

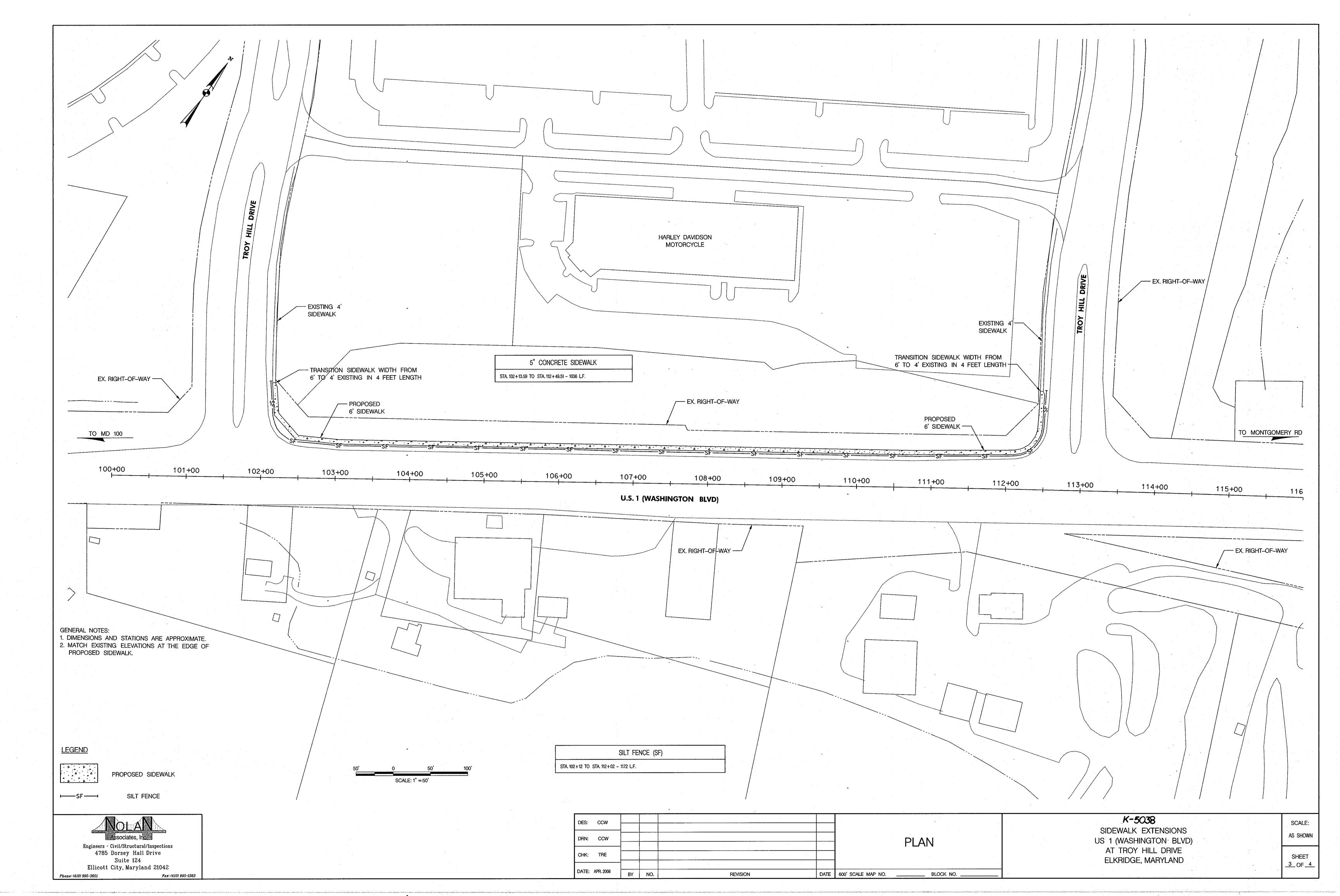
TYPICAL SECTION NOT TO SCALE

Engineers - Civil/Structural/Inspections
4785 Dorsey Hall Drive
Suite 124
Ellicott City, Maryland 21042 Fax: (410) 995-1363

DES: C	CCW						
DRN:	ccw					TYDICAL OFOTIONS	
		<u> </u>				TYPICAL SECTIONS	
CHK:	TRE				•		
DATE: AP	APR. 2008						
		BY	NO	REVISION	DATE	600' SCALE MAP NO BLOCK NO	1

K-5038 SIDEWALK EXTENSIONS US 1 (WASHINGTON BLVD) AT TROY HILL DRIVE ELKRIDGE, MARYLAND

SCALE: AS SHOWN SHEET \_2\_OF\_4\_



# SPECIFICATIONS FOR VEGETATION ESTABLISHMENT

#### PERMANENT SEEDING NOTES

Apply to graded or cleared areas not subject to immediate further disturbance where a permanent long-lived vegetative cover is needed.

Seedbed Preparation:—Loosen upper three inches of soil by raking, disking or other acceptable means before seeding, if not previously loosened.

Soil Amendments:—In lieu of soil test recommendations, use one of the following schedules:

- 1. Preferred—Apply 2 tons per acre dolomitic limestone (92 lbs/1000 sq. ft.) and 600 lbs per acre 10-10-10 fertilizer (14 lbs/1000 sq. ft.) before seeding. Harrow or disk into upper three inches of soil. At time of seeding, apply 400 lbs per acre 30-0-0 ureaform fertilizer (9 lbs/1000 sq. ft.)
- 2. Acceptable—Apply 2 tons per acre dolomitic limestone (92 lbs/1000 sq. ft.) and 1000 lbs. per acre 10-10-10 fertilizer (23 lbs/1000 sq. ft.) before seeding. Harrow or disk into upper three inches of soil.

Seeding—For the periods March 1 thru April 30, and August 1 thru October 15, seed with 60 lbs per acre (1.4 lbs/1000 sq. ft.) of Kentucky 31 Tall Fescue and 2 lbs per acre (.05 lbs/1000 sq. ft.) of weeping lovegrass. During the period of October 16 thru February 28, protect site by: Option (1) -2 tons per acre of well anchored straw mulch and seed as soon as possible in the spring. Option (2) - Use sod. Option (3) - Seed with 60 lbs/acre Kentucky 31 Tall Fescue and mulch with 2 tons/acre well anchored straw.

Mulching-Apply 1-1/2 to 2 tons per acre (70 to 90 lbs/1000 sq. ft.) of unrotted small grain strawimmediately after seeding. Anchor mulch immediately after application using mulch anchoring tool or 218 gallons per acre (5 gal/1000 sq. ft.) of emulsified asphalt on flat areas. On slopes 8 feet or higher, use 348 gallons per acre (8 gal/1000 sq. ft.) for anchoring.

Maintenance—Inspect all seeding areas and make needed repairs, replacements and reseedings.

#### TEMPORARY SEEDING NOTES

Apply to graded or cleared areas likely to be redisturbed where a short-term vegetative cover is

Seedbed preparation:—Loosen upper three inches of soil by raking, disking or other acceptable means before seeding, if not previously loosened.

Soil Amendments:—Apply 600 lbs per acre 10-10-10 fertilizer (14 lbs/1000 sq. ft.).

Seeding—For periods March 1 thru April 30 and from August 15 thru November 15, seed with 2-1/2 bushelper acre of annual rye (3.2 lbs/1000 sq. ft.). For the period May 1 thru August 14, seed with 3 lbs per acre of weeping lovegrass (.07 lbs/1000 sq. ft.). For the period November 16 thru February 28, protect site by applying 2 tons per acre of well anchored straw mulch and seed as soon as possible in the spring, or use sod.

Mulching-Apply 1-1/2 to 2 tons per acre (70 to 90 lbs/1000 sq. ft.) of unrotted weed free small grain straw immediately after seeding. Anchor mulch immediately after application using mulch anchoring tool or 218 gal per acre (5 gal/1000 sq. ft.) of emulsified asphalt on flat areas. On slopes 8 ft. or higher, use 348 gal per acre (8 gal/1000 sq. ft.) for anchoring.

Refer to the 1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL for additional rates and methods not covered

# STANDARD SEDIMENT CONTROL NOTES

- A minimum of 24 hours notice must be given to the Howard County Department of Inspections, Licenses and Permits, Sediment Control Division prior to the start of any construction, (313–1850). All vegetative and structural practices are to be installed according to the provisions of this
- plan and are to be in conformance with the most current "MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL", and revisions thereto. Following initial soil disturbance or redisturbance, permanent or temporary stabilization shall be completed within: a) 7 calendar days for all perimeter sediment control structures, dikes, perimeter slopes and all slopes greater than 3:1, b) 14 days as to all other disturbed or graded
- 4. All sediment traps/basins shown must be fenced and warning signs posted around their perimeter in accordance with Vol. 1. Chapter 12, of the HOWARD COUNTY DESIGN
- MANUAL Storm Drainage. All disturbed areas must be stabilized within the time period specified above in accordance with the 1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL for permanent seeding (Sec. 51), sod (Sec. 54), temporary seeding (Sec. 50)
- and mulching (Sec. 52). Temporary stabilization with mulch alone can only be done when recommended seeding dates do not allow for proper germination and establishment of grasses. All sediment control structures are to remain in place and are to be maintained in operative condition until permission for their removal has been obtained from the Howard County
- Sediment Control Inspector.

Site Analysis		
Total Area of Site	0.24	Acres
Area Disturbed	0.19	Acres
Area to be roofed or paved	0.14	Acres
Area to be vegetatively stabilized	0.05	Acres
Total Cut	106	Cu. Yds
Total Fill	0	Cu. Yds
Offsite Waste/Borrow Area Location To Be Determined E	By Contractor	

at a site with an active grading permit. \*It is the responsibility of the contractor to identify the soil/borrow site and notify and gain the approval from the sediment control inspector of the site and its grading permit

- number at the time of construction. Any sediment control practice which is disturbed by grading activity for placement of utilities must be repaired on the same day of disturbance.
- Additional sediment control must be provided, if deemed necessary by the Howard County Sediment Control Inspector.

