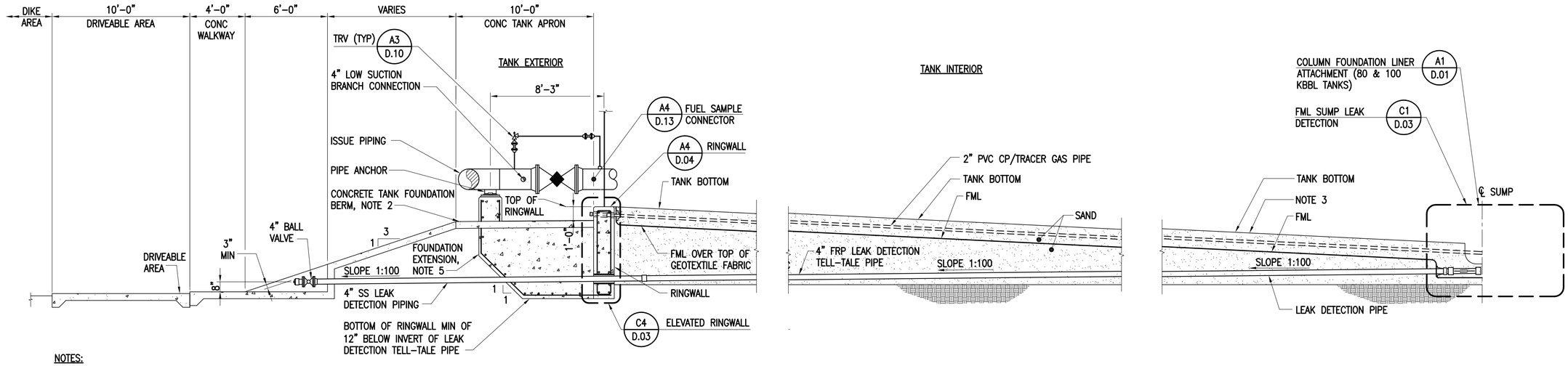
FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\A\D.01 TANK DETAILS – SHELL NOZZLES & APPURTENANCES.dwg LAYOUT NAME: D.01 TYPICAL DETAILS – INTERSTITIAL SPACE PLOTTED: Thursday, October 06, 2011 – 2:38pm USER: Guest



NOTE:
SEE A1/D.02 FOR NOTES.

SECTION - NON-ELEVATED TANK FOUNDATION C1 / D.01 D.02

SCALE: 1/4"=1'-0"



NOTES:

1. DETAIL IS BASED ON TYPICAL 80,000 BBL TANK, OTHER TANK SIZES ARE SIMILAR.
2. SLOPE TOP OF CONCRETE TANK FOUNDATION BERM 1:20 TO OUTSIDE.
3. ON SIDE FURTHERMOST FROM SUMP, SLOPE TANK BOTTOM FROM SHELL TO OFF-CENTER SUMP AT A SLOPE OF NOT LESS THAN 1:20. SEE TANK "ELEVATION", 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01 AS APPLICABLE, FOR ELEVATION OF TOP OF SUMP.
4. FOR TANKS WITHOUT AN ELEVATED TANK FOUNDATION, SEE DETAIL C1 ON THIS SHEET.
5. FOUNDATION EXTENSION FOR CONCRETE PIPE SUPPORT PIER AND PIPE ANCHOR SHOWN ROTATED OUT OF POSITION FOR CLARITY.

SECTION - ELEVATED TANK FOUNDATION A1 / * D.02

SCALE: 1/4"=1'-0"

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

GRAPHIC SCALE(S):

1/4"=1'-0" 1' 0' 1' 5' 11'

APPR	DATE	DESCRIPTION	SYM

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ACTIVITY
XXXXX

SATISFACTORY TO DATE	DD/MM/YY
DES MSO DRW MHK CHK	WB
<<PM/DM>>	XXXX
BRANCH MANAGER	XX
CHIEF ENG/ARCH	XXX
DATE	OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

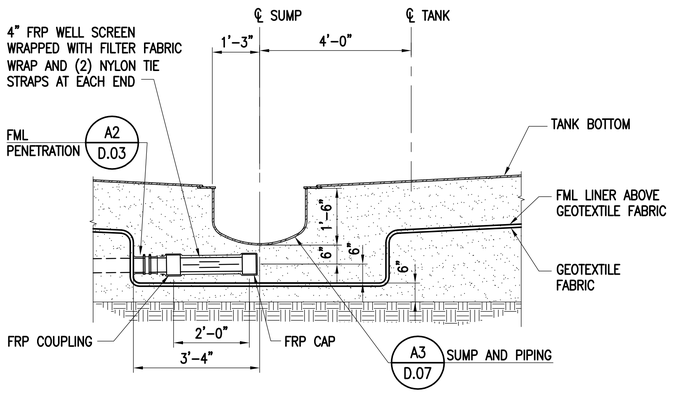
DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS - INTERSTITIAL SPACE

SCALE:	AS NOTED
EPROJECT NO.:	
CONSTR. CONTR. NO.	
NAVFAC DRAWING NO.	
SHEET	25 OF 38

D.02

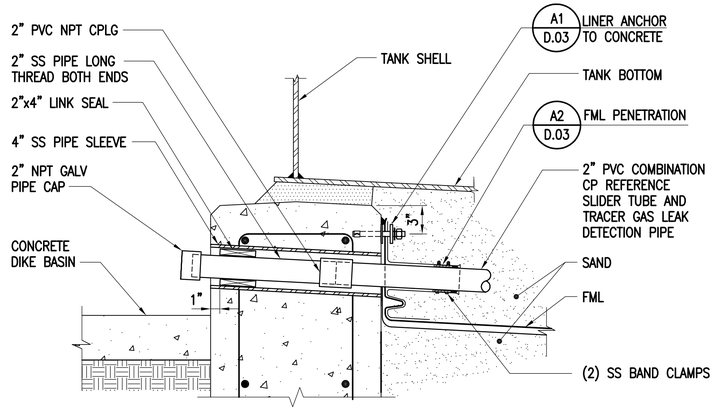
DRAWFORM REVISION: 10 MARCH 2009



FML SUMP LEAK DETECTION

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

C1 / D.03 — D.02

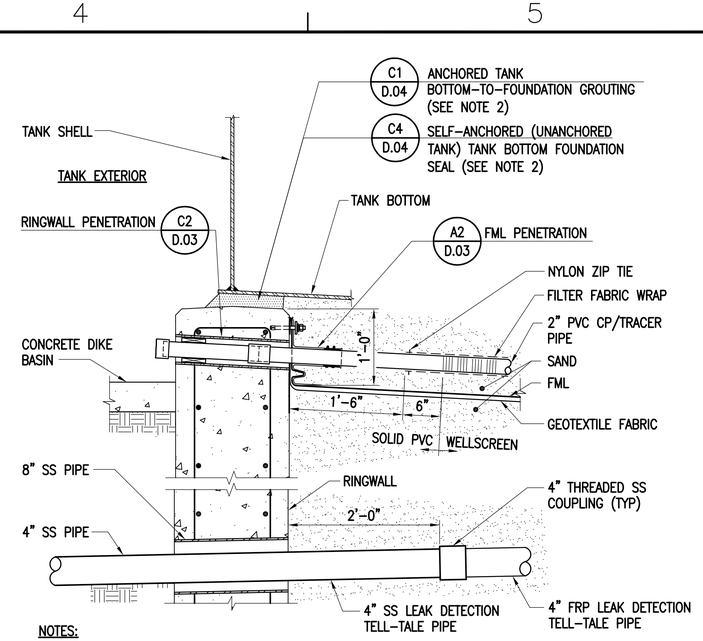


RINGWALL PENETRATION

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

C2 / D.03 — *

* D.01, D.03



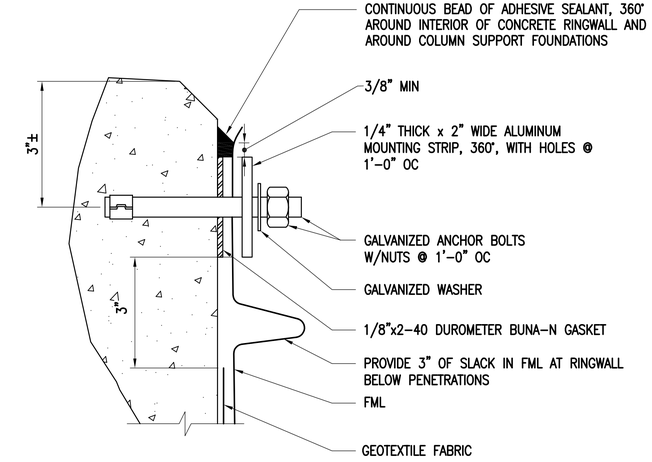
NOTES:

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"

C4 / D.03 — D.02

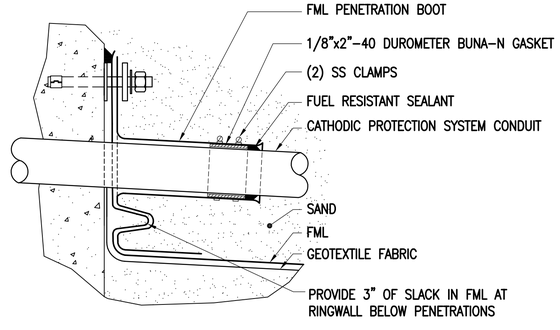


LINER ANCHOR TO CONCRETE

SCALE: NONE

A1 / D.03 — *

* D.01, D.03



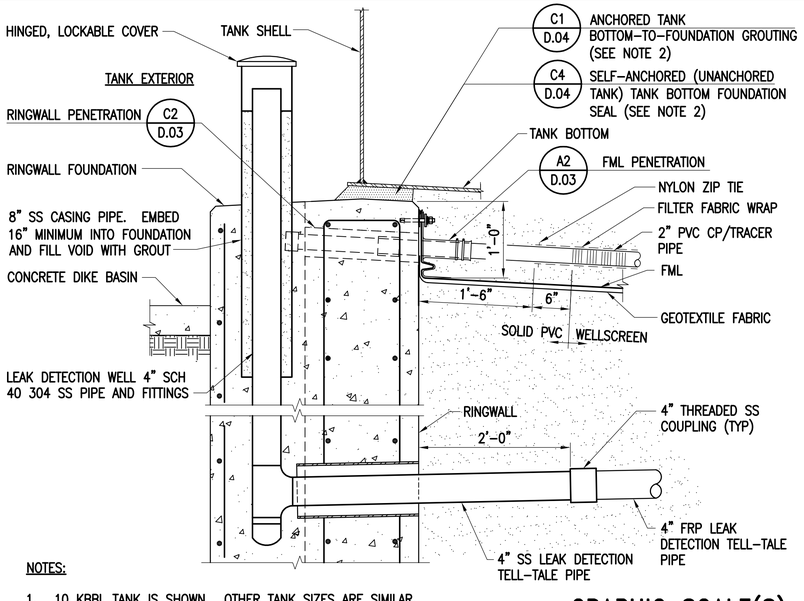
NOTE:
FML PENETRATION SHOWN IS FOR THE CATHODIC PROTECTION SYSTEM CONDUIT. THE FML PENETRATIONS FOR THE CP REFERENCE SLIDER TUBES, THE TRACER GAS LEAK DETECTION PIPES, AND THE LEAK DETECTION TELL-TALE PIPE ARE SIMILAR.

FML PENETRATION

SCALE: 3"=1'-0"

A2 / D.03 — *

* D.03, D.15



NOTES:

1. 10 KBBL TANK IS SHOWN. OTHER TANK SIZES ARE SIMILAR.
2. TANK BOTTOM FUNDATION SEAL FOR ANCHORED TANK SHOWN.