# SPECIFICATIONS FOR TOPSOIL

Definition: Placement of topsoil over a prepared subsoil prior to establishment of permanent vegetation. Purpose: To provide a suitable soil medium for vegetative growth. Soils of concern have low moisture content, low nutrient levels, low pH, materials toxic to plants, and/or unacceptable soil gradation. Conditions Where Practice Applies

- This practice is limited to areas having 2:1 or flatter slopes where:
  - The texture of the exposed subsoil/parent material is not adequate to produce vegetative growth. The soil material is so shallow that the rooting zone is not deep enough to support plants or furnish
  - continuing supplies of moisture and plant nutrients.
  - The original soil to be vegetated contains material toxic to plant growth. The soil is so acidic that treatment with limestone is not feasible.
- For the purpose of these Standards and Specifications, areas having slopes steeper than 2:1 require special consideration and design for adequate stabilization. Areas having slopes steeper than 2:1 shall have the appropriate stabilization shown on the plans.

#### Construction and Material Specifications

Topsoil salvaged from the existing site may be used provided that it meets the standards as set forth in these specifications. Typically, the depth of topsoil to be salvaged for a given soil type can be found in the representative soil profile section in the Soil Survey published by USDA-SCS in cooperation with Maryland Agricultural Experimental Station.

- Topsoil Specifications Soil to be used as topsoil must meet the following:
- Topsoil shall be a loam, sandy loam, clay loam, silt loam, sandy clay loam, loamy sand. Other soils may be used if recommended by an agronomist or soil scientist and approved by the appropriate approval authority. Regardless, topsoil shall not be a mixture of contrasting textured subsoils and shall contain less than 5% by volume of cinders, stones, slag, coarse fragments, gravel, sticks, roots, trash, or other materials larger than
- Topsoil must be free of plants or plant parts such as bermuda grass, quackgrass, Johnsongrass, nutsedge, poison iw, thistle, or others as specified.
- Where the subsoil is either highly acidic or composed of heavy clays, ground limestone shall be spread at the rate of 4-8 tons/acre (200-400 pounds per 1,000 square feet) prior to the placement of topsoil. Lime shall be distributed uniformly over designated areas and worked into the soil in conjunction with tillage operations as described in the following procedures.
- For sites having disturbed areas under 5 acres: Place topsoil (if required) and apply soil amendments as specified in 20.0 Vegetative Stabilization - Section I

- Vegetative Stabilization Methods and Materials. For sites having disturbed areas over 5 acres:

- On soil meeting Topsoil specifications, obtain test results dictating fertilizer and lime amendments required to bring the soil into compliance with the following:
  - pH for topsoil shall be between 6.0 and 7.5. If the tested soil demonstrates a pH of less than 6.0, sufficient lime shall be prescribed to raise the pH to 6.5 or higher.
- Organic content of topsoil shall be not less than 1.5 percent by weight.
- Topsoil having soluble salt content greater than 500 parts per million shall not be used.
- No sod or seed shall be placed on soil which has been treated with soil sterilants or chemicals used for weed

control until sufficient time has elapsed (14 days min.) to permit dissipation of phyto-toxic materials. Note: Topsoil substitutes or amendments, as recommended by a qualified agronomist or soil scientist and

approved by appropriate authority, may be used in lieu of natural topsoil. Place topsoil (if required) and apply soil amendments as specified in 20.0 Vegetative Stabilization - Section I - Vegetative Stabilization Methods and Materials.

# Topsoil Application

- When topsoiling, maintain needed erosion and sediment control practices such as diversions, Grade
- Stabilization Structures, Earth Dikes, Slope Silt Fence and Sediment Traps and Basins. Grades on the areas to be topsoiled, which have been previously established, shall be maintained, albeit 4"-8"
- Topsoil shall be uniformly distributed in a 4"-8" layer and lightly compacted to a minimum thickness of 4". Spreading shall be performed in such a manner that sodding or seeding can proceed with a minimum of additional soil preparation and tillage. Any irregularities in the surface resulting from topsoiling or other operations shall be corrected in order to prevent the formation of depressions or water pockets.
- Topsoil shall not be placed while the topsoil or subsoil is in a frozen or muddy condition, when the subsoil is excessively wet or in a condition that may otherwise be detrimental to proper grading and seedbed preparation.
- Alternative for Permanent Seeding. Instead of applying the full amounts of lime and commercial fertilizer,
  - composted sludge and amendments may be applied as specified below: Composted Sludge Material for use as soil conditioner for sites having disturbed areas over 5 acres shall be tested to prescribe amendments and for sites having disturbed areas under 5 acres shall conform to the
    - Composted sludge shall be supplied by, or originate from, a person or persons that are permitted (at the time of acquisition of the compost) by the Maryland Department of Environment under COMAR 26.04.06.
    - Composted sludge shall contain at least 1 percent nitrogen, 1.5 percent phosphorus, and 0.2 percent potassium and have a Ph of 7.0 to 8.0. If compost does not meet these requirements, the appropriate constituents must be added to meet the requirements prior to use.
  - Composted sludge shall be applied at the rate of 1 ton/1,000 square feet.
  - Composted sludge shall be amended with a potassium fertilizer applied at the rate of

# 4 lb/1000 square feet, and 1/3 the normal lime application rate.

# SEQUENCE OF CONSTRUCTION

**DURATION** 

- 1. OBTAIN GRADING PERMIT.
- 2. NOTIFY HOWARD COUNTY BUREAU OF INSPECTIONS AND PERMITS (410-313-1880) AT LEAST 48 HOURS BEFORE STARTING ANY WORK.

3. DELINEATE LIMITS OF DISTURBANCE.

4. INSTALL SILT FENCE.

5. CONSTRUCT SIDEWALK.

NOTE:

6. STABILIZED DISTURBED AREAS WITH 4" TOPSOIL, SEED AND MULCH.

7. WITH THE APPROVAL OF THE SEDIMENT CONTROL INSPECTOR, REMOVE DIVERSION AND ALL SEDIMENT CONTROL DEVICES. STABILIZE AREAS DISTURBED BY THE REMOVAL

1 DAY 1 DAY

10 DAYS 2 DAYS

2 DAYS

NO DISTURBED AREA SHALL BE LEFT UNSTABILIZED OVERNIGHT UNLESS THE RUNOFF IS DIRECTED TO AN APPROVED SEDIMENT CONTROL DEVICE.

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		APR. 2008	BY	NO.	REVISION	DATE	600' SCALE MAP NO BLOCK NO

# - FENCE POST SECTION MINIMUM 20" ABOVE THE THE THE THE THE THE - FENCE POST DRIVEN A MINIMUM OF 16" INTO STANDARD SYMBOL -----SF ----ground. Wood posts shall be 11/2" x 11/2" square (minimum) cut. or 13/4" diameter

# SILT FENCE

Silt Fence Design Criteria

(Maximum) (Maximum) Silt Fence Length Slope Length Slope Steepness Flatter than 50:1 unlimited unlimited 1,000 feet 125 feet 50:1 to 10:1 100 feet 750 feet 10:1 to 5:1 60 feet 500 feet 5:1 to 3:1 3:1 to 2:1 40 feet 250 feet 20 feet 125 feet 2:1 and steeper

Note: In areas of less than 2% slope and sandy soils (USDA general classification system, soil Class A) maximum slope length and silt fence length will be unlimited. In these areas a silt fence may be the only perimeter control required.

U.S. DEPARTMENT OF AGRICULTURE MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION SOIL CONSERVATION SERVICE

> THIS PLAN IS FOR SEDIMENT AND EROSION CONTROL PURPOSE ONLY

By the Owner/Developer:

"I/We certify that all development and/or construction will be done according to these plans, and that any responsible personnel involved in the construction project will have a Certificate of Attendance at a Department of the Environment Approved Training Program for the Control of Sediment and Erosion before beginning the project. I also authorize periodic on-site inspections by the Howard Soil Conservation District."

> Steve Sharan Signature of Owner/Developer Print name below signature

DETAIL 22 - SILT FENCE

36" MINIMUM FENCE-

FLOW

A MINIMUM OF 8" VERTICALLY

EMBED GEOTEXTILE CLASS F

Construction Specifications

1. Fence posts shall be a minimum of 36" long driven 16" minimum into the

(minimum) round and shall be of sound quality hardwood. Steel posts will be

standard T or U section weighting not less than 1.00 pond per linear foot.

2. Geotextile shall be fastened securely to each fence post with wire ties

or staples at top and mid-section and shall meet the following requirements

50 lbs/in (min.)

20 lbs/in (min.)

3. Where ends of geotextile fabric come together, they shall be overlapped.

4. Silt Fence shall be inspected after each rainfall event and maintained when

bulges occur or when sediment accumulation reached 50% of the fabric height.

INTO THE GROUND

TISTISTISTISTISTISTISTISTI

POST LENGTH

10' MAXIMUM CENTER TO

--- CENTER .

PERSPECTIVE VIEW

TOP VIEW

STAPLE

for Geotextile Class F:

Flow Rate

Tensile Strenath

Filtering Efficiency 75% (min.)

folded and stapled to prevent sediment bypass.

Tensile Modulus

U.S. DEPARTMENT OF AGRICULTURE

JOINING TWO ADJACENT SILT

FENCE SECTIONS

— 36" MINIMUM LENGTH FENCE POST.

DRIVEN A MINIMUM OF 16" INTO

---16" MINIMUM HEIGHT OF

GROUND

THE GROUND

Test: ASTM D-4595

Test: ASTM D-4595

Test: ASTM D-5141

MARYLAND DEPARTMENT OF ENVIRONMENT

WATER MANAGEMENT ADMINISTRATION

GEOTEXTILE CLASS F

-- 8" MINIMUM DEPTH IN

GROUND

CROSS SECTION

0.3 gal ft\*/ minute (max.) Test: ASTM D-5141

10/30/08

By the Engineer:

"Icertify that this plan for erosion and sediment control represents a practical and workable plan based on my personal knowledge of the site conditions. This plan was prepared in accordance with the requirements of the Howard Soil Conservation District."

Print name below signature

These plans are approved for soil erosion and sediment control by the Howard Soil Conservation District.

K-5038 SIDEWALK EXTENSIONS US 1 (WASHINGTON BLVD) AT TROY HILL DRIVE ELKRIDGE, MARYLAND

AS SHOWN

SCALE:

Phone: (410) 995-3651

Ellicott City, Maryland 21042

Suite 124

Engineers - Civil/Structural/Inspections 4785 Dorsey Hall Drive

SHEET 4\_OF\_4

- THE APPROXIMATE LOCATION OF EXISTING UTILITIES ARE SHOWN. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO PROTECT EXISTING STRUCTURES, UTILITIES AND SERVICES AND MAINTAIN UNINTERRUPTED SERVICE. ANY DAMAGE INCURRED SHALL BE REPAIRED IMMEDIATELY TO THE SATISFACTION OF THE ENGINEER AT " THE CONTRACTOR'S EXPENSE.
- TOPOGRAPHIC FIELD SURVEYS WERE PERFORMED IN APRIL, 2009 BY KCI TECHNOLOGIES.
- HORIZONTAL AND VERTICAL CONTROL:

EMBEDDED ON TOP OF 10"CONCRETE CURB

- THE COORDINATES SHOWN ON THE DRAWINGS ARE BASED ON MARYLAND STATE REFERENCE SYSTEM NAD'83/91
- AS PROJECTED BY HOWARD COUNTY GEODETIC CONTROL STATIONS NO. 22BB, NO. 28AA AND NO. 07FC ALL VERTICAL CONTROLS ARE BASED ON NAVD '88, STATIONS 22BB AND 28AA ARE HOWARD COUNTY STANDARD DISKS WITH A PIECE OF IRON TO FACILITATE MAGNETIC DETECTION. STATION 07FC IS A NAIL
- THE CONTRACTOR SHALL NOTIFY MISS UTILITY AT 1-800-257-7777 AT LEAST 48 HOURS IN ADVANCE OF ANY WORK IN THIS AREA, SO APPROPRIATE MARKING OF EXISTING UTILITIES CAN BE MADE.
- ALL EXCAVATION SHALL BE KEPT FREE OF WATER UNTIL BACKFILL IS PROPERLY TAMPED IN PLACE TO FINISHED
- FOR DETAILS NOT SHOWN ON THE DRAWINGS, AND FOR MATERIALS AND CONSTRUCTION METHODS, USE HOWARD COUNTY DESIGN MANUAL, VOLUME IV, STANDARD SPECIFICATIONS AND DETAILS FOR CONSTRUCTION (LATEST EDITION). THE CONTRACTOR SHALL HAVE A COPY OF VOLUME IV ON THE JOB.
- CONTRACTOR SHALL NOTIFY THE FOLLOWING UTILITY COMPANIES OR AGENCIES AT LEAST FIVE WORKING DAYS

BEFORE STARTING WORK SHOWN ON THESE PLANS: BG&E (CONSTRUCTION SERVICES) 410-858-4628 BG&E (EMERGENCY) 410-685-1400 410-313-4900 BUREAU OF UTILITIES (DPW) 410-795-1390 COLONIAL PIPELINE CO. MISS UTILITY 1-800-257-7777 STATE HIGHWAY ADMINISTRATION 410-531-5533

1-800-743-0033 / 410-224-9210

- TREES AND SHRUBS ARE TO BE PROTECTED FROM DAMAGE TO THE MAXIMUM EXTENT. TREES AND SHRUBS WITHIN THE CONSTRUCTION AREA ARE NOT TO BE REMOVED UNLESS THEY ARE LOCATED WITHIN THE AREA OF EXCAVATION.
- CLEAR ALL UTILITIES BY A MINIMUM OF 12". CLEAR ALL POLES BY 5'-0" MINIMUM. THE CONTRACTOR SHALL CONTACT THE UTILITY COMPANIES AND MAKE ARRANGEMENTS FOR BRACING OF POLES AS REQUIRED.

# **TANK GENERAL NOTES:**

- CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH THESE DRAWINGS, THE SPECIAL PROVISIONS AND THE HOWARD COUNTY STANDARD DETAILS AND SPECIFICATIONS FOR CONSTRUCTION.
- 2. THE CONTRACTOR SHALL CONDUCT A VERIFICATION OF SITE STAKING AND LAYOUT PRIOR TO EXCAVATION.
- 3. ALL EXCAVATION, BACKFILL, AND COVER SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS ON THESE DRAWNGS AS A MINIMUM, AND TANK MANUFACTURER'S SPECIFICATIONS. DETAILS AND DIMENSIONS SHALL NOT SUPERCEDE MANUFACTURER'S REQUIREMENTS. EXCAVATION DEPTH SHALL BE DETERMINED BY SITE CONDITIONS AND MANUFACTURER'S SPECIFICATIONS. SHORE AS NECESSARY. ELEVATIONS SHOWN IN TABLE 2 ON SHEET 5 OF 6 REPRESENT THE MAXIMUM ALLOWABLE CONDITION FOR PROPER TANK OPERATION AND SHALL NOT BE EXCEEDED.
- 4. ALL TESTING IS THE RESPONSIBILITY OF THE CONTRACTOR.
- 5. ALL CONTRACTORS SHALL BE CERTIFIED BY THE TANK MANUFACTURER PRIOR TO ANY INSTALLATION
- ALL WORK SHALL BE COMPLETED IN A TIMELY AND WORKMANLIKE MANNER. ALL WORK SHALL CONFORM TO APPLICABLE CODES AND STANDARDS.
- 7. EXCAVATION AND SITE WORK SHALL BE PERFORMED IN ACORDANCE WITH APPLICABLE AND CURRENT MOSHA AND OSHA REGULATIONS.
- 8. PRESSURE TEST PROCEDURES SHALL BE PERFORMED BY THE INSTALLER PRIOR TO AND AFTER INSTALLATION, IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND THESE DRAWINGS.
- 9. AN OPERATIONAL TEST SHALL BE CONDUCTED AFTER INSTALLATION PER THE TANK MANUFACTURERS SPECIFICATIONS AND THESE DRAWINGS.
- 10. ALL STEEL AND PVC FITTINGS ABOVE GRADE SHALL BE PAINTED WITH EXTERIOR ENAMEL, UNLESS OTHERWISE SPECIFIED. COLORS SHALL BE APWA STANDARD YELLOW OR RED AS NOTED ON THE DRAWINGS .
- 11. THE CONTRACTOR SHALL RESTORE THE SITE TO ORIGINAL CONDITION AFTER FINAL TESTING INCLUDING, BUT NOT LIMITED TO FINE GRADING, SEEDING, MULCHING, AND GENERAL CLEANUP. THE DISTANCE FROM THE CENTERLINE OF THE DRAFT FITTING SHALL BE 8'-0" OR LESS TO THE EDGE OF THE
- 13. THE WATER LEVEL INDICATOR SHALL BE ORIENTED TOWARD THE ACCESS AREA OR PULLOFF FOR VISIBILITY.

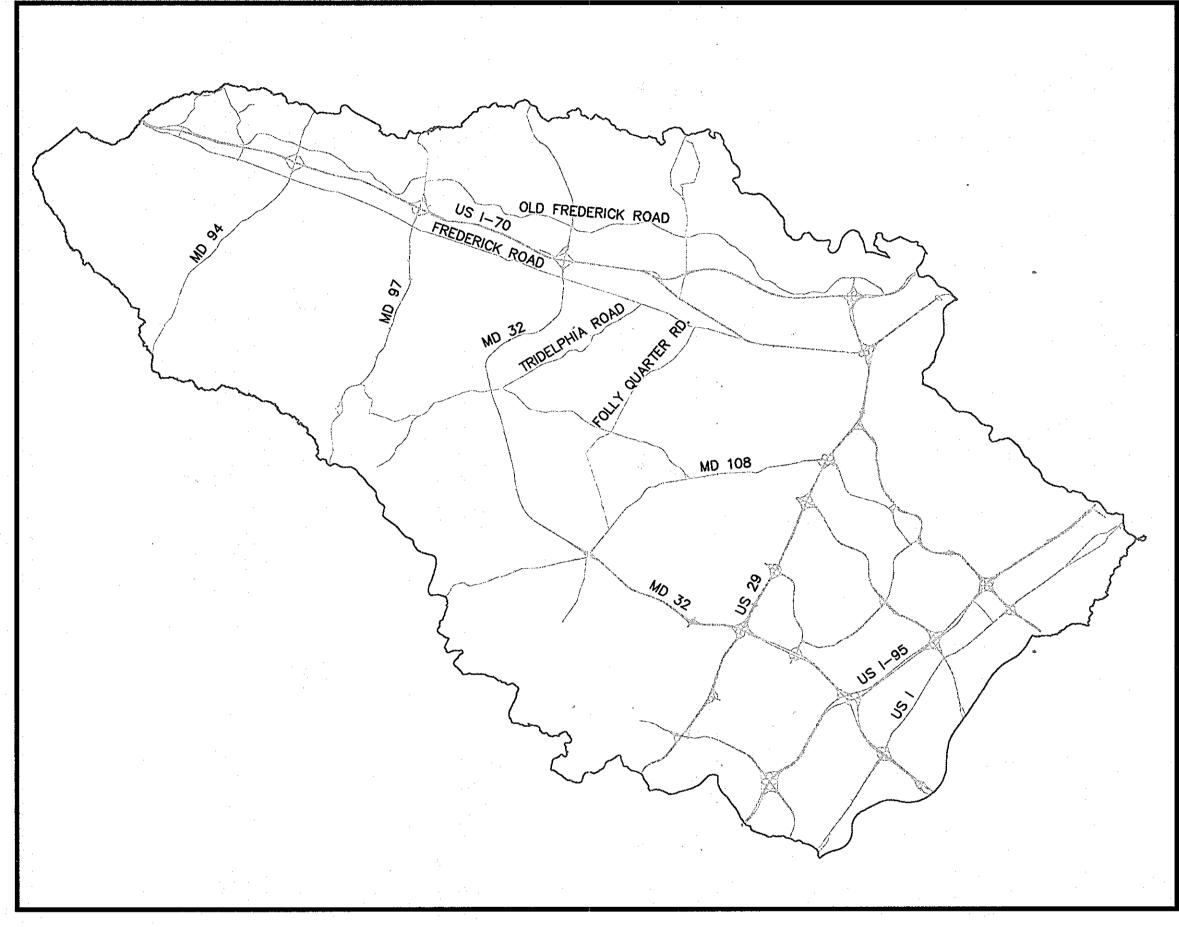
ROADWAY OR PULLOFF. THIS DIMENSION SHALL APPLY TO ALL INSTALLATION CONFIGURATIONS.