NON-ELEVATED RINGWALL

SCALE: 1"=1'-0"

A4 / D.03 — D.02

GRAPHIC SCALE(S):

1/2"=1'-0": 1' 0' 1' 2' 3' 4' 5'

1"=1'-0": 1' 0' 1' 2'

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

3"=1'-0": 0' 3" 6" 9" 1'

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A/E INFO

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ACTIVITY: XXXXX

SATISFACTORY TO | DATE: DD/MM/YY

DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
LANT CAPITAL IMPROVEMENTS
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – INTERSTITIAL SPACE

SCALE: AS NOTED

EPROJECT NO.:

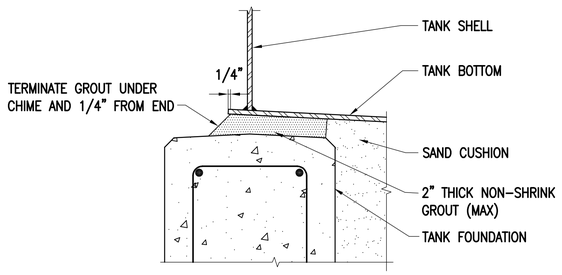
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 26 OF 38

D.03

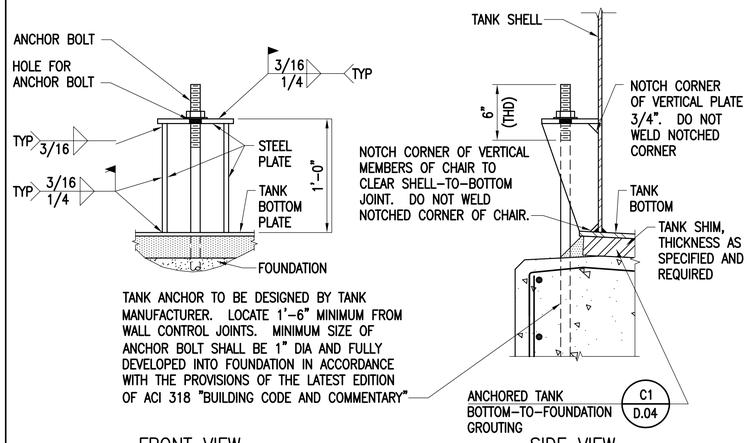
DRAWFORM REVISION: 10 MARCH 2009



ANCHORED TANK BOTTOM-TO-FOUNDATION GROUTING (C1)

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

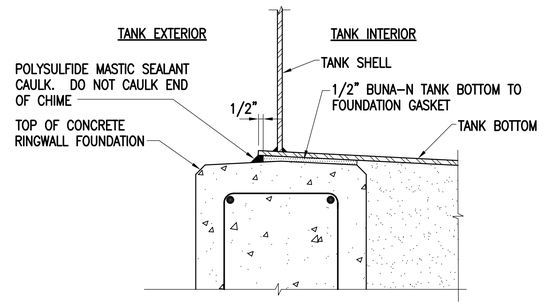
D.03 | D.04 | D.04



ANCHOR CHAIR (C3)

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

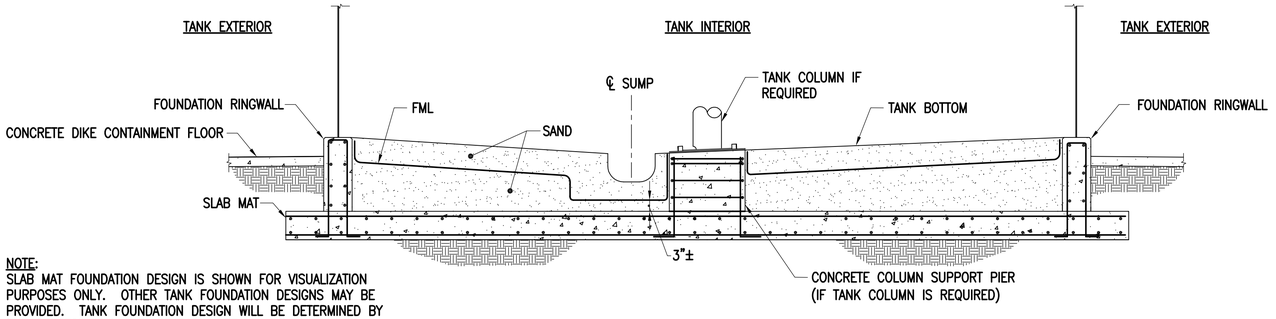
D.04 | D.04



SELF-ANCHORED (UNANCHORED TANK) TANK BOTTOM FOUNDATION SEAL (C4)

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

D.03 | D.04

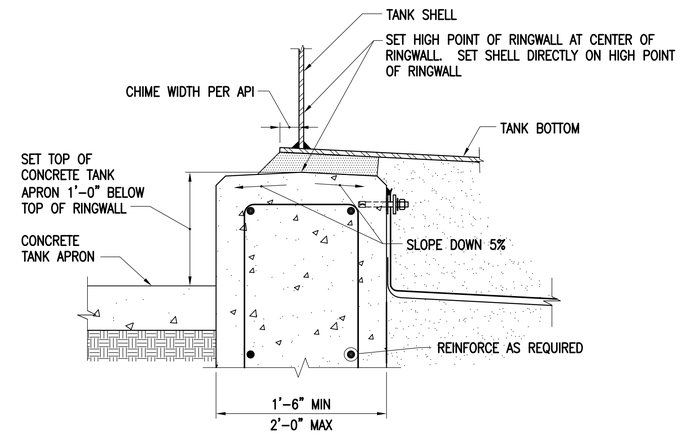


NOTE:
SLAB MAT FOUNDATION DESIGN IS SHOWN FOR VISUALIZATION PURPOSES ONLY. OTHER TANK FOUNDATION DESIGNS MAY BE PROVIDED. TANK FOUNDATION DESIGN WILL BE DETERMINED BY THE GEOTECHNICAL DATA AT EACH SITE.

TYPICAL SLAB MAT FOUNDATION (A1)

SCALE: NONE

G.03 | D.04



RINGWALL (A4)

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

D.02 | D.04

GRAPHIC SCALE(S):

1 1/2"=1'-0" 0' 1' 2'

APPR	DATE	DESCRIPTION	SYM

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<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – FOUNDATION

SCALE: AS NOTED

EPROJECT NO.:

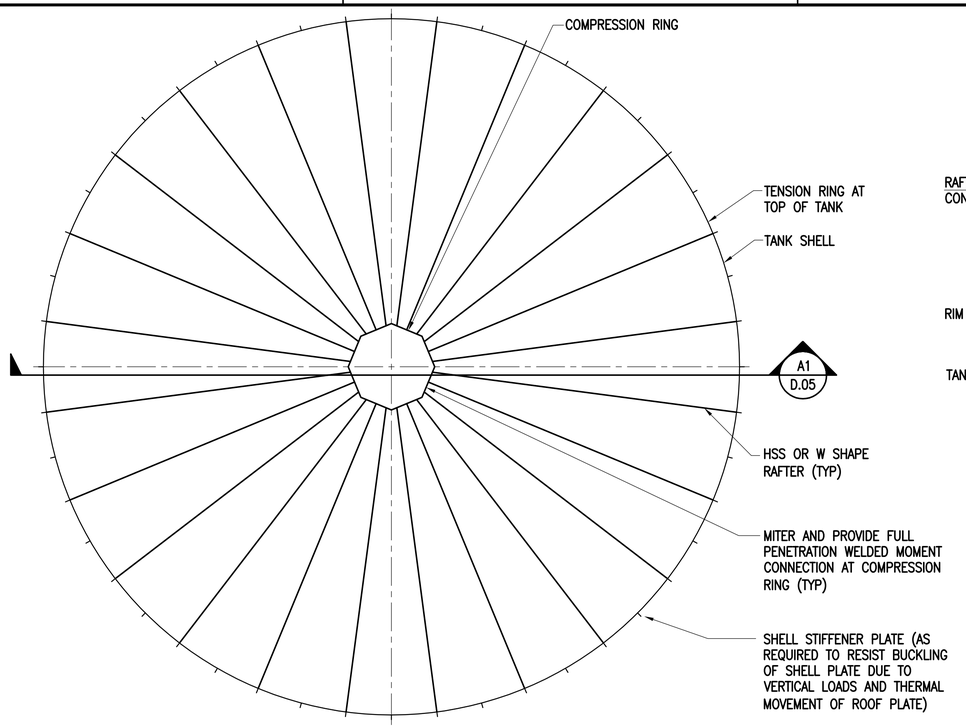
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 27 OF 38

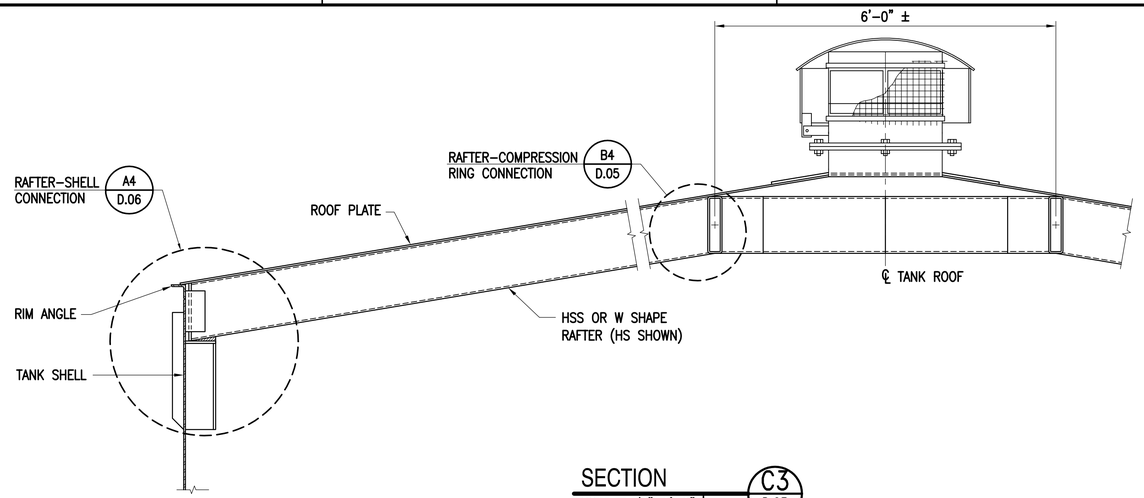
D.04

DRAWFORM REVISION: 10 MARCH 2009



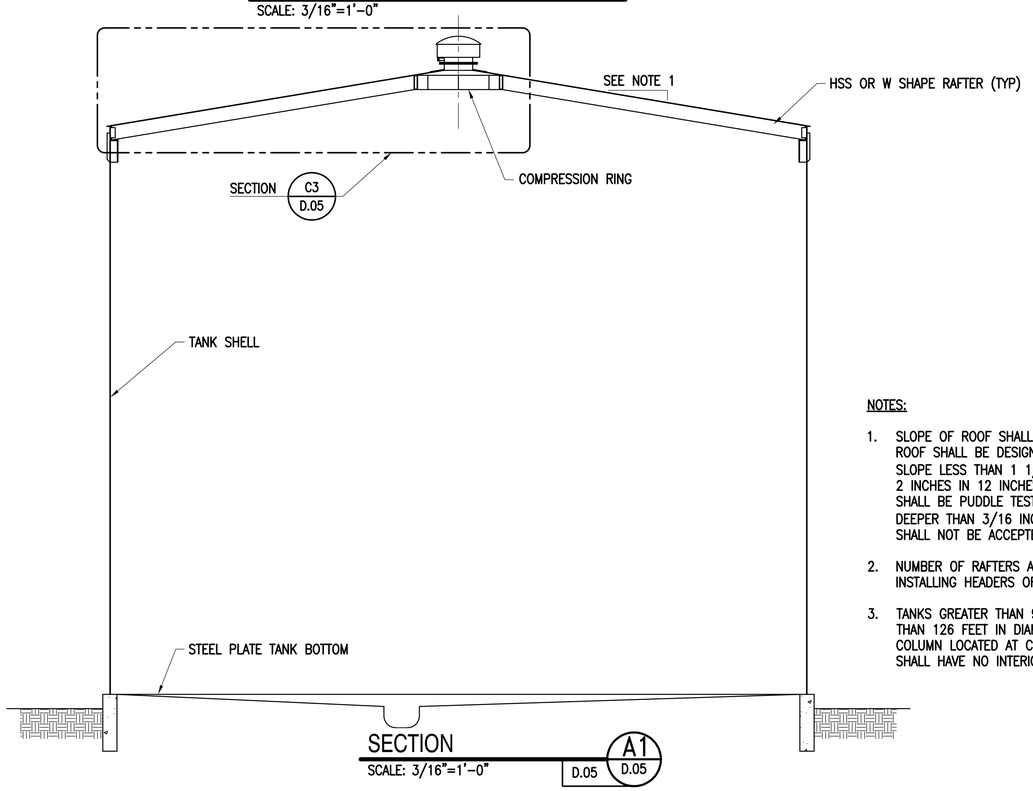
ROOF SUPPORT PLAN - NO COLUMNS

SCALE: 3/16"=1'-0"



SECTION

SCALE: 3/4"=1'-0" C3 D.05 D.05

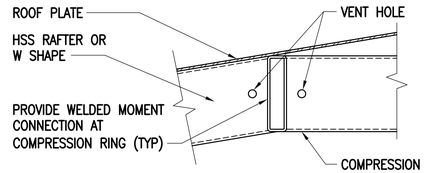


SECTION

SCALE: 3/16"=1'-0" A1 D.05 D.05

NOTES:

1. SLOPE OF ROOF SHALL BE CONSISTENT AND CONTINUOUS. TANK ROOF SHALL BE DESIGNED SUCH THAT NO PART OF THE ROOF HAS SLOPE LESS THAN 1 1/2 INCHES IN 12 INCHES AND NO MORE THAN 2 INCHES IN 12 INCHES. SLOPE OF FINISHED TANK ROOF PLATE SHALL BE PUDDLE TESTED AS SPECIFIED. PUDDLES OF WATER DEEPER THAN 3/16 INCH ANYWHERE ON THE TANK ROOF PLATES SHALL NOT BE ACCEPTED.
2. NUMBER OF RAFTERS AT COMPRESSION RING CAN BE REDUCED BY INSTALLING HEADERS OR ADDITIONAL FRAMING BETWEEN RAFTERS.
3. TANKS GREATER THAN 91 FEET IN DIAMETER AND, EQUAL OR LESS THAN 126 FEET IN DIAMETER SHALL HAVE NO MORE THAN ONE COLUMN LOCATED AT CENTER OF TANK. LESSER DIAMETER TANKS SHALL HAVE NO INTERIOR COLUMN SUPPORTS.