- 14. INSTALL POST AND DOT R7 STYLE NO PARKING SIGNAGE, SEE SHEET 5 OF 6 FOR DETAILS. TOP OF POST SHALL BE 7'-0" ABOVE FINISHED GRADE.
- UNLESS OTHERWISE NOTED, THE CENTER DRAFT CONFIGURATION SHALL BE USED WHERE THE TANK IS PLACED PARALLEL TO THE PULLOFF OR ROADWAY. THE END DRAFT CONFIGURATION SHALL BE USED WHERE THE TANK IS PLACED PERPENDICULAR TO THE PULLOFF OR ROADWAY. ALTERNATE CONFIGURATIONS MAY BE REQUIRED DUE TO SPECIFIC SITE CONDITIONS.
- VARIATION IN FITTING PLACEMENT DUE TO DIFFERENT TANK MANUFACTURERS IS ACCEPTABLE, BUT CRITICAL DIMENSIONS SHALL BE MAINTAINED, SEE SPECIFICATIONS. VARIATIONS OR SPECIAL FEATURES REQUIRE APPROVAL BY THE OWNER AND THE HOWARD COUNTY FIRE MARSHALL.

# UNDERGROUND WATER STORAGE TANKS FOR FIRE SUPPRESSION

HOWARD COUNTY GOVERNMENT DEPARTMENT OF PUBLIC WORKS

> CAPITAL PROJECT NO. F-5972 **CONTRACT NO. 65-4647**



HOWARD COUNTY, MARYLAND

-	INDEX OF SHEETS
SHEET NO.	DESCRIPTION
1 of 7	TITLE SHEET
2 of 7	SPECIFICATIONS - 1
3 of 7	SPECIFICATIONS - 2
4 of 7	GENERAL DETAILS - 1
5 of 7	GENERAL DETAILS - 2
6 OF 7	GENERAL DETAILS - 3
7 of 7	SEDIMENT AND EROSION CONTROL NOTES AND DETAILS

PROFESSIONAL CERTIFICATION. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State Of Maryland, License No. 20453, Expiration Date 05/18/2010.

DEPARTMENT OF PUBLIC WORKS HOWARD COUNTY, MARYLAND

CHIEF, BUREAU OF ENGINEERING RECTOR DE PUBLIC WORKS ACACHIEF, UTILITY DESIGN DIVISION PSD DATE

TECHNOLOGIES

HUNT VALLEY, MD 21030 PHONE: (410) 316-7800

Fax: (410) 316-7817



DATE: 01/05/09	BY	NO.	REVISION	DATE
CHK: CLO				
DRN: JBM				
DES: TLF				

TITLE SHEET

# UNDERGROUND WATER STORAGE TANKS FOR FIRE SUPPRESSION

CAPITAL PROJECT No.F-5972 **CONTRACT No. 65-4647** HOWARD COUNTY, MARYLAND AS SHOWN SHEET

SCALE

\_\_\_OF\_\_Z

#### 1.1. SCOPE

THE CONSTRUCTION OF UNDERGROUND TANKS FOR FIRE PROTECTION IN ACCORDANCE WITH HOWARD COUNTY CODE, TITLE 17 AND THIS SPECIFICATION IS PART OF A PROGRAM DESIGNED TO IMPROVE THE LEVEL OF PROTECTION FROM FIRES IN RESIDENTIAL AND COMMERCIAL PROPERTIES. THESE SPECIFICATIONS, ALONG WITH ASSOCIATED DOCUMENTS, PROVIDE THE INFORMATION NECESSARY FOR THE CONSTRUCTION AND PLACEMENT OF FIRE PROTECTION TANKS USED FOR THIS PURPOSE.

#### 1.2. PURPOSE

THE PURPOSE OF THIS SPECIFICATION IS TO PROVIDE THE TECHNICAL INFORMATION REQUIRED FOR THE CONSTRUCTION OF UNDERGROUND WATER STORAGE TANKS IN ACCORDANCE WITH HOWARD COUNTY MARYLAND, TITLE 17 AND ALL DATA THEREIN REFERENCED.

#### 2. UNDERGROUND TANKS

- 2.1. MATERIALS FOR A STATIC WATER SUPPLY TANK
  - 2.1.1. TANKS SHALL BE CONSTRUCTED OF SINGLE-WALL FIBERGLASS PER THESE SPECIFICATIONS AND IN ACCORDANCE WITH THE APPROVED MANUFACTURER'S SPECIFICATIONS.
  - 2.1.2. THE MANUFACTURER SHALL PROVIDE A 30-YEAR WARRANTY, AGAINST DEFECTS IN MATERIAL FOR THE TANK SYSTEM, TO THE PURCHASER OF THE TANK AND THEIR HEIRS, SUCCESSORS, AND ASSIGNS.

#### 2.2. FEATURES

- 2.2.1. THE TANK SYSTEM SHALL INCLUDE A DEVICE FOR HOLDING THE TANK IN POSITION AGAINST FLOATATION (DEADMAN). THIS CONFIGURATION SHALL BE SUPPLIED BY THE TANK MANUFACTURER AS PART OF THE TANK PACKAGE. INSTALLATION SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS AND THE MANUFACTURER'S RECOMMENDATIONS.
- 2.2.2. THE TANK SHALL INCLUDE A REMOVABLE ACCESS COVER AT GRADE (MANHOLE), AT LEAST 52" IN DIAMETER, TO ALLOW ENTRY FOR MAINTENANCE AND INSPECTION OF THE INSIDE OF THE TANK. THE ACCESS COVER SHALL BE PROPERLY SECURED AND LOCKED.
- 2.2.3. A PAD CONSISTING OF 6 INCH THICK CONCRETE SHALL BE PLACED OVER THE TANK. AND SHALL ENCOMPASS ALL FITTINGS. REFER TO TANK DRAWINGS FOR CONCRETE SPECIFICATIONS.

#### 2.2.4. FITTINGS

- ONE DRAFT CONNECTION SHALL CONSIST OF A 6 INCH NOMINAL DIAMETER DUCTILE IRON PIPE. THE DRAFT CONNECTION SHALL TERMINATE IN A 6NH (NATIONAL HYDRANT FEMALE) SWIVEL CONNECTOR WITH PLUG OR CAP. A PVC DRAFT PIPE WITH AN ANTI-VORTEX PLATE SHALL BE INSTALLED INSIDE THE TANK BY THE MANUFACTURER. THE DRAFT CONNECTION ALLOWS A FIRE DEPARTMENT PUMPER TO CONNECT AND REMOVE WATER FROM THE TANK AT THE SPECIFIED RATE OF FLOW (FIRE FLOW). DRAFT CONNECTION SHALL BE PAINTED FIRE ENGINE RED.
- ONE COMBINATION VENT/FILL INDICATOR SHALL CONSIST OF AN 8 INCH DIAMETER PVC PIPE WHICH ALLOWS VISUAL INSPECTION OF THE TANK WATER LEVEL, AS WELL AS PROVIDING THE REQUIRED AMOUNT OF VENTING TO THE TANK.
- ONE FILL CONNECTION SHALL CONSIST OF A 4 INCH NOMINAL DIAMETER DUCTILE IRON PIPE, WITH A SIAMESE CONNECTION WITH TWO, TWO AND ONE HALF INCH (2-2 1/2") CONNECTION AND ONE 4" STORTZ CONNECTION. THE FITTING SHALL BE ANGLED DOWNWARD AT 30 DEGREES TO REDUCE HOSE AND FITTING STRAIN DURING FILLING OPERATIONS.
- 2.2.4.4. ALL PIPE JOINTS ABOVE THE SLAB SHALL BE FLANGED BREAK AWAY CONNECTIONS AT OR NEAR SLAB.

# 2.2.5. SUBMITTALS

- SHOP DRAWINGS SHALL BE PROVIDED FOR ALL MATERIALS OR COMPONENTS OF CONSTRUCTION, AND PROPOSED PIPING LAYOUTS. THESE SHOP DRAWINGS SHALL BE PROVIDED WELL IN ADVANCE OF CONSTRUCTION IN ORDER TO ALLOW FOR DISTRIBUTION AND REVIEW BY THE OWNER AND THE FIRE MARSHALL. THE CONTRACTOR SHALL PROVIDE A LIST OF ALL ANTICIPATED SHOP DRAWINGS TO THE OWNER FOR REVIEW PRIOR TO CONSTRUCTION. ADDITIONAL SUBMITTALS OR DOCUMENTATION MAY BE REQUIRED BY THE OWNER OR OTHER REVIEWING PARTIES, FOR WHICH THE CONTRACTOR SHALL NOT SEEK ADDITIONAL COMPENSATION.
- IN THE EVENT THAT SITE CONDITIONS DICTATE THE USE OF STRUCTURAL ELEMENTS NOT EXPLICITLY DETAILED IN THE DRAWINGS, THE CONTRACTOR SHALL SUBMIT DRAWINGS AND CALCULATIONS SIGNED AND SEALED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF MARYLAND.
- OPERATION AND MAINTENANCE MANUALS SHALL BE PROVIDED BY THE TANK MANUFACTURER, INCLUDING OPERATIONAL TESTING PROCEDURES.
- 2.2.6. ANY FEATURES NOT INCLUDED IN THIS SPECIFICATION, AS WELL AS ANY SPECIAL CIRCUMSTANCES SUCH AS MULTIPLE-TANK DESIGNS SHALL BE EVALUATED AND APPROVED DURING DESIGN PHASE AND BEFORE ANY CONSTRUCTION IS STARTED.
- 2.2.7. THE STANDARD TANK DETAIL, 30.000 GALLON TANK, FIRE SUPPRESSION WATER STORAGE, ON SHEET 4 OF 6, DEFINES THE REQUIREMENTS FOR A TYPICAL 30,000 GALLON, 10-FOOT DIAMETER TANK INSTALLATION. TANK SIZES OTHER THAN 30,000 GALLONS MAY REQUIRE ADDITIONAL DRAWINGS TO BE PROVIDED TO FIT THE REQUIREMENTS OF A PARTICULAR

# 2.3. INSTALLATION

- 2.3.1. ALL TANKS SHALL BE INSTALLED IN ACCORDANCE WITH THESE SPECIFICATIONS AND THE APPROVED MANUFACTURER'S SPECIFICATIONS.
- 2.3.2. LOCATION AND ORIENTATION OF THE TANK SHALL BE DETERMINED DURING SITE PLAN OR PRELIMINARY SUBDIVISION PLAN LAYOUT, AS APPROVED BY THE HOWARD COUNTY FIRE
- 2.3.3. THE INSTALLING CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR WORK AND FOR SCHEDULING REQUIRED INSPECTIONS.

#### 2.3.4. THE FITTINGS SHALL BE PLACED AS FOLLOWS:

- THE DRAFT CONNECTION SHALL BE LOCATED 8 FEET OR LESS FROM THE EDGE OF THE PARKING SURFACE OR CURB LINE. THIS ALLOWS FOR ONE 10 FOOT SECTION OF SUCTION SLEEVE TO BE USED FOR DRAFTING. THE DRAFT CONNECTION OPENING SHALL BE TURNED FACING DIRECTLY TOWARD THE ROAD SURFACE.
- TOTAL ELEVATION FROM THE BOTTOM OF THE SUCTION PIPE TO THE CENTERLINE OF THE DRAFT CONNECTION SHALL NOT EXCEED 15 FEET ZERO INCHES. THIS DIMENSION 4. PREPARATION FOR INSTALLATION SHALL BE MINIMIZED AS MUCH AS POSSIBLE TO REDUCE HEAD LOSS, WHILE MAINTAINING CORRECT DEPTH OF COVER OVER TANK, PER MANUFACTURER'S SPECIFICATIONS.
- THE DRAFT CONNECTION SHALL BE FIXED AT A HEIGHT OF 18 INCHES ABOVE FINISHED GRADE OF THE PULL OFF PAD, TO THE CENTERLINE OF THE FITTING.
- THE FILL CONNECTION SHALL BE FIXED AT A HEIGHT OF 18 INCHES ABOVE FINISHED GRADE OF THE PULL OFF PAD, TO THE CENTERLINE OF THE FITTING.
- 2.3.5. EXCAVATION SHALL BE PERFORMED PER ALL APPLICABLE REGULATIONS. THE EXCAVATION SHALL BE BACKFILLED WITH A MATERIAL PER HOWARD COUNTY SPECIFICATIONS. IN DESIGNS IN WHICH THE DRAFT PIPE IS PLACED ON THE TANK END, THE TANK SHALL HAVE A 2 PERCENT SLOPE TOWARD THE DRAFT CONNECTION END.

#### 2.4. TESTING AND ACCEPTANCE

- 2.4.1. THE TANK SHALL BE OPERABLE WITH A RATE OF FLOW (FIRE FLOW) OF 1000 GALLONS PER MINUTE (GPM) MINIMUM USING A FIRE DEPARTMENT PUMPER OPERATING UNDER NORMAL CONDITIONS.
- 2.4.2. A PRESSURE TEST SHALL BE PERFORMED PRIOR TO INSTALLATION OF THE TANK, PER THESE SPECIFICATIONS AND THE APPROVED MANUFACTURER'S SPECIFICATIONS.
- 2.4.3. A PRESSURE TEST SHALL BE PERFORMED PRIOR TO INSTALLATION AT A MAXIMUM PRESSURE OF 5 PSI (POUNDS PER SQUARE INCH) AND HELD FOR A TIME PERIOD AS DETERMINED BY THE HOWARD COUNTY FIRE OFFICIAL, OR PER MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.
- 2.4.4. AN OPERATIONAL TEST SHALL BE PERFORMED WHEN CONSTRUCTION IS COMPLETED, IN ACCORDANCE WITH THE APPROVED PROCEDURES. THE TEST SHALL BE CONDUCTED BY THE FIRE DEPARTMENT AND THE INSTALLER. WHEN TESTING HAS BEEN COMPLETED, THE INSTALLER SHALL REFILL THE TANK TO FULL CAPACITY AS REQUIRED. ONCE ACCEPTED, FURTHER USE OF THE TANK SHALL BE LIMITED TO FIREFIGHTING OPERATIONS AND ROUTINE TESTING. THE FIRE DEPARTMENT SHALL BE RESPONSIBLE FOR SUBSEQUENT REFILLING TO FULL CAPACITY WITHIN 12 HOURS AFTER USING WATER FROM THE TANK.
- 2.4.5. FINAL APPROVAL WILL BE MADE PER NOTIFICATION IN WRITING BY THE HOWARD COUNTY FIRE OFFICIAL.

# 2.5. ACCESSIBILITY AND SURROUNDING FEATURES

FOLLOWING:

- 2.5.1. A PULLOFF SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS. THE REQUIREMENTS FOR EACH SITE WILL BE EVALUATED AND APPROVED BY THE FIRE OFFICIAL PRIOR TO START OF WORK. DETAILS SHALL BE INDICATED ON THE SITE OR SUBDIVISION PLAN AS APPLICABLE.
- 2.5.2. NO OBSTRUCTIONS SHALL IMPEDE ACCESS TO TANK FITTINGS. THE FACILITY SHALL REMAIN ACCESSIBLE ON A YEAR-ROUND BASIS.
  - LANDSCAPING, BRUSH, AND TREES SHALL BE TRIMMED AWAY FROM FITTINGS. OVERHANGING BRANCHES SHALL BE TRIMMED AWAY AT A MINIMUM OF 12 FEET OVERHEAD. GRASS AND WEEDS SHALL BE CUT AS NEEDED.
- 2.5.3. PROTECTIVE DEVICES SHALL BE USED AS APPLICABLE TO PREVENT DAMAGE TO THE FITTINGS AND TO PROVIDE SAFETY TO OPERATORS. THESE INCLUDE, BUT ARE NOT LIMITED TO THE
  - A. BOLLARDS
  - B. GUARD RAILS C. FENCING
  - D. WALKWAYS
  - E. CURBS
  - F. ANY OTHER BARRIERS/DEVICES AS DETERMINED BY THE FIRE OFFICIAL
- 2.5.4. A REFLECTIVE SIGN SHALL BE POSTED WHICH CLEARLY INDICATES TANK FULL CAPACITY AND 6. IDENTIFICATION (ID) NUMBER. AN IDENTIFICATION NUMBER SHALL BE ASSIGNED BY THE COUNTY AND POSTED AT THE SITE. SIGNS SHALL BE PLACED ON ALL MAJOR ROADS INDICATING THE DISTANCE AND DIRECTION TO TANK WITHIN A 2,500 FOOT RADIUS.
- 2.5.5. AN APPROVED NO PARKING SIGN SHALL BE PROVIDED AND ATTACHED TO A METAL POST AT EACH END OF THE PULL-OFF AREA.
- 2.5.6. ALL FITTINGS ABOVE GRADE SHALL BE PAINTED WITH EXTERIOR-GRADE ENAMEL. COLOR SHALL BE YELLOW UNLESS OTHERWISE SPECIFIED, WITH THE EXCEPTION OF THE DRAFT CONNECTION WHICH SHALL BE PAINTED RED.

# 3. REFERENCES

# 3.1. PUBLISHED STANDARDS

- 3.1.1. NFPA 1963 STANDARD FOR FIRE HOSE SCREW THREADS
- 3.1.2. NFPA 1142 STANDARD FOR WATER SUPPLIES FOR SUBURBAN AND RURAL FIRE **PROTECTION**
- 3.1,3. NFPA 1141 STANDARD FOR FIRE PROTECTION IN PLANNED BUILDING GROUPS
- 3.1.4. ASTM C33

# 3.2. OTHER REFERENCED DOCUMENTS

- 3.2.1. THE CODE OF PUBLIC LOCAL LAWS AND ORDINANCES OF HOWARD COUNTY MARYLAND, CHAPTER 112.
- 3.2.2. UNDERGROUND TANKS & DRY FIRE HYDRANTS MAINTENANCE AND INSPECTION, CHIEF GREG DODS / REGIONAL FIRE PROTECTION COMMITTEE, 2003.

- 4.1 THE TANK INSTALLER SHALL TAKE CARE SO THAT THE TANK IS NOT DROPPED OR DAMAGED DURING DELIVERY, UNLOADING AND HANDLING ON THE JOB SITE.
- 4.2 BEFORE UNLOADING THE TANK FROM THE TRUCK, THE TANK INSTALLER SHALL MAKE SURE THAT ALL TOOLS OR OTHER ITEMS THAT MAY DAMAGE THE TANK DURING UNLOADING ARE REMOVED FROM THE TRAILER BED.
- 4.3 BEFORE THE TANK IS UNLOADED OR RELOCATED ON THE JOB SITE (AND BEFORE PREINSTALLATION TESTING AT JOB SITE), THE TANK INSTALLER SHALL COMPLETE THE FOLLOWING STEPS:
  - 4.3.1. VISUALLY INSPECT THE ENTIRE EXTERIOR SURFACE OF THE TANK TO MAKE SURE THAT NO SHIPPING OR HANDLING DAMAGE HAS OCCURRED. LOOK PARTICULARLY FOR HOLES, CRACKS
  - 4.3.2. BE SURE THAT ALL EQUIPMENT USED TO LIFT THE TANK IS RATED TO HANDLE THE LOAD.
  - 4.3.3. TO UNLOAD TANKS, USE THE LIFTING LUGS THAT ARE SITUATED ON TOP OF THE TANK IN ITS ROTATED POSITION.
  - 4.3.4. DO NOT WRAP CHAIN OR CABLE AROUND THE TANK.
- 4.3.5. USE GUY ROPES TO GUIDE THE TANK WHEN NEEDED.
- 4.3.6. DO NOT ROLL THE TANK TO MOVE IT.
- 4.4 WHENEVER A TANK IS TEMPORARILY PLACED ABOVEGROUND AT THE SITE, CHOCK IT IN PLACE TO PREVENT ROLLING. TIE THE TANK DOWN IF HIGH WINDS ARE EXPECTED.
- 4.5 WHENEVER A TANK IS TEMPORARILY PLACE ABOVE THE GROUND AT THE SITE, ALWAYS TAKE EXTRA CARE SO WATER DOES NOT ENTER THE COLLAR. THE TANK BE ROTATED AND/OR THE COLLAR COVERED.