RAFTER-COMPRESSION RING CONNECTION

SCALE: 1"=1'-0" B4 D.05 D.05

GRAPHIC SCALE(S):

3/16"=1'-0" 0' 5' 10' 16'

3/4"=1'-0" 1' 0 1' 2' 3'

1"=1'-0" 1' 0' 1' 2'

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CHIEF ENG/ARCH: XXX

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DEPARTMENT OF THE NAVY
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LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

5K THROUGH 50K BBL TANKS ROOF FRAMING PLAN

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

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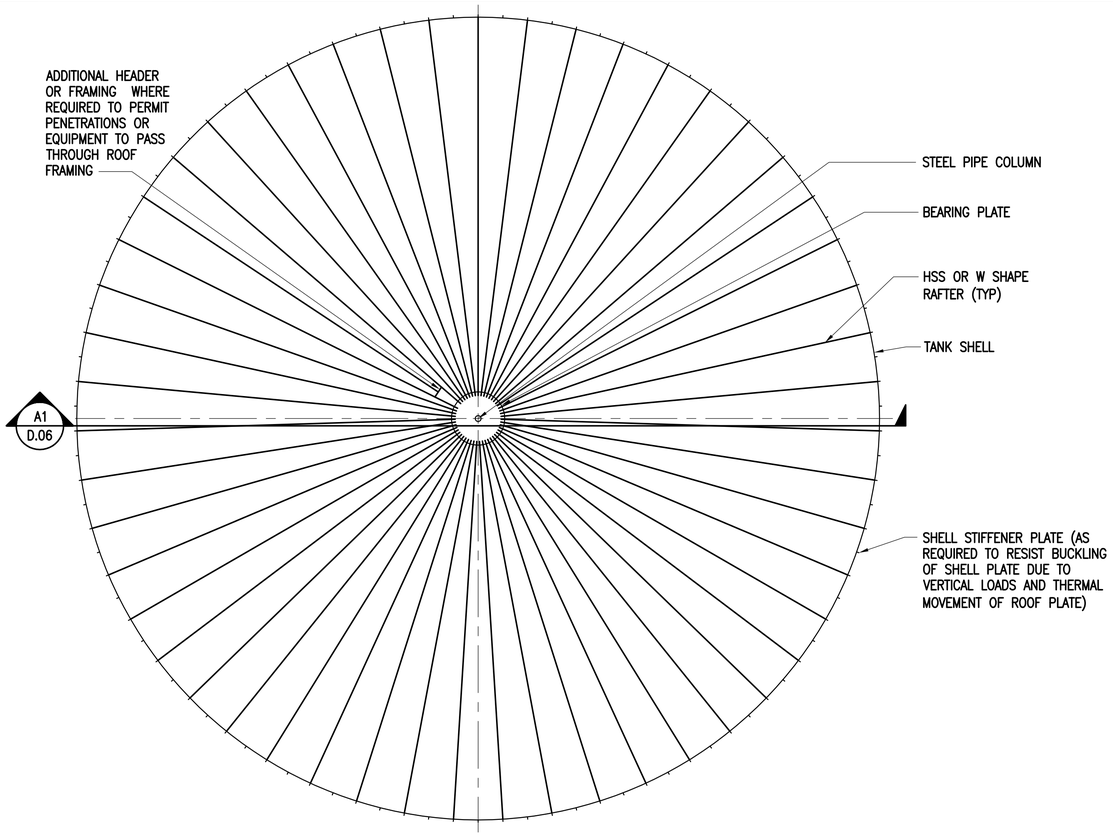
SHEET 28 OF 38

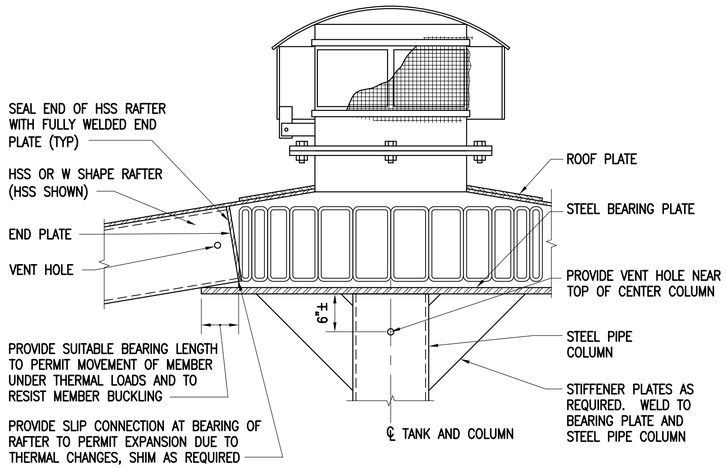
D.05

DRAWFORM REVISION: 10 MARCH 2009



ROOF SUPPORT PLAN - SINGLE COLUMN TANKS

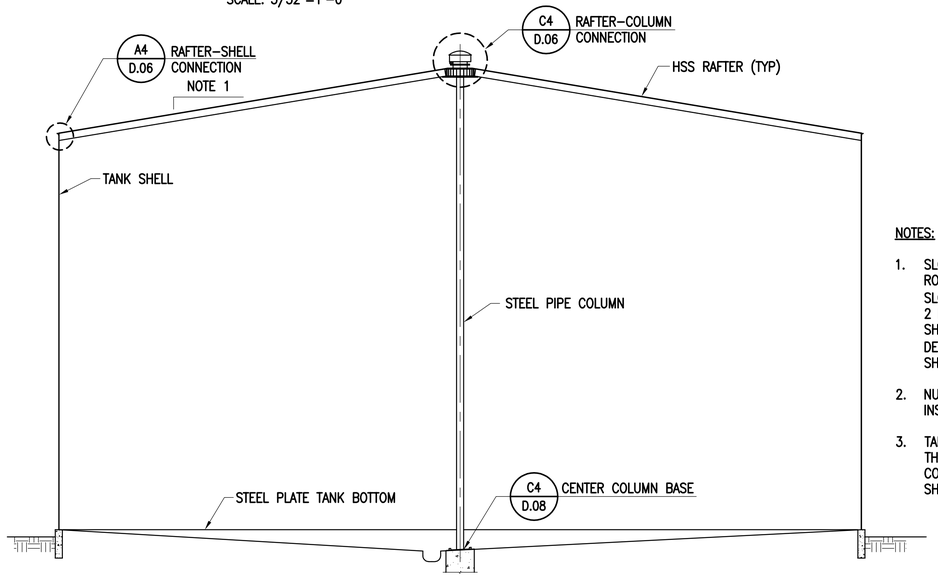
SCALE: 3/32"=1'-0"



RAFTER-COLUMN CONNECTION

SCALE: 1"=1'-0"

C4 / D.06 — D.06



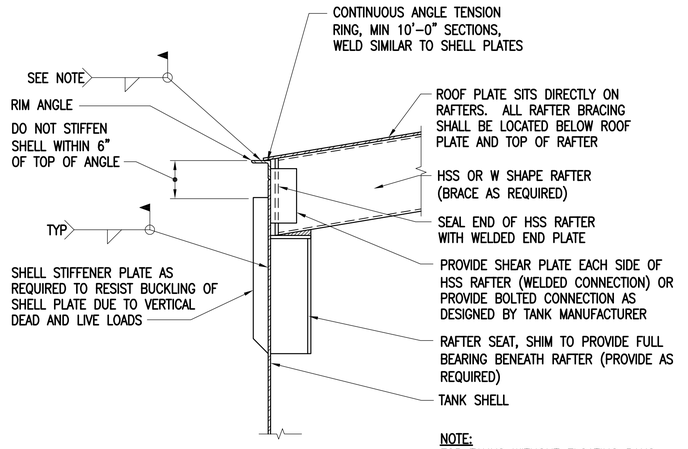
SECTION

SCALE: 3/32"=1'-0"

A1 / D.06 — D.06

NOTES:

1. SLOPE OF ROOF SHALL BE CONSISTENT AND CONTINUOUS. TANK ROOF SHALL BE DESIGNED SUCH THAT NO PART OF THE ROOF HAS SLOPE LESS THAN 1 1/2 INCHES IN 12 INCHES AND NO MORE THAN 2 INCHES IN 12 INCHES. SLOPE OF FINISHED TANK ROOF PLATE SHALL BE PUDDLE TESTED AS SPECIFIED. PUDDLES OF WATER DEEPER THAN 3/16 INCH ANYWHERE ON THE TANK ROOF PLATES SHALL NOT BE ACCEPTED.
2. NUMBER OF RAFTERS AT BEARING PLATE CAN BE REDUCED BY INSTALLING HEADERS OR ADDITIONAL FRAMING BETWEEN RAFTERS.
3. TANKS GREATER THAN 91 FEET IN DIAMETER AND, EQUAL OR LESS THAN 126 FEET IN DIAMETER SHALL HAVE NO MORE THAN ONE COLUMN LOCATED AT CENTER OF TANK. LESSER DIAMETER TANKS SHALL HAVE NO INTERIOR COLUMN SUPPORTS.



NOTE:
FOR TANKS WITHOUT FLOATING PANS, PROVIDE ROOF PLATE-TO-RIM ANGLE WELD NO LARGER THAN 3/16"

RAFTER-SHELL CONNECTION

SCALE: 1"=1'-0"

A4 / D.06 — D.05 | D.06

GRAPHIC SCALE(S):

3/32"=1'-0": 0' 5' 10' 15' 32'

1"=1'-0": 1' 0' 1' 2'

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DATE	
DESCRIPTION	
SYM	

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MSO	WMC	WVB

<<PM/DM>>	XXXX
BRANCH MANAGER	XX
CHIEF ENG/ARCH	XXX
DATE	OCTOBER 2011

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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

80K AND 100K BBL TANKS ROOF FRAMING PLAN

SCALE: AS NOTED

EPROJECT NO.:

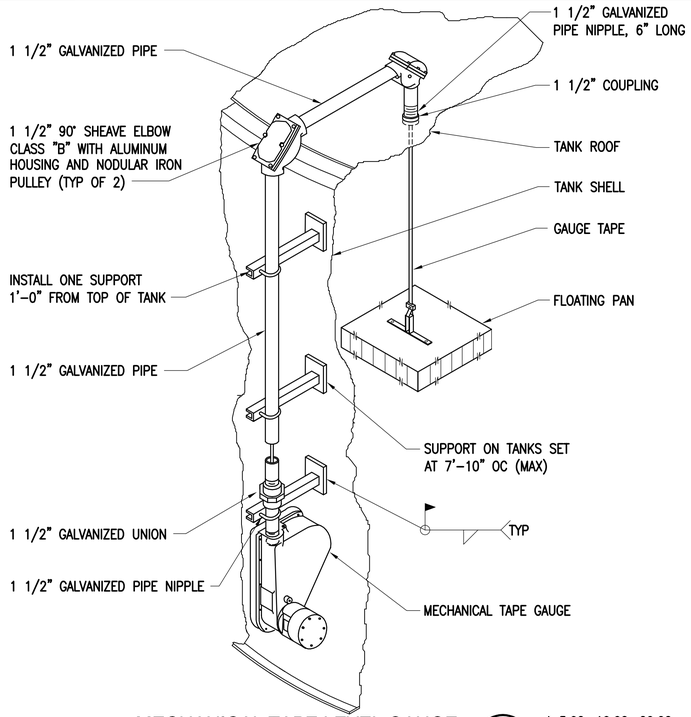
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 29 OF 38

D.06

DRAWFORM REVISION: 10 MARCH 2009

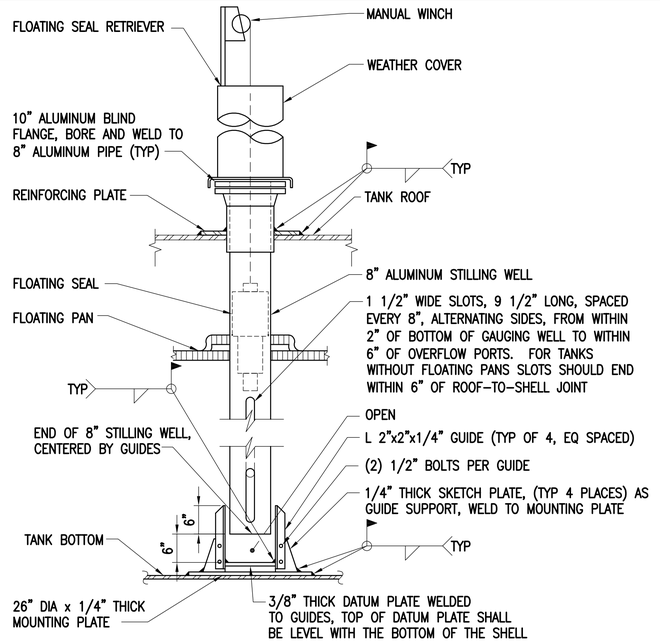


MECHANICAL TAPE LEVEL GAUGE (C1)

SCALE: NONE

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



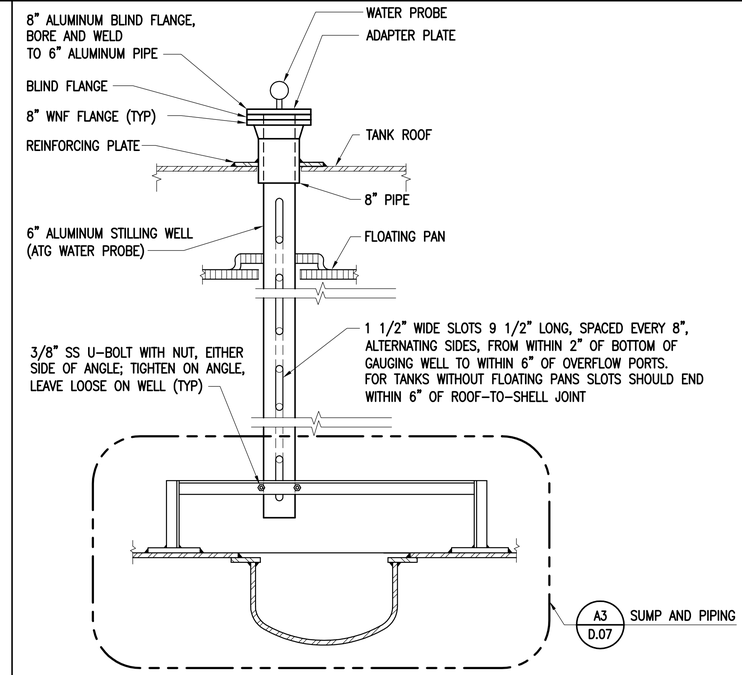
NOTE: DO NOT ATTACH GUIDE SUPPORTS TO STILLING WELL.