### 5. PRE-INSTALLATION TESTING

- 5.1 PRIOR TO ANY INSTALLATION IT IS THE REQUIREMENT OF THE CONTRACTOR TO MEET OR OBTAIN ALL CERTIFICATION REQUIRED BY THE TANK MANUFACTURER.
- 5.2 TANK MUST BE RETESTED AT THE SITE PRIOR TO INSTALLATION IN ORDER TO VERIFY THE ABSENCE OF SHIPPING AND HANDLING DAMAGE.
- 5.3 THE INSTALLER SHALL VERIFY THAT ALL OF THE TEST EQUIPMENT IS IN GOOD WORKING CONDITION, AND IS PROPERLY CONFIGURED AND CALIBRATED.
- 5.4 CONSTRUCT A TEST MANIFOLD WITH TWO AIR-SUPPLY GAUGES. EACH AIR SUPPLY GAUGE MUST HAVE A MAXIMUM FULL-SCALE READING OF 15 PSIG WITH 14-LB. OR 1/10-LB. INCREMENTS, AND A PRESSURE-RELIEF DEVICE SET AT 6 PSIG.
- 5.5 IT IS THE INSTALLER'S RESPONSIBILITY TO SELECT A THREAD SEALANT THAT IS COMPATIBLE WITH THE PRODUCT BEING STORED. SOME SEALANTS CANNOT BE USED WITH SOME PRODUCTS. REMOVE, CLEAN AND REDOPE ALL FACTORY-FURNISHED TEMPORARY PLUGS WITH APPROPRIATE THREAD SEALANT. INSTALL PERMANENT PLUGS IN ALL OPENINGS WHERE PIPING WILL NOT BE INSTALLED. MAKE SURE ALL MANWAY BOLTS ARE TIGHTENED, AND FITTING PLUGS ARE PROPERLY DOPED AND SEALED.
- 5.6 WHEN CHECKING THE TANK FOR LEAKS DURING AN AIR/SOAP TEST, ROTATE THE TANK TO CHECK
- 5.7 BEFORE ROTATING THE TANK DURING AN AIR/SOAP TEST, PLACE PROTECTIVE MATERIAL ON THE AREA ON WHICH THE TANK WILL BE ROTATED. MAKE SURE THE AREA IS FLAT AND IS FREE OF LARGE OR SHARP OBJECTS, SUCH AS ROCKS, WHICH MAY DAMAGE THE TANK.
- 5.8 ROTATE THE TANK SLOWLY AND CAREFULLY TO AVOID DEVELOPING TOO MUCH MOMENTUM. DO NOT ROTATE THE TANK MORE THAN 120 DEGREES FROM THE INITIAL STARTING POINT.

# TANK TESTING

- 6.1 REMOVE ALL TEMPORARY SERVICE-FITTING PLUGS.
- 6.2 RE-DOPE FITTINGS AND INSTALL PLUGS IN ALL OPENINGS, EXCEPT ONE SERVICE FITTING (NEEDED FOR THE TEST MANIFOLD).
- 6.3 INSTALL THE TEST MANIFOLD IN THE OPEN SERVICE FITTING. CONNECT THE PRESSURE SOURCE TO THE TEST MANIFOLD.
- 6.4 PRESSURIZE THE TANK TO 5 PSIG. ALLOW THE PRESSURE TO STABILIZE BY ADDING OR REMOVING AIR AS NECESSARY.
- 6.5 CLOSE THE AIR-SUPPLY VALVE ON THE TEST MANIFOLD. DISCONNECT THE AIR-SUPPLY LINE.
- 6.6 SOAP THE ENTIRE EXTERIOR OF THE TANK, CHECKING FOR LEAKS. WATCH FOR ACTIVE AIR BUBBLES, WHICH INDICATE A LEAK. PAY SPECIAL ATTENTION TO FITTINGS AND MANWAYS.
- 6.7 MONITOR THE PRESSURE FOR ONE HOUR. 5 PSIG SHALL BE MAINTAINED.
- 6.8 WHEN THE TEST IS COMPLETE, CAREFULLY RELEASE THE AIR PRESSURE FROM THE TANK BY OPENING THE AIR-SUPPLY VALVE.
- 6.9 WHEN AIRFLOW STOPS, REMOVE THE TEST MANIFOLD.

#### 6.10 REPLACE THE PROTECTIVE COVERS IN THE SERVICE FITTINGS.

# 7. BACKFILL MATERIAL

- 7.1 TANKS MUST BE INSTALLED USING EITHER PEA GRAVEL OR CRUSHED STONE AS BACKFILL MATERIAL.
- 7.2 USING OTHER THAN APPROVED BEDDING AND BACKFILL MATERIALS WITHOUT PRIOR WRITTEN
- 7.3 USE OF UNAPPROVED BACKFILL MATERIAL MAY CAUSE TANK FAILURE, OR DAMAGE THE TANK OR SURROUNDING PROPERTY.
- 7.4 APPROVED BACKFILL MATERIAL MUST MEET THE FOLLOWING SPECIFICATIONS:

AUTHORIZATION FROM HOWARD COUNTY DPW IS PROHIBITED.

- 7.4.1. THE MATERIAL IS WASHED, FREE-FLOWING, AND FREE OF ICE, SNOW AND DEBRIS.
- 7.4.2. WHEN USING PEA GRAVEL, THE MATERIAL IS TO BE A MIX OF ROUNDED PARTICLES, SIZES BETWEEN 1/8 INCH AND % INCH. THE PEA GRAVEL SHALL CONFORM TO THE SPECIFICATIONS OF ASTM C-33, PARAGRAPH 9.1, SIZES 6, 67, OR 7.
- 7.4.3. WHEN USING CRUSHED STONE, THE MATERIAL IS TO BE A MIX OF ANGULAR PARTICLES. SIZES BETWEEN 1/8 INCH AND 1/2 INCH. THE CRUSHED STONE MUST CONFORM TO THE SPECIFICATIONS OF ASTM C-33, PARAGRAPH 9.1, SIZES 7 OR 8.
- 7.4.4. NO MORE THAN 5% (BY WEIGHT) OF THE MATERIAL MAY PASS THROUGH A #8 SIEVE.
- 7.4.5. THE MATERIALS SUPPLIER SHALL CERTIFY THAT THE MATERIAL CONFORMS TO ASTM C-33 AND ANY OTHER APPLICABLE SPECIFICATIONS.

#### 8. EXCAVATION

- CONTRACTOR MUST TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EMPLOYEES WORKING IN OR NEAR A TANK EXCAVATION. THESE PRECAUTIONS SHOULD INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
- 8.2 LOCATE AND PROTECT ANY UTILITY INSTALLATIONS NEAR THE EXCAVATION BEFORE OPENING THE EXCAVATION.
- 8.3 SECURE THE WALLS OF THE EXCAVATION.
- 8.4 PREVENT EXPOSURE OF EMPLOYEES TO HAZARDOUS FUMES FROM THE EXCAVATION.
- 8.5 PROTECT EMPLOYEES FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION IN THE EXCAVATION.
- 8.6 ERECT BARRICADES, ETC., TO PREVENT UNAUTHORIZED VEHICLE OR PEDESTRIAN TRAFFIC.
- 8.7 INSPECT, A MINIMUM OF ONCE A DAY, THE EXCAVATION AND SURROUNDING AREA.

#### 9. BURIAL DEPTH

- TANKS SUBJECTED TO TRAFFIC LOADS (H-20 LOADS) MUST HAVE A COVER DEPTH OF AT LEAST 36 INCHES OF BACKFILL, OR 18 INCHES OF BACKFILL PLUS 6 INCHES OF REINFORCED CONCRETE OR 9 INCHES OF ASPHALT. IN A WET CONDITION, SUFFICIENT OVERBURDEN AND/OR AN APPROPRIATE ANCHORING SYSTEM MUST BE PRESENT TO OFFSET BUOYANCY OF THE TANK.
- 9.2 TANKS NOT SUBJECTED TO TRAFFIC LOADS MUST HAVE A COVER DEPTH OF AT LEAST 24 INCHES OF BACKFILL, OR 12 INCHES OF BACKFILL PLUS 4 INCHES OF REINFORCED CONCRETE OR 6 INCHES OF ASPHALT. IN A WET CONDITION, SUFFICIENT OVERBURDEN AND/OR AN APPROPRIATE ANCHORING SYSTEM MUST BE PRESENT TO OFFSET BUOYANCY OF THE TANK.
- 9.3 IN A NONTRAFFIC INSTALLATION, ENSURE THAT THE AREAS ABOVE THE TANKS ARE NOT SUBJECTED TO TRAFFIC OR OTHER TYPES OF LOADS, WHICH COULD CAUSE TANK DAMAGE AND RESULT IN DEATH OR SERIOUS INJURY.
- 9.4 THE MAXIMUM BURIAL DEPTH IS 7 FEET OF COVER OVER THE TOP OF THE TANK. DEVIATION FROM THIS MAY BE PERMISSIBLE WITH PRIOR WRITTEN AUTHORIZATION FROM DPW
- 9.5 IF THERE IS AN UNATTACHED MANWAY RISER, IT MUST NOT TRANSMIT LOAD FROM THE CONCRETE SLAB TO THE TANK. A MINIMUM SPACE OF 6 INCHES MUST EXIST BETWEEN THE BOTTOM OF THE RISER AND THE TOP OF THE TANK.
- 9.6 TRAFFIC LOADS FROM THE TOP SLAB MUST NOT BE TRANSMITTED TO AN ATTACHED SUMP OR RISER. A MINIMUM SPACE OF 3 INCHES MUST EXIST BETWEEN THE RISER OR SUMP AND THE SLAB.