SAMPLE GAUGE WELL (C3)

SCALE: 3/4"=1'-0"

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

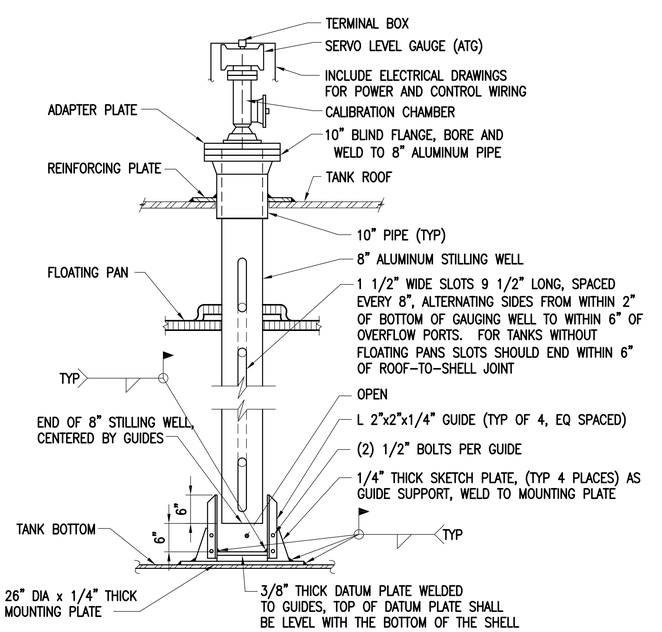


ATG WATER PROBE WELL (C4)

SCALE: 3/4"=1'-0"

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



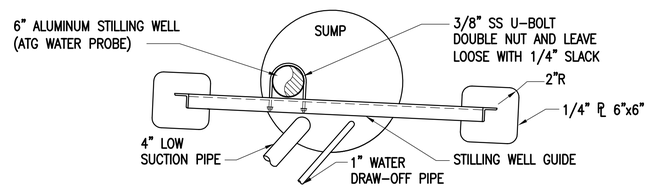
NOTE: DO NOT ATTACH GUIDE SUPPORTS TO STILLING WELL.

ATG GAUGE WELL (A1)

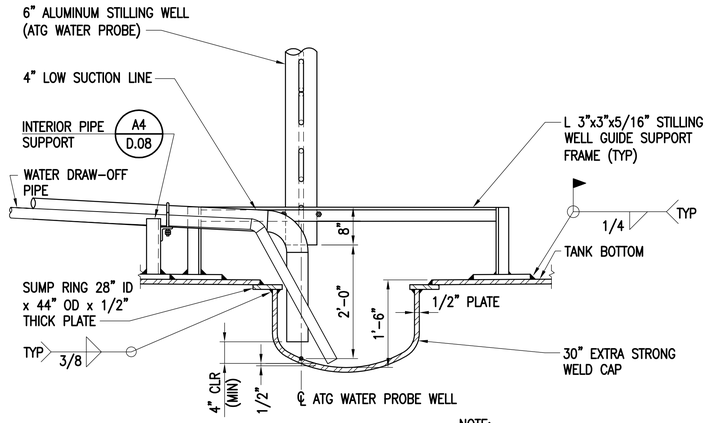
SCALE: 3/4"=1'-0"

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



PLAN



ELEVATION

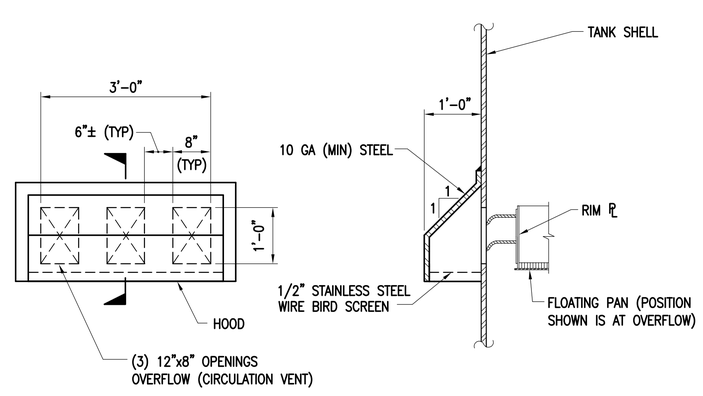
NOTE: FLOATING PAN NOT SHOWN FOR CLARITY.

SUMP AND PIPING (A3)

SCALE: 3/4"=1'-0"

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02, D.03, D.07



ELEVATION SECTION

OVERFLOW/CIRCULATION VENT AND SHELL CIRCULATION VENT (A4)

SCALE: 3/4"=1'-0"

* D.07

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

GRAPHIC SCALE(S):

3/4"=1'-0" 1' 0 1' 2' 3'

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A/E INFO

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ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES: MSO DRW: MHK CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – TANK APPURTENANCES

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

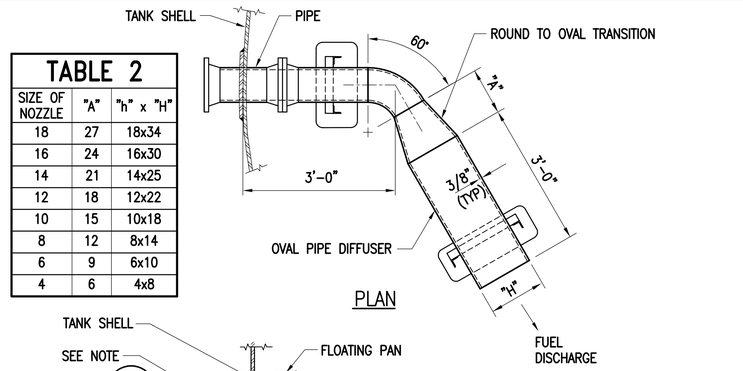
SHEET 30 OF 38

D.07

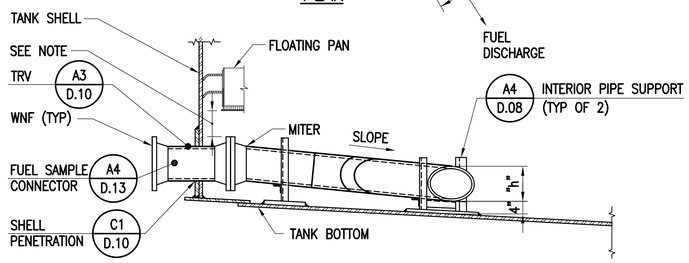
DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Upgade AST Standard\CAD\M\D.07 TYPICAL DETAILS – TANK APPURTENANCES.dwg LAYOUT NAME: D.07 TYPICAL DETAILS – TANK APPURTENANCES PLOTTED: Thursday, October 06, 2011 – 2:38pm USER: Guest

TABLE 2		
SIZE OF NOZZLE	"A"	"h" x "H"
18	27	18x34
16	24	16x30
14	21	14x25
12	18	12x22
10	15	10x18
8	12	8x14
6	9	6x10
4	6	4x8



PLAN

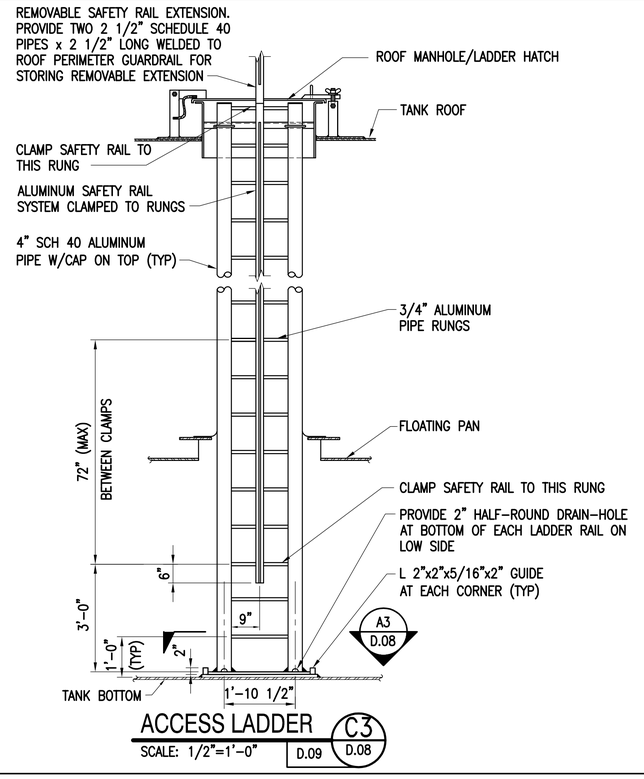


ELEVATION

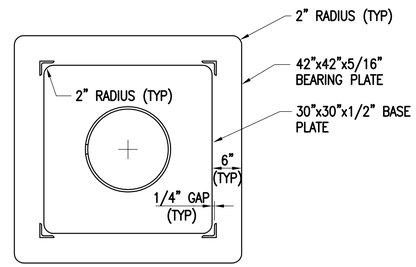
NOTES:

1. FLOATING PAN SHALL CLEAR HIGHEST POINT OF FLANGE ON ANY NOZZLE AND OTHER INTERNAL APPURTENANCES BY 6 INCHES AT LOW LEG LEVEL. A 12" NOZZLE IS SHOWN. FOR OTHER SIZES, SEE TABLE 2.
2. DIFFUSER MAY BE PROVIDED OPPOSITE-HAND FROM THAT SHOWN. HOWEVER, THE GENERAL ARRANGEMENT SHALL BE SUCH THAT THE FLOW INTO THE TANK DOES NOT ENCOUNTER OTHER APPURTENAANCES FOR AT LEAST 180 DEGREES.

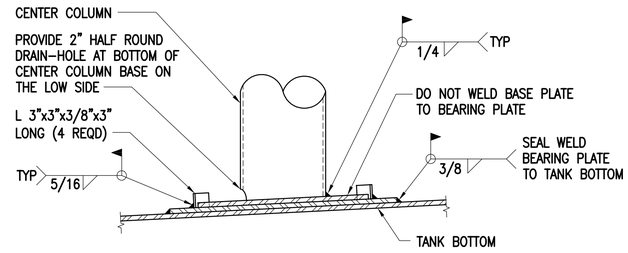
FILL NOZZLE — C1 / D.08
SCALE: NONE
* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



ACCESS LADDER — C3 / D.08 / D.09
SCALE: 1/2"=1'-0"

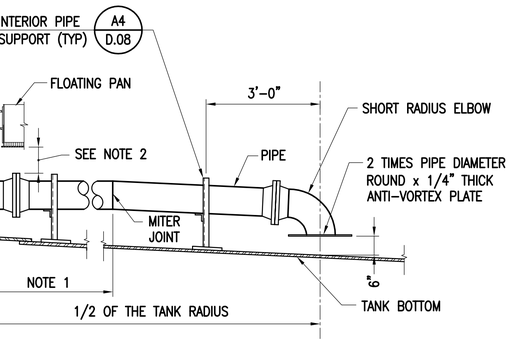


PLAN



ELEVATION

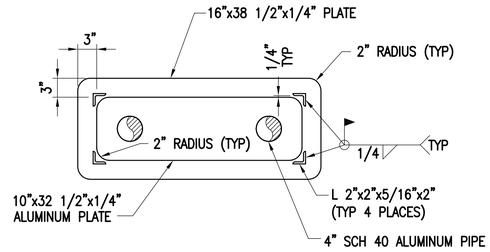
CENTER COLUMN BASE — C4 / D.08
SCALE: 3/4"=1'-0"
* D.01, D.06



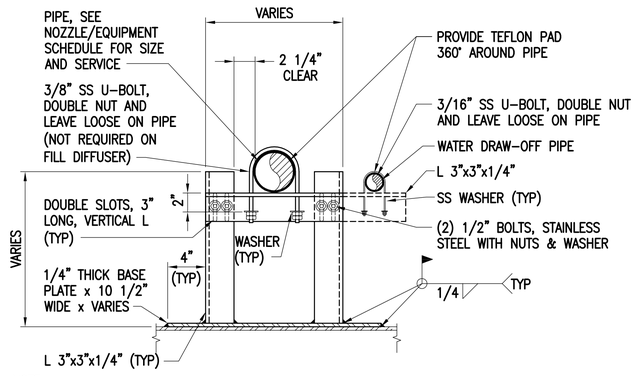
NOTES:

1. LOCATE MITER JOINT SO AS TO PROVIDE SLOPE OF PIPE PARALLEL TO TANK BOTTOM.
2. FLOATING PAN SHALL CLEAR HIGHEST POINT OF FLANGE ON ANY NOZZLE AND OTHER INTERNAL APPURTENANCES BY 6 INCHES AT LOW LEG LEVEL.

ISSUE NOZZLE — A1 / D.08
SCALE: 1/2"=1'-0"
* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



SECTION — A3 / D.08
SCALE: 1"=1'-0"



NOTE:
PROVIDE INTERNAL PIPE SUPPORTS EVERY 6'-0" FOR PIPES 4" AND SMALLER.
PROVIDE INTERNAL PIPE SUPPORTS EVERY 8'-0" FOR LARGER SIZE PIPES.

INTERIOR PIPE SUPPORT — A4 / D.08
SCALE: 1 1/2"=1'-0"
* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01, D.07, D.08

GRAPHIC SCALE(S):

1/2"=1'-0" 0' 1' 2' 3' 4' 5' 6'
3/4"=1'-0" 1' 0 1' 2' 3'
1"=1'-0" 1' 0' 1' 2'
1 1/2"=1'-0" 0' 1' 2'

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ACTIVITY: XXXXX

SATISFACTORY TO | DATE: DD/MM/YY

DES	MSO	DRW	MHK	CHK	WVB

<<PM/DM>>	XXXX
BRANCH MANAGER	XX
CHIEF ENG/ARCH	XXX
DATE	OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

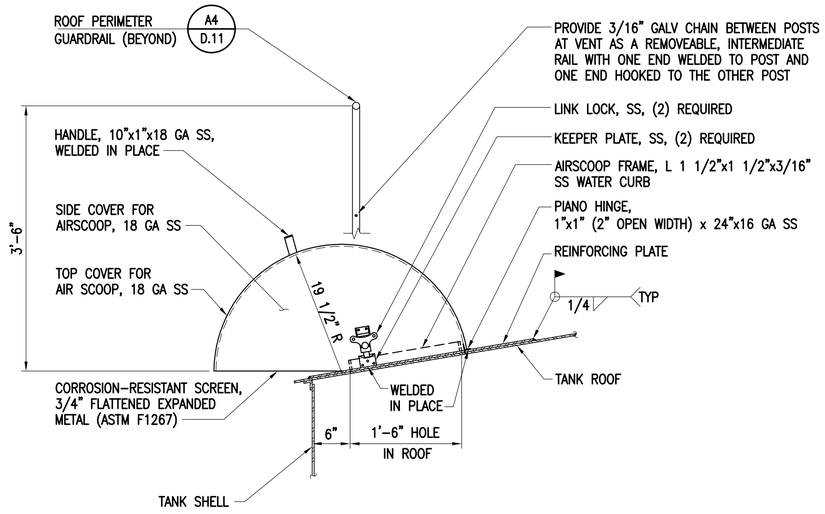
TYPICAL DETAILS - INTERIOR APPURTENANCES

SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 31 OF 38

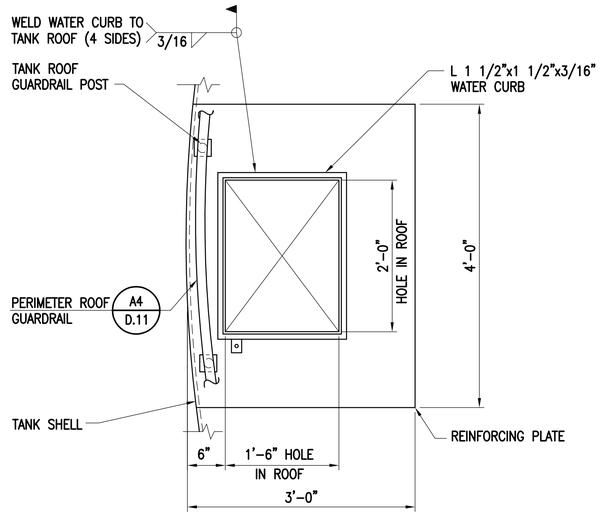
D.08

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\W\D.08 TYPICAL DETAILS - INTERIOR APPURTENANCES.dwg LAYOUT NAME: D.08 TYPICAL DETAILS - INTERIOR APPURTENANCES PLOTTED: Thursday, October 06, 2011 - 2:38pm USER: Guest



ELEVATION



NOTE: AIR SCOOP NOT SHOWN FOR CLARITY.

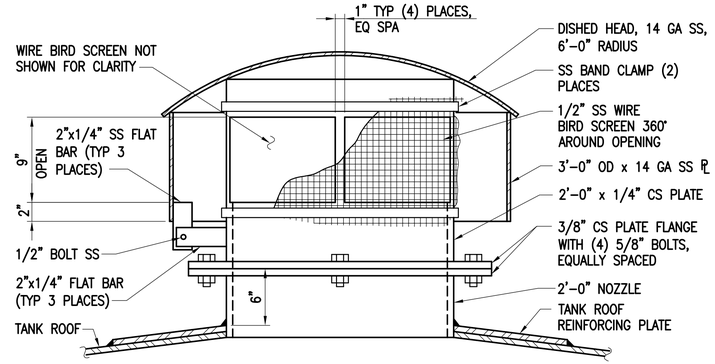
PLAN

CIRCULATION VENT/INSPECTION HATCH C1

SCALE: 1"=1'-0"

* D.09

* 5.02, 10,02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

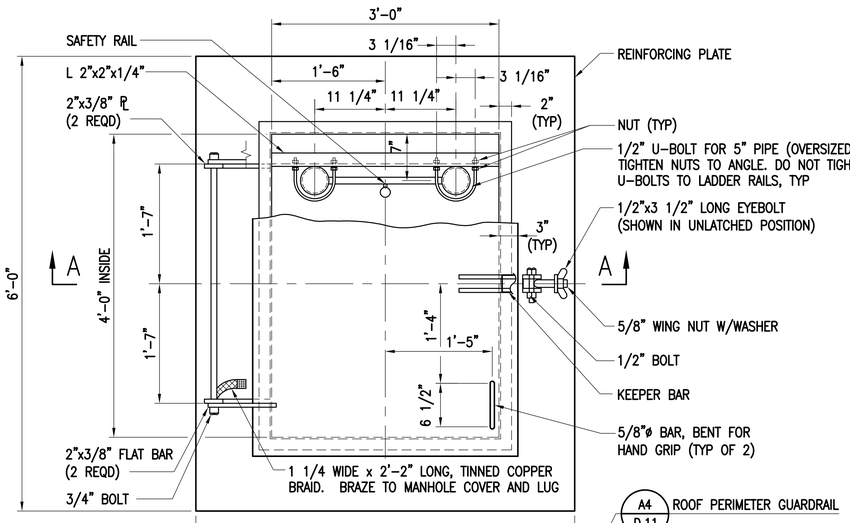


CENTER ROOF VENT C4

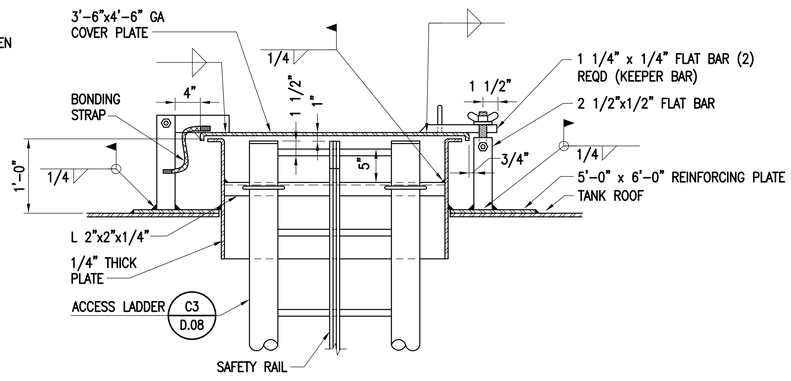
SCALE: 1 1/2"=1'-0"

* D.09

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



PLAN



SECTION A-A

ROOF MANHOLE/LADDER HATCH A1

SCALE: 1"=1'-0"

* D.09

* 5.02, 10,02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

GRAPHIC SCALE(S):

1"=1'-0" 0' 1' 2' 3'

1 1/2"=1'-0" 0' 1' 2'

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ACTIVITY: XXXXX

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DES: MSO | DRW: MHK | CHK: WVB

<<PM/DM>>: XXXX

BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

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LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – ROOF NOZZLES & APPURTENANCES

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

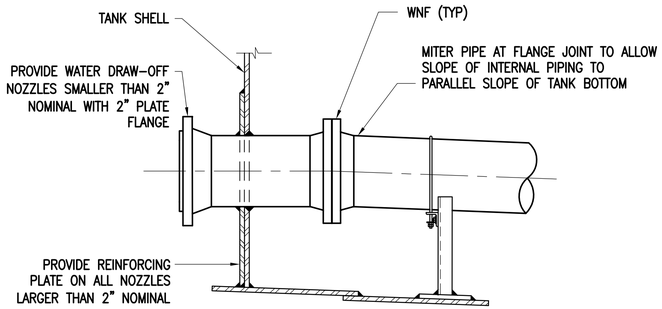
NAVFAC DRAWING NO.

SHEET 32 OF 38

D.09

DRAWFORM REVISION: 10 MARCH 2009

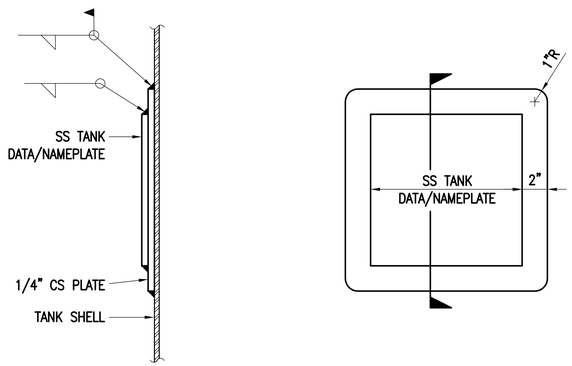
FILE NAME: G:\10 Jobs\10-042 Re-start Update AST Standard\CAD\M\D.09 TYPICAL DETAILS - ROOF NOZZLES & APPURTENANCES.dwg LAYOUT NAME: D.09 TYPICAL DETAILS - ROOF NOZZLES & APPURTENANCES PLOTTED: Thursday, October 06, 2011 - 2:38pm USER: Guest



SHELL PENETRATION — C1

SCALE: 3/4"=1'-0" — * — D.10

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02, D.08



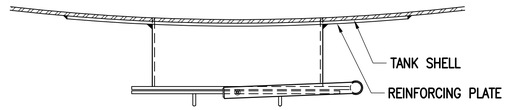
SECTION FRONT VIEW

NOTE:
TANK DATA/NAMEPLATE SHALL INDICATE THE DIAMETER OF THE TANK, JOINT EFFICIENCY, NOMINAL THICKNESS, AND MATERIAL FOR EACH SHELL COURSE IN ADDITION TO INFORMATION REQUIRED BY API STANDARD 650. LOCATE NEAR MANHOLE ON MOST USED APPROACH SIDE AND AT EYE LEVEL.