# 10. UNSTABLE IN SITU SOIL CONDITIONS

- 10.1 IF THE SOIL HAS LESS THAN 750 LBS./SQ. FT. COHESION AS CALCULATED FROM AN UNCONFINED COMPRESSION TEST: OR IN SOILS HAVING AN ULTIMATE BEARING CAPACITY OF LESS THAN 3.500 LBS./SQ. FT.: OR WHERE SOIL WILL NOT MAINTAIN A VERTICAL WALL, THE EXCAVATION MUST ALLOW A MINIMUM SPACE EQUAL TO HALF THE DIAMETER OF THE TANK BETWEEN THE EXCAVATION WALL AND BOTH THE SIDE AND THE ENDCAP OF THE TANK TO ENHANCE LATERAL RESISTANCE.
- 10.2 A REINFORCED CONCRETE SLAB MAY BE REQUIRED UNDER THE TANK AS A FOUNDATION IN THE EXCAVATION WHERE THE BOTTOM IS UNSTABLE.

# 11. TANK LOCATION - NEARBY STRUCTURES

- 11.1 THE CONTRACTOR SHALL SEEK THE ADVICE OF A MARYLAND-LICENSED PROFESSIONAL ENGINEER TO DETERMINE THE PROPER PLACEMENT OF A TANK EXCAVATION NEAR ANY EXISTING STRUCTURE(S). IMPROPER PLACEMENT MAY RESULT IN TANK AND/OR OTHER PROPERTY DAMAGE.
- 11.2 ENSURE THAT DOWNWARD FORCES FROM LOADS CARRIED BY THE FOUNDATIONS AND SUPPORTS OF NEARBY STRUCTURES (CONSTRUCTED BEFORE OR AFTER TANK INSTALLATION) ARE NOT TRANSMITTED TO THE TANKS.

# 12. GEOTEXTILE

- 12.1 GEOTEXTILE ALLOWS THE PASSAGE OF WATER BUT PREVENTS THE MIGRATION AND MIXING OF IN SITU SOIL AND THE SELECT BACKFILL MATERIAL. GEOTEXTILE HELPS PRESERVE THE INTEGRITY OF THE SELECT BACKFILL ENVELOPE, WHICH SURROUNDS AND SUPPORTS THE TANK.
- 12.2 GEOTEXTILE ENVELOPE IS REQURED ON ALL UNDERGROUND TANK INSTALLATIONS
- 12.3 POLYETHYLENE FILM IS NOT AN ACCEPTABLE SUBSTITUTE FOR GEOTEXTILE

**SPECIFICATIONS ARE** CONTINUED ON SHEET 3 OF 7

**DEPARTMENT OF PUBLIC WORKS** HOWARD COUNTY, MARYLAND

AM CHIEF, BUREAU OF ENGINEERING ALL CHIEF, UTILITY DESIGN DIVISION PSD DATE **TECHNOLOGIES** 



DES: TLF DRN: JBM CHK: CLO -15-09 DATE: 01/05/09 BY NO. DATE REVISION

**SPECIFICATIONS - 1** 

**UNDERGROUND WATER STORAGE** TANKS FOR FIRE SUPPRESSION CAPITAL PROJECT No. F-5972

SHEET \_2\_OF\_Z

SCALE

AS SHOWN

HOWARD COUNTY, MARYLAND

**CONTRACT No. 65-4647** 

F PUBLIC WORKS

1/21/B

PLANNERS SCIENTISTS CONSTRUCTION MANAGERS 10 North Park Drive HUNT VALLEY, MD 21030 PHONE: (410) 316-7800 Fax: (410) 316-7817 www.kci.com

Engineers

PROFESSIONAL CERTIFICATION. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws

of the State Of Maryland, License No. 20453, Expiration Date 05/18/2010

- 13.1.1. DEADMEN SHALL BE REINFORCED CONCRETE BEAMS.
- 13.1.2. THE LENGTH OF DEADMEN SHALL BE EQUAL TO THE LENGTH OF THE TANK, AT A MINIMUM.
- 13.1.3. PREFABRICATED DEADMEN ARE SUPPLIED WITH 3/4 —INCH—DIAMETER, GALVANIZED, ADJUSTABLE ANCHOR POINTS (SUBSEQUENTLY REFERRED TO AS ANCHOR POINTS). THESE ANCHOR POINTS PROTRUDE UP THROUGH THE SLOTS IN THE DEADMEN AND ARE HELD UP WITH COTTER PINS.
- 13.3 ONLY USE THE ANCHOR POINTS WHEN LIFTING AND POSITIONING THE DEADMEN. A SPREADER BAR MAY BE REQUIRED TO LIFT LONGER SECTIONS OF DEADMEN. USE GUY ROPES TO GUIDE THE DEADMEN WHEN LIFTING.
- 13.4 THE ANCHOR POINTS CAN BE MOVED AND POSITIONED TO MATCH THE HOLD-DOWN STRAP LOCATIONS ON THE TANK
- 13.5 CARE SHOULD BE TAKEN TO KEEP BACKFILL FROM ENTERING THE ANCHOR-POINT SLOT UNTIL FINAL ADJUSTMENT IS MADE.
- 13.6 THE DEADMEN ARE TO BE BUTTED TOGETHER WHEN MULTIPLE SECTIONS ARE USED.
- 13.7 USE ONE ANCHOR POINT PER STRAP END AND ONLY ONE STRAP PER ANCHOR POINT.
- 14. ANCHOR SLAB (GROUNDWATER INSTALLATION ONLY)
  - 14.1 THE ANCHOR SLAB SHALL BE REINFORCED CONCRETE.
  - 14.2 THE TOTAL LENGTH OF THE SLAB SHALL BE AT LEAST THE SAME AS THE LENGTH OF THE TANK.
  - 14.3 THE MINIMUM SLAB THICKNESS IS 8 INCHES.
  - 14.4 THE WIDTH OF THE SLAB DEPENDS ON THE TANK DIAMETER. THE SLAB SHALL EXTEND A MINIMUM OF 18 INCHES BEYOND EACH SIDE OF THE TANK.
  - 14.5 PROVIDE A SEPARATE ANCHOR POINT FOR EACH HOLD-DOWN STRAP.
  - 14.6 ALL ANCHOR POINTS MUST BE ENGINEERED TO WITHSTAND THE TANK'S BUOYANCY FORCES.
  - 14.7 WHEN USING A CONCRETE BASE SLAB, ALLOW SUFFICIENT DEPTH IN THE EXCAVATION FOR 12 INCHES OF BEDDING MATERIAL BELOW THE TANK.
- 15. HOLD-DOWN STRAPS
  - 15.1 EVENLY DISTRIBUTE LOADS BY TIGHTENING ALL HOLD-DOWN STRAPS UNIFORMLY UNTIL THEY ARE SNUG OVER THE RIBS BUT CAUSE NO DEFLECTION OF THE TANK.
  - 15.2 TAKE A MEASUREMENT OF THE INTERNAL DIAMETER OF THE TANK TO DETERMINE WHETHER VERTICAL DEFLECTION IS WITHIN THE LIMITS SPECIFIED AFTER THE STRAPS HAVE BEEN INSTALLED AND TIGHTENED.
  - 15.3 ALL ANCHORING HARDWARE SHALL BE GALVANIZED AND SIZED ACCORDING TO THE FOLLOWING MINIMUM REQUIREMENTS (FOR A 10' DIAMETER TANK):
    - 15.3.1. HOOK 1 ¼\*\*
    - 15.3.2. JAW 1/4"
    - 15.3.3. EYE **%**\*
    - 15.3.4. WIRE ROPE 1/2\*
  - 15.4 THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR PROVIDING HARDWARE AND ANCHOR POINTS OF SUFFICIENT SIZE AND STRENGTH.
  - 15.5 THE PARTICULAR CONFIGURATION OF HARDWARE WILL BE DETERMINED BY THE CONTRACTOR, THE OWNER OR THE OWNER'S REPRESENTATIVE.
- 16. INSTALLATION
  - 16.1 USE ONLY APPROVED BACKFILL MATERIAL.
  - 16.2 DO NOT MIX APPROVED BACKFILL MATERIAL WITH SAND OR IN SITU SOIL.
  - 16.3 DO NOT USE IN SITU SOIL AS BACKFILL MATERIAL.
  - 16.4 PREPARE A SMOOTH, LEVEL BED, 12 INCHES THICK, OF APPROVED BACKFILL MATERIAL.
  - 16.5 PLACE THE TANK OR TANKS ONTO THE BED.
  - 16.6 USE THE TOPS OF THE RIBS TO ESTABLISH LONGITUDINAL LEVEL. ESTABLISH LATERAL LEVEL BY PLACING THE LEVEL ACROSS THE TOP OF A FITTING OR A MANWAY.
  - 16.7 WHEN THE TANK IS PLACED, TAKE A MEASUREMENT OF THE INTERNAL DIAMETER OF THE TANK. RECORD THIS MEASUREMENT AS INITIAL INTERNAL DIAMETER ON THE TANK INSTALLATION
  - 16.8 IF THE TANK IS TO BE ANCHORED, INSTALL THE ANCHORING HARDWARE AT THIS TIME.
  - 16.9 PLACE ONE 12-INCH LIFT OF APPROVED BACKFILL MATERIAL EVENLY AROUND THE TANK. FROM THE EDGE OF THE HOLE OR THE TOP OF AN ADJACENT TANK, PUSH THE BACKFILL IN PLACE BY USING A NON-METAL PROBE LONG ENOUGH TO REACH BENEATH THE TANK. WORK THE BACKFILL MATERIAL UNDER THE TANK BODY AND DOMES SO THE TANK IS FULLY SUPPORTED THAT IS, SO THERE ARE NO VOIDS UNDER THE TANK.
  - 16.10 REPEAT POINT 16.9 WITH A SECOND 12-INCH LIFT.
  - 16.11 AFTER THE SECOND LIFT OF MATERIAL HAS BEEN PLACED AND WORKED UNDER THE TANK, BRING THE BACKFILL TO THE TOP OF THE TANK.