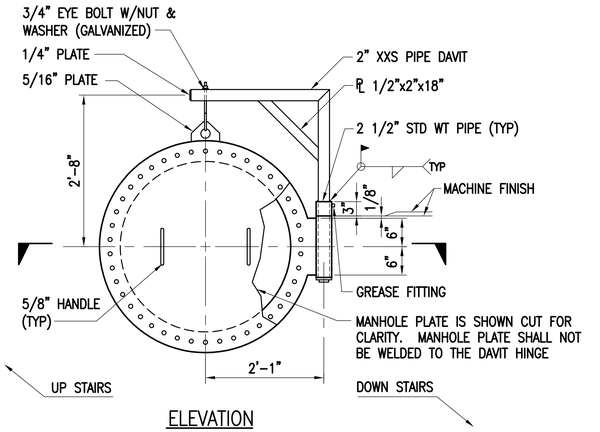
TANK DATA PLATE — C3

SCALE: NONE — * — D.10

* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01



SECTION

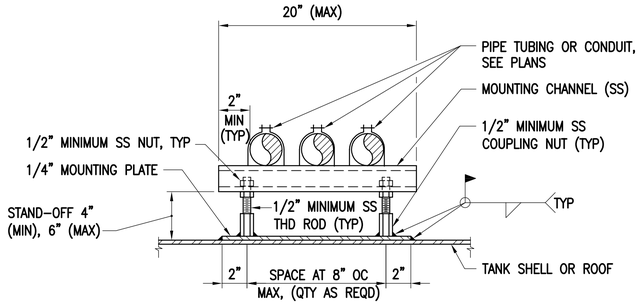


ELEVATION

SHELL MANHOLE DAVIT — C4

SCALE: 3/4"=1'-0" — * — D.10

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



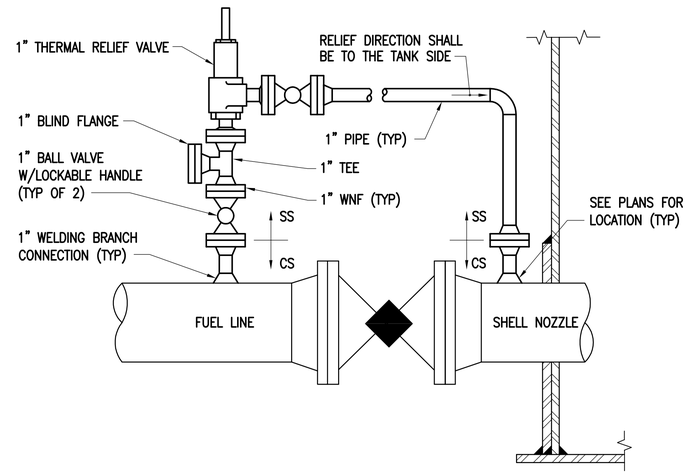
PLAN – TANK SHELL
ELEVATION – TANK ROOF

NOTES:

1. COUPLING NUT SHALL BE COATED WITH TANK. INSTALL MOUNTING CHANNEL ASSEMBLY AFTER TANK IS COATED; DO NOT COAT MOUNTING CHANNEL.
2. USE SIMILAR DETAIL FOR SUPPORTS MOUNTED ALONG THE TANK'S CONCRETE RINGWALL FOUNDATION, EXCEPT THE STAND-OFF IS NOT REQUIRED. BOLT SUPPORTS ON THE SIDE OF THE CONCRETE RINGWALL NOT THE TOP.

TYPICAL SUPPORT ON TANKS — A1

SCALE: NONE — D.12 — D.10

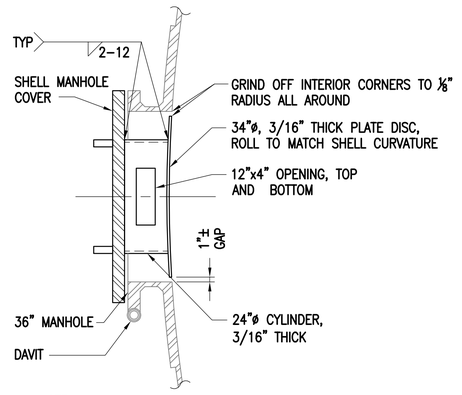


NOTE: MOUNT THERMAL RELIEF VALVES IN VERTICAL.

THERMAL RELIEF VALVE (TRV) — A3

SCALE: NONE — * — D.10

* D.02, D.08, D.12



NOTE:
PROVIDE FILLER DRUM ON SHELL MANHOLES OF TANKS WITH FLOATING PANS.

FILLER DRUM — A4

SCALE: 3/4"=1'-0" — * — D.10

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02

GRAPHIC SCALE(S):

3/4"=1'-0" 1' 0 1' 2' 3'

SYM	DESCRIPTION	DATE	APPR

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NAVAL FACILITIES ENGINEERING COMMAND – ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS – SHELL NOZZLES & APPURTENANCES

SCALE: AS NOTED

EPROJECT NO.:

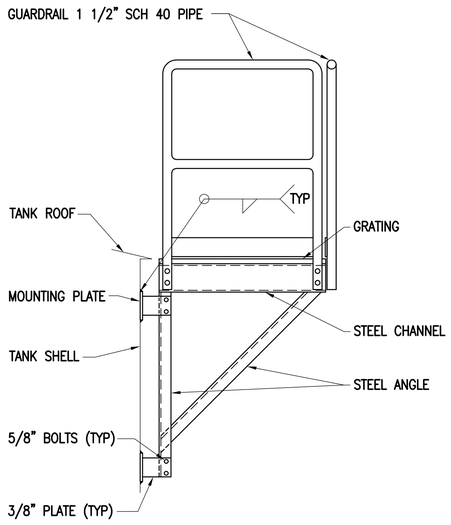
CONSTR. CONTR. NO.

NAVFAC DRAWING NO.

SHEET 33 OF 38

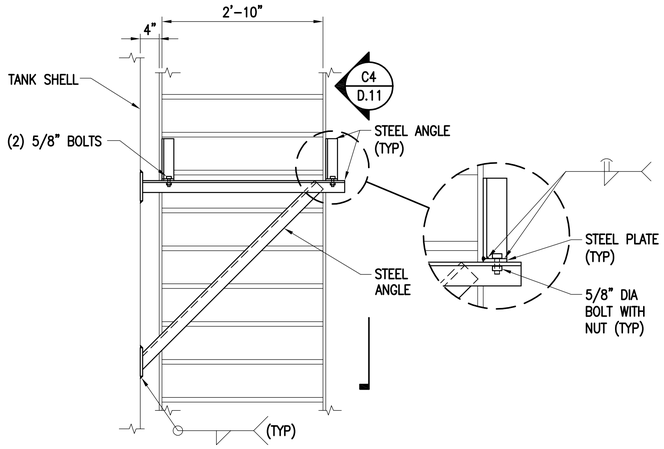
D.10

DRAWFORM REVISION: 10 MARCH 2009



PLATFORM SUPPORT C1 / D.11
SCALE: 3/4"=1'-0"

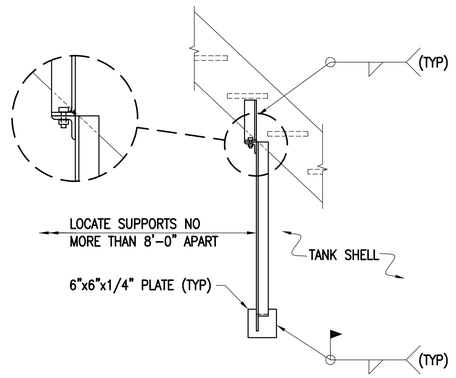
* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01



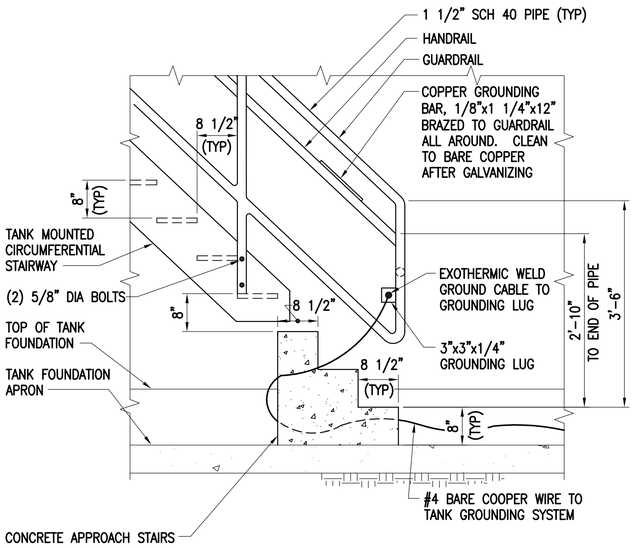
NOTE:
PROVIDE STAIRWAY SUPPORTS AS REQUIRED.
SUPPORT STAIRWAY ENTIRELY ON SHELL.

STAIRWAY SUPPORT C3 / D.11
SCALE: 3/4"=1'-0"

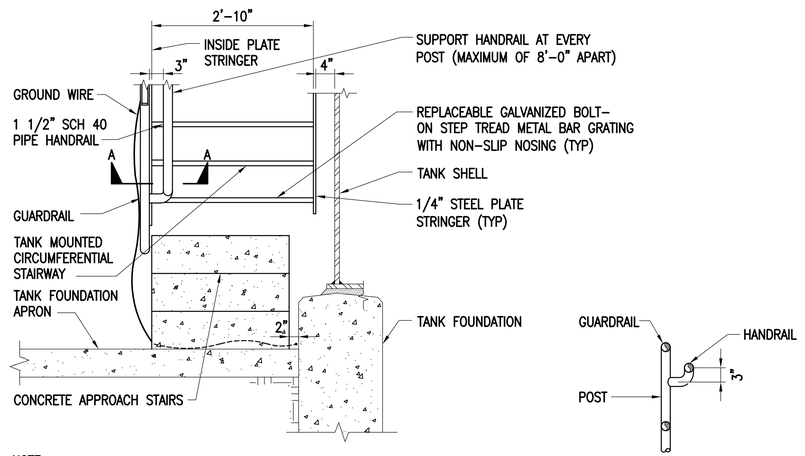
* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01



SECTION C4 / D.11 / D.11
SCALE: 3/4"=1'-0"



SIDE ELEVATION



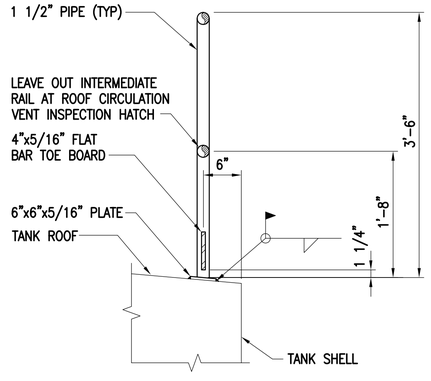
END ELEVATION

SECTION A-A

NOTE:
SUPPORT STAIRWAY ENTIRELY ON SHELL. (SUPPORTS NOT SHOWN ON DETAIL)

SECTION - CIRCUMFERENTIAL STAIR A1 / D.11
SCALE: 3/4"=1'-0"

* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01



ROOF PERIMETER GUARDRAIL A4 / D.11
SCALE: 1"=1'-0"

* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01, D.09

GRAPHIC SCALE(S):

1"=1'-0" 1' 0' 1' 2'

3/4"=1'-0" 0 1' 2' 3' 4'

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ACTIVITY: XXXXX

SATISFACTORY TO DATE: DD/MM/YY

DES	MSO	DRW	MHK	CHK	WVB

<<PM/DM>>: XXXX
BRANCH MANAGER: XX
CHIEF ENG/ARCH: XXX
DATE: OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA
LANT CAPITAL IMPROVEMENTS

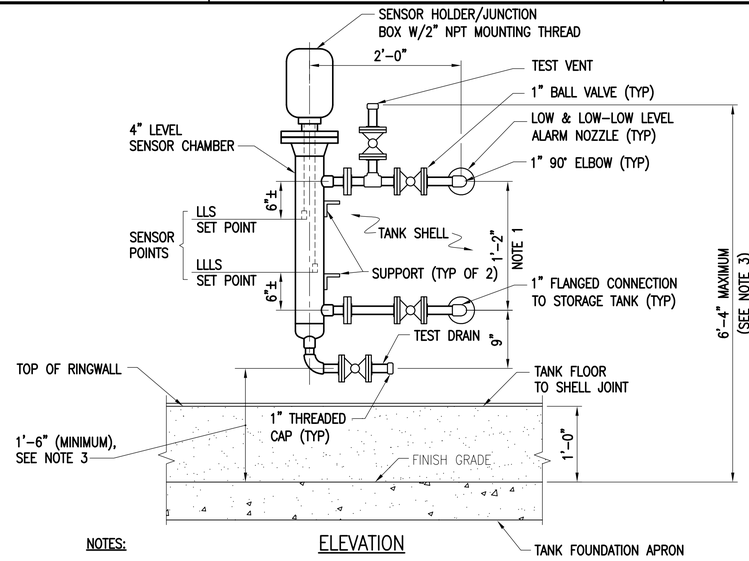
DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS - STAIRWAY AND GUARDRAIL DETAILS

SCALE: AS NOTED
EPROJECT NO.:
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET 34 OF 38

D.11

DRAWFORM REVISION: 10 MARCH 2009



ELEVATION

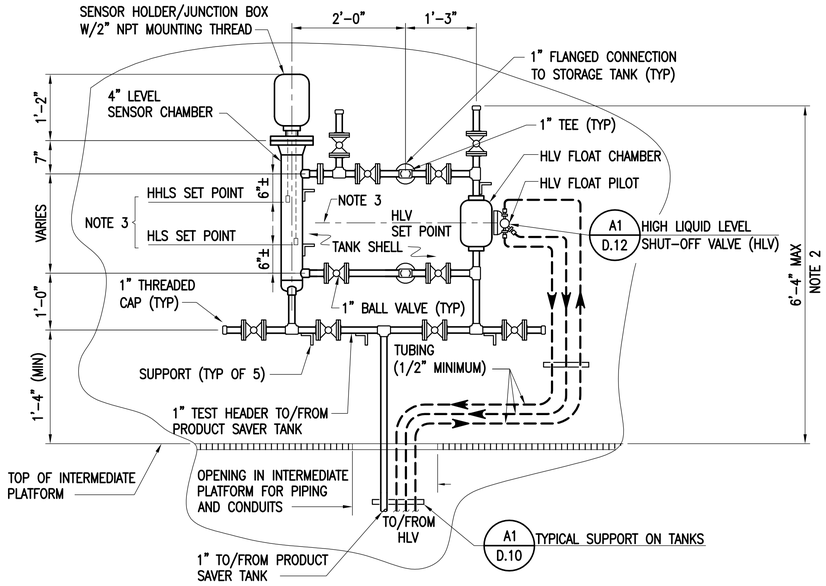
NOTES:

1. MAY BE INCREASED FOR LARGER SPACING BETWEEN LLS AND LLLS SET POINTS.
2. EQUIPMENT, PIPE, FITTINGS, CHAMBER AND VALVES SHALL BE STAINLESS STEEL.
3. FOR TANKS WITH FLOATING PAN, LOW AND LOW-LOW ALARM SHELL NOZZLES WILL BE HIGHER. ENSURE TEST DRAIN IS NEVER LOWER THAN AS INDICATED AND TEST VENT IS NEVER HIGHER THAN AS INDICATED.

LOW AND LOW-LOW LEVEL SWITCHES — C1 / D.12

SCALE: 1"=1'-0"

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



ELEVATION

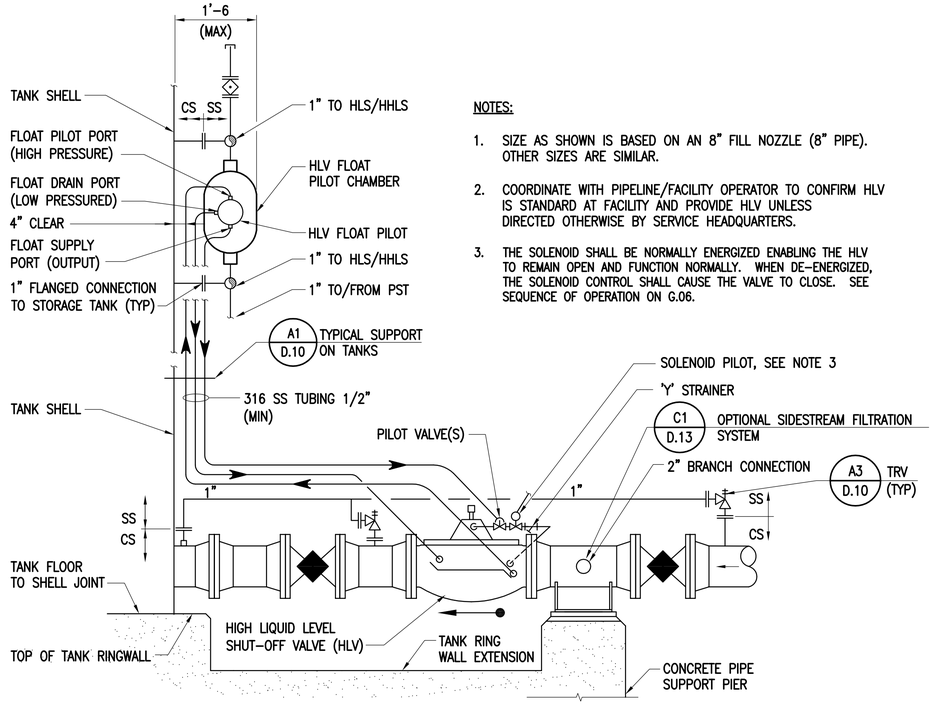
NOTES:

1. EQUIPMENT PIPE, FITTINGS, CHAMBERS AND VALVES SHALL BE STAINLESS STEEL.
2. NOT TO EXCEED DISTANCE SHOWN PLUS ONE STAIR RISER.
3. SEE LEVEL SET POINT TABLE BELOW.

HIGH AND HIGH-HIGH LEVEL SWITCHES AND HIGH LIQUID LEVEL SHUT-OFF VALVE (HLV) — C3 / D.12

SCALE: 3/4"=1'-0"

* 5.02, 10.02, 20.02, 30.02, 40.02, 50,02, 80.02 100.02



ELEVATION

NOTES:

1. SIZE AS SHOWN IS BASED ON AN 8" FILL NOZZLE (8" PIPE). OTHER SIZES ARE SIMILAR.
2. COORDINATE WITH PIPELINE/FACILITY OPERATOR TO CONFIRM HLV IS STANDARD AT FACILITY AND PROVIDE HLV UNLESS DIRECTED OTHERWISE BY SERVICE HEADQUARTERS.
3. THE SOLENOID SHALL BE NORMALLY ENERGIZED ENABLING THE HLV TO REMAIN OPEN AND FUNCTION NORMALLY. WHEN DE-ENERGIZED, THE SOLENOID CONTROL SHALL CAUSE THE VALVE TO CLOSE. SEE SEQUENCE OF OPERATION ON G.06.

HIGH LIQUID LEVEL SHUT-OFF VALVE (HLV) — A1 / D.12

SCALE: NONE

LEVEL SET - POINT TABLE

TANK SIZE (BBLs)	LLLA	LLA	HLA	HLV	HHLA
5	2'-7"	3'-3"	26'-8"	27'-1"	27'-7"
10	3'-1"	4'-2"	33'-11"	34'-5"	35'-0"
20	3'-0"	3'-8"	42'-1"	42'-9"	43'-5"
30	3'-0"	3'-5"	42'-3"	42'-11"	43'-7"
40	4'-1"	4'-10"	41'-10"	42'-6"	43'-2"
50	4'-1"	4'-9"	49'-4"	50'-2"	50'-11"
80	4'-0"	4'-5"	49'-3"	50'-0"	50'-9"
100	4'-0"	4'-4"	49'-4"	50'-2"	50'-11"

LEVEL SWITCH AND LCV NOTE:

1. SET POINT IS DEFINED AS THE DISTANCE ABOVE THE BOTTOM OF THE SHELL.
2. SET POINTS ARE BASED ON A TANK W/FLOATING PAN, AND THE FLOW RATES AND NOZZLE SIZES INCLUDED IN THIS STANDARD. SEE SHEET G.03 FOR DESIGNER NOTES; LEVELS SHALL BE SITE ADAPTED, IF FLOW RATES ARE GREATER, TO ALLOW SUFFICIENT OPERATOR RESPONSE TIME.

LEVEL SET-POINT TABLE — A3 / D.12

SCALE: NONE

* 5.01, 10.01, 20.01, 30.01, 40.01, 50.01, 80.01, 100.01

GRAPHIC SCALE(S):

3/4"=1'-0" 1' 0 1' 2' 3'

1"=1'-0" 1' 0' 1' 2'

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<<PM/CM>>	XXXX
BRANCH MANAGER	XX
CHIEF ENG/ARCH	XXX
DATE	OCTOBER 2011

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
LANT CAPITAL IMPROVEMENTS

NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS - EXTERNAL APPURTENANCES

SCALE:	AS NOTED
EPROJECT NO.:	
CONSTR. CONTR. NO.	
NAVFAC DRAWING NO.	
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D.12

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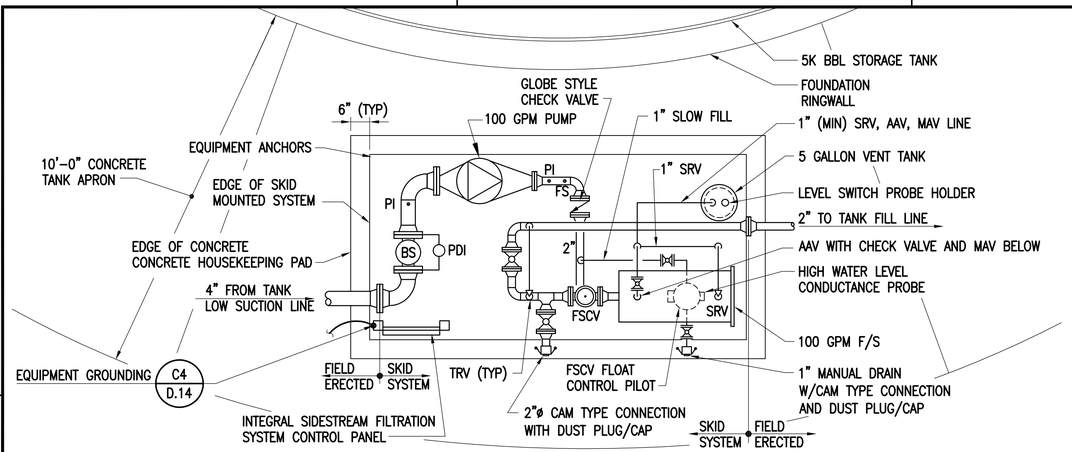


NOTES:

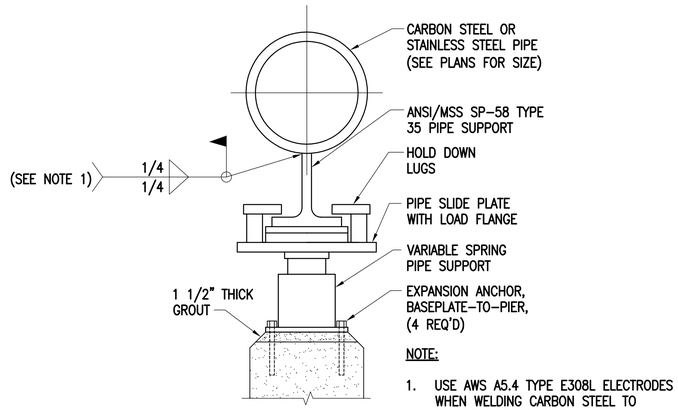
1. SYSTEM SHALL BE FACTORY ASSEMBLED, SKID MOUNTED, FACTORY RUN.
2. PROVIDE ONLY CLASS 1, DIVISION 1, RATED ELECTRICAL COMPONENTS.
3. HEAT TRACE DRAIN PIPING (AND SLOW FILL PIPING TO FIRST VALVE) IN COLD CLIMATES.
4. PIPING ARRANGEMENT SHOWN IS CONCEPTUAL ONLY.
5. COORDINATE LOCATION OF CONCRETE HOUSEKEEPING PAD WITH PAVING JOINTS TO PREVENT CRACKING.

OPTIONAL SIDESTREAM FILTRATION SYSTEM

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

C1 / D.13 *

* G.05, D.12



NOTE:

1. USE AWS A5.4 TYPE E308L ELECTRODES WHEN WELDING CARBON STEEL TO STAINLESS STEEL PIPE.

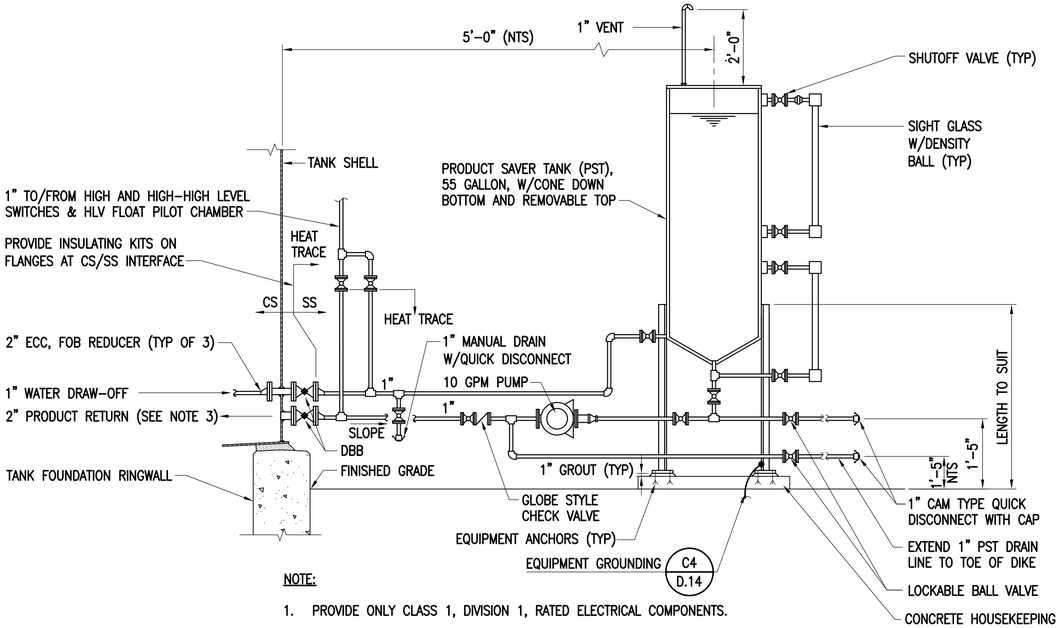
SPRING PIPE SUPPORT

SCALE: NONE

C3 / D.13 G.07

NOTE:

1. SELECT SPRING SUPPORTS TO PROVIDE FOR MAXIMUM TANK SETTLEMENT.



NOTE:

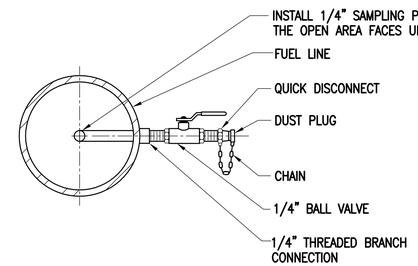
1. PROVIDE ONLY CLASS 1, DIVISION 1, RATED ELECTRICAL COMPONENTS.
2. PROVIDE HEAT TRACING ON DRAIN PIPING WHERE INDICATED WHEN REQUIRED BY COLD CLIMATES.
3. OPTION: PIPE 1" PRODUCT RETURN LINE INTO THE ISSUE NOZZLE ON THE PUMPHOUSE SIDE OF THE TANK SKIN VALVE, INSTEAD OF INTO THE INDICATED SHELL NOZZLE.

WATER DRAW-OFF SYSTEM

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

A1 / D.13 *

* G.05, 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02



FUEL SAMPLE CONNECTOR

SCALE: NONE

A4 / D.13 *

* D.02, D.08

GRAPHIC SCALE(S):

1/2"=1'-0" 1' 0' 1' 2' 3' 4' 5'

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NAVAL FACILITIES ENGINEERING COMMAND - ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AM 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TYPICAL DETAILS - EXTERNAL APPURTENANCES

SCALE: AS NOTED

EPROJECT NO.:

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SHEET 36 OF 38

D.13

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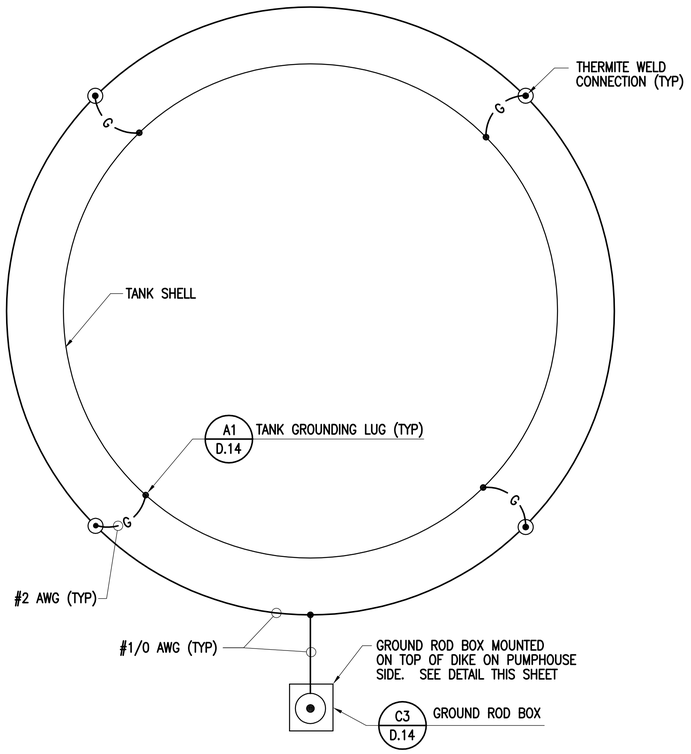
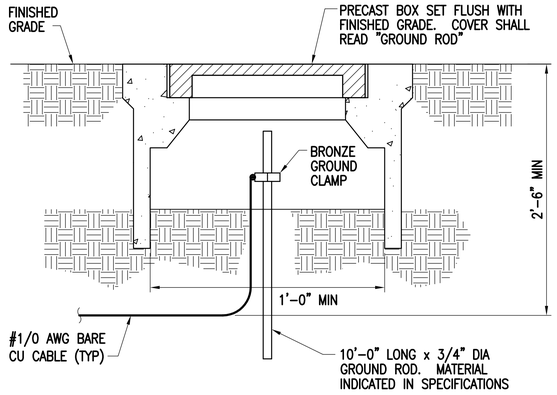


TANK GROUNDING SYSTEM

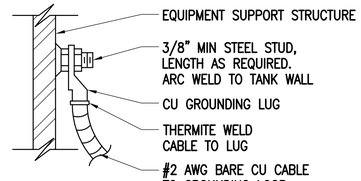
SCALE: NONE



GROUND ROD BOX

SCALE: NONE

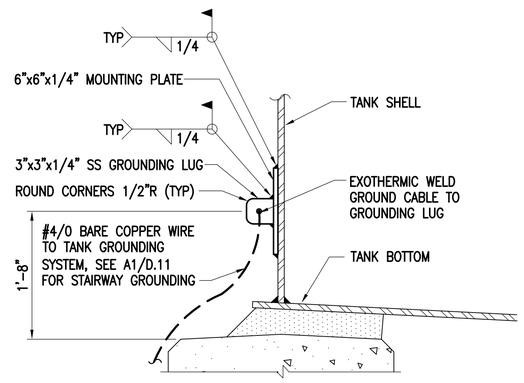
C3 / D.14



EQUIPMENT GROUNDING

SCALE: NONE

C4 / D.13 / D.14



TANK GROUNDING LUG

SCALE: NONE

A1 / * / D.14

* 5.02, 10.02, 20.02, 30.02, 40.02, 50.02, 80.02, 100.02, D.14

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BRANCH MANAGER: XX

CHIEF ENG/ARCH: XXX

DATE: OCTOBER 2011

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NAVAL FACILITIES ENGINEERING COMMAND ~ ATLANTIC
NORFOLK, VIRGINIA

DOD STANDARD DESIGN AW 78-24-27
ABOVEGROUND VERTICAL STEEL FUEL TANKS WITH FIXED ROOFS

TANK GROUNDING PLAN

SCALE: AS NOTED

EPROJECT NO.:

CONSTR. CONTR. NO.

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SHEET 37 OF 38

D.14

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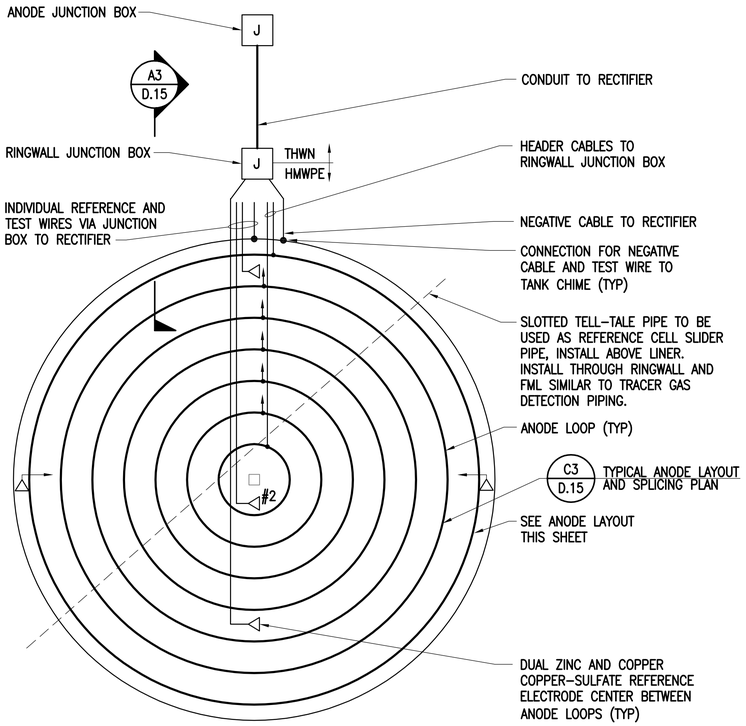
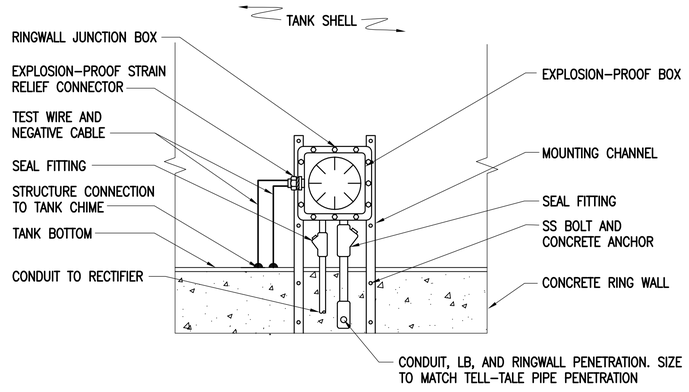
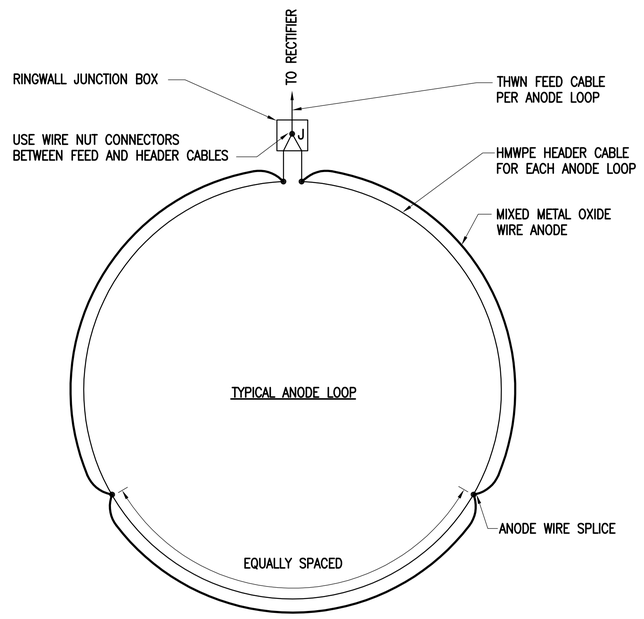


TYPICAL CATHODIC PROTECTON LAYOUT-EXTERNAL BOTTOM

SCALE: NONE



SECTION — SCALE: NONE — A1 / D.15 — D.15

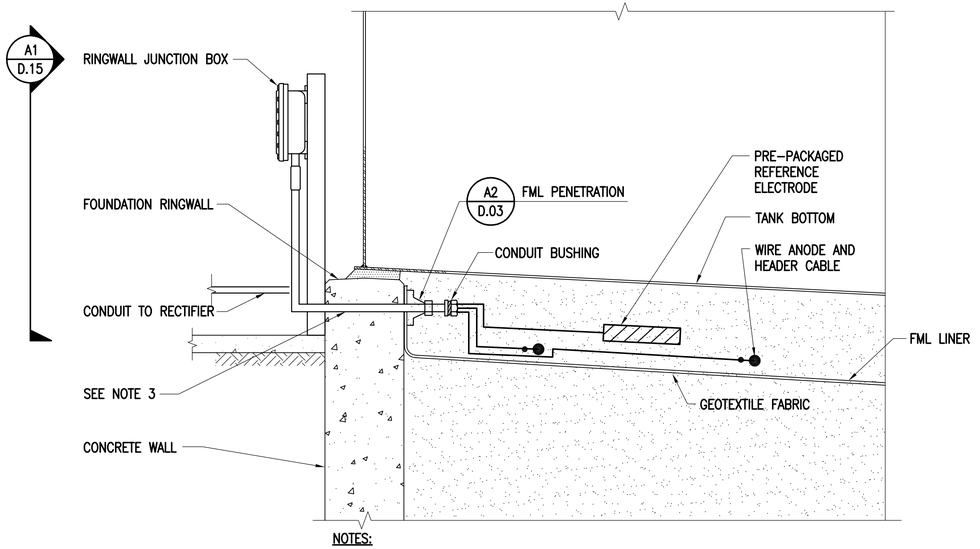


TYPICAL ANODE LAYOUT AND SPLICING PLAN

SCALE: NONE — C3 / D.15 — D.15

NOTES:

1. ALL WIRING UNDER TANK BOTTOM SHALL HAVE HMWPE CATHODIC TYPE INSULATION. WIRING IN CONDUIT SHALL HAVE THWN INSULATION.
2. MAINTAIN ELECTRICAL ISOLATION BETWEEN TANK BOTTOM AND ANODES AND REFERENCE ELECTRODES DURING CONSTRUCTION. SUBMIT WRITTEN RECORD OF ISOLATION TESTING. NOTE TO THE DESIGNER, INCLUDE ISOLATION TESTING REQUIREMENTS IN UFGS 26 42 19.00 20 CATHODIC PROTECTION BY IMPRESSED CURRENT.
3. CATHODIC PROTECTION SYSTEM SHOWN IN THIS STANDARD IS ONE ACCEPTABLE DESIGN; OTHER TYPES MAY BE PROVIDED. ALL DESIGNS SHALL BE PROVIDED BY A NACE CERTIFIED CATHODIC PROTECTION SPECIALIST. SEE SPECIFICATIONS.



NOTES:

1. INSTALL THWN CABLE IN CONDUIT FROM RINGWALL JUNCTION BOX TO ANODE AND REFERENCE CELL BOXES AT RECTIFIER. USE WIRE NUT CONNECTORS BETWEEN UNDERTANK HMWPE CABLE.
2. ALL CONDUIT FITTINGS NOT SHOWN FOR CLARITY.
3. FOR CONDUIT INSTALLATION THROUGH RINGWALL, PROVIDE PVC COATED, GALVANIZED RIGID STEEL CONDUIT CAST DIRECTLY INTO CONCRETE.

SECTION — SCALE: NONE — A3 / D.15 — D.15

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CATHODIC PROTECTION LAYOUT & TYPICAL DETAILS

SCALE: AS NOTED

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D.15

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