- 16.12 FOR GROUNDWATER INSTALLATION, FOLLOW THE INSTALLATION PROCEDURE ABOVE WITH THE FOLLOWING MODIFICATIONS:
  - 16.12.1. BEFORE PERFORMING POINT 16.4 OF THE DRY—HOLE INSTALLATION, TAKE A MEASUREMENT OF THE INTERNAL DIAMETER OF THE TANK BEFORE THE TANK IS PLACED IN THE EXCAVATION HOLE. RECORD THIS MEASUREMENT AS INITIAL INTERNAL DIAMETER ON THE TANK INSTALLATION CHECKLIST.
  - 16.12.2. BEFORE PERFORMING POINT 16.4. OF THE DRY—HOLE INSTALLATION, PUMP THE WATER FROM THE HOLE AND CONTINUE PUMPING TO MAINTAIN MINIMUM WATER LEVEL DURING TANK
  - 16.12.3. DURING POINT 16.5. OF THE DRY—HOLE INSTALLATION, WHEN SETTING AND LEVELING THE TANK, PARTIALLY BALLAST THE TANK UNTIL IT SETTLES FIRMLY ON THE PREPARED BED. THE BALLAST LEVEL IN THE TANK MUST NEVER EXCEED THE WATER LEVEL IN THE HOLE BY MORE THAN 1 FOOT UNTIL THE BACKFILL REACHES THE TOP OF THE TANK.
  - 16.12.4. COVER DEPTH MUST MEET MINIMUM DEPTH SPECIFIED IN SECTION 9.
  - 16.12.5. COMPLETELY BALLAST THE TANK ONCE BACKFILL IS EVEN WITH THE TOP OF THE TANK.
  - 16.12.6. AFTER BACKFILL IS BROUGHT TO THE TOP OF THE TANK, TAKE A MEASUREMENT OF THE INTERNAL DIAMETER OF THE TANK AS A DEFLECTION CHECK.
- 17. POST-INSTALLATION TESTING
  - 17.1 AFTER THE INTERNAL DIAMETER OF THE TANK HAS BEEN MEASURED AND VERTICAL DEFLECTION IS DETERMINED TO BE WITHIN THE LIMITS THE TANK MUST BE PRESSURE—TESTED TO ENSURE THAT NO DAMAGE OCCURRED DURING INSTALLATION.
  - 17.2 FOLLOW THE PROCEDURE IN SECTION 6, SOAPING ALL EXPOSED AREAS OF THE TANK AND ALL FITTINGS, AND MONITORING THE PRESSURE FOR ONE HOUR.
  - 17.3 CAREFULLY RELIEVE THE PRESSURE IN THE TANK.
- 18. BACKFILLING TO GRADE
  - 18.1 CONTINUE TO TAKE SAFETY MEASURES (SUCH AS PLACING BARRICADES) AROUND THE EXCAVATION SITE UNTIL INSTALLATION IS COMPLETED.
  - 18.2 WHEN THE TANK HAS BEEN SET, TESTED AND BACKFILLED, AND ALL PIPING AND VENTING HAS BEEN COMPLETED, ADD THE BALANCE OF THE BACKFILL MATERIAL.
  - 18.3 THE BACKFILL MUST BE FREE OF DEBRIS, ICE OR SNOW. ANY BLOCKS OR BRICKS USED AS SUPPORT MATERIAL DURING PIPING MUST BE REMOVED PRIOR TO COMPLETION OF BACKFILLING.
  - 18.4 THE BACKFILL MATERIAL SPECIFIED IN SECTION 7 MUST BE USED TO COMPLETELY FILL EXCAVATION.
  - 18.5 THE INSTALLATION SHALL MEET ALL THE REQUIREMENTS OF MINIMUM COVER AS SPECIFIED IN SECTION
  - 18.6 WHEN THE TANK HAS BEEN BACKFILLED TO SUBGRADE (BEFORE PLACEMENT OF ASPHALT OR CONCRETE), TAKE A MEASUREMENT OF THE INTERNAL DIAMETER OF THE TANK. RECORD THIS MEASUREMENT AS FINAL INTERNAL DIAMETER ON THE TANK INSTALLATION CHECKLIST.
  - 18.7 COMPLETE THE TANK INSTALLATION CHECKLIST.
- 19. DEFLECTION MEASUREMENT
  - 19.1 OBTAIN THE DEFLECTION MEASUREMENT BY TAKING A MINIMUM OF TWO MEASUREMENTS OF THE INTERNAL DIAMETER OF THE TANK.
  - 19.2 TWO METHODS OF MEASURING THE INTERNAL DIAMETER OF THE TANK ARE DESCRIBED HERE. BOTH METHODS USE A DIPSTICK. (SIMILAR METHODS CAN BE USED, SUCH AS USING A TAPE MEASURE, ETC.)
  - 19.3 THE DEFLECTION MEASUREMENT CAN BE OBTAINED BY USING EITHER METHOD TWICE OR BY USING EACH METHOD ONCE. EACH WILL BE DESCRIBED HERE AS IF THAT METHOD WERE BEING USED TWICE.
  - 19.4 TAKE THE INITIAL INTERNAL—DIAMETER MEASUREMENT BEFORE BACKFILLING THE TANK, AND RECORD THE MEASUREMENT ON THE TANK INSTALATION CHECKLIST. IN A GROUNDWATER INSTALLATION, TAKE THIS MEASUREMENT BEFORE THE TANK IS PLACED IN THE EXCAVATION HOLE.
  - 19.5 TAKE OTHER DIAMETER MEASUREMENTS DURING THE BACKFILLING PROCESS TO DETERMINE WHETHER VERTICAL DEFLECTION CONTINUES TO BE WITHIN THE LIMITS SPECIFIED BY THE TANK MANUFACTURER.
  - 19.6 TAKE THE FINAL INTERNAL-DIAMETER MEASUREMENT WHEN THE TANK HAS BEEN BACKFILLED TO SUBGRADE.
  - 19.7 TO GET THE DEFLECTION MEASUREMENT AT ANY TIME, SUBTRACT THE CURRENT INTERNAL—DIAMETER MEASUREMENT FROM THE INITIAL INTERNAL—DIAMETER MEASUREMENT.
  - 19.8 COMPARE THIS MEASUREMENT TO THE ALLOWABLE DEFLECTIONS PROVIDED BY THE TANK MANUFACTURER AND RECORD THE INFORMATION ON THE TANK INSTALLATION CHECKLIST.
  - 19.9 VERTICAL DEFLECTION IN EXCESS OF THIS MEASUREMENT INDICATES IMPROPER INSTALLATION AND VOIDS THE TANK WARRANTY.
- 20. OPERATING GUIDELINES
  - 20.1 NO PERSON SHALL BE PERMITTED TO ENTER THE TANK UNLESS IT HAS BEEN PROPERLY EMPTIED AND VENTED, AND UNLESS THE PERSON ENTERING THE TANK HAS BEEN TRAINED IN CONFINED—SPACE ENTRY PROCEDURES, APPLICABLE OSHA REGULATIONS, AND IS IN POSESSION OF A VALID HOWARD COUNTY CONFINED SPACE ENTRY PERMIT.
  - 20.2 NEVER OVERFILL THE TANK.
  - 20.3 EACH TIME THE TANK IF FILLED, THE OWNER/OPERATOR SHALL MAKE SURE THE TANK IS PROPERLY
  - 20.4 OWNER/OPERATOR SHALL DETERMINE WHETHER THE TANK HAS OVERFILL PROTECTION, SUCH AS AUTOMATIC SHUT-OFF DEVICES OR VENT-RESTRICTION DEVICES ("BALL-FLOAT VALVES"), WHICH WILL CLOSE OFF THE INTERNAL PIPING AND REDUCE THE TANK'S CAPACITY.
  - 20.5 OWNER/OPERATOR SHALL NOTIFY WHOEVER FILLS THE TANK THAT IT HAS OVERFILL PROTECTION, WHICH REDUCES THE TANK'S CAPACITY.
  - 20.6 BEFORE EACH TANK FILLING, OWNER/OPERATOR OR THE DELIVERY SERVICE MUST DETERMINE THE TANK'S REDUCED CAPACITY DUE TO THE OVERFILL PROTECTION, AND CONSULT THE INSTRUCTIONS OR GUIDELINES PROVIDED BY THE INSTALLER AND MANUFACTURER OF THE OVERFILL-PROTECTION DEVICE TO DETERMINE HOW MUCH ADDITIONAL PRODUCT THE TANK CAN HOLD.
  - 20.7 THE MAXIMUM TEMPERATURE FOR STORING NONPOTABLE WATER IS 150° F. NOTE: POTABLE WATER IS TO BE STORED AT AMBIENT TEMPERATURE.

PROFESSIONAL CERTIFICATION. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State Of Maryland, License No. 20453. Expiration Date 05/18/2010.

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND

DIRECTOR OF PUBLIC WORKS

DATE

CHIEF, BUREAU OF UTILITIES

DATE

ACCHIEF, UTILITY DESIGN DIVISION PSO DATE



Engineers
Planners
Scientists
Construction managers

10 North Park Drive
Hunt Valley, MD 21030
Phone: (410) 316-7800
Fax: (410) 316-7817
www.kci.com



DES: TLF

DRN: JBM

CHK: CLO

DATE: 01/05/09

BY NO. REVISION

DATE

SPECIFICATIONS - 2

UNDERGROUND WATER STORAGE TANKS FOR FIRE SUPPRESSION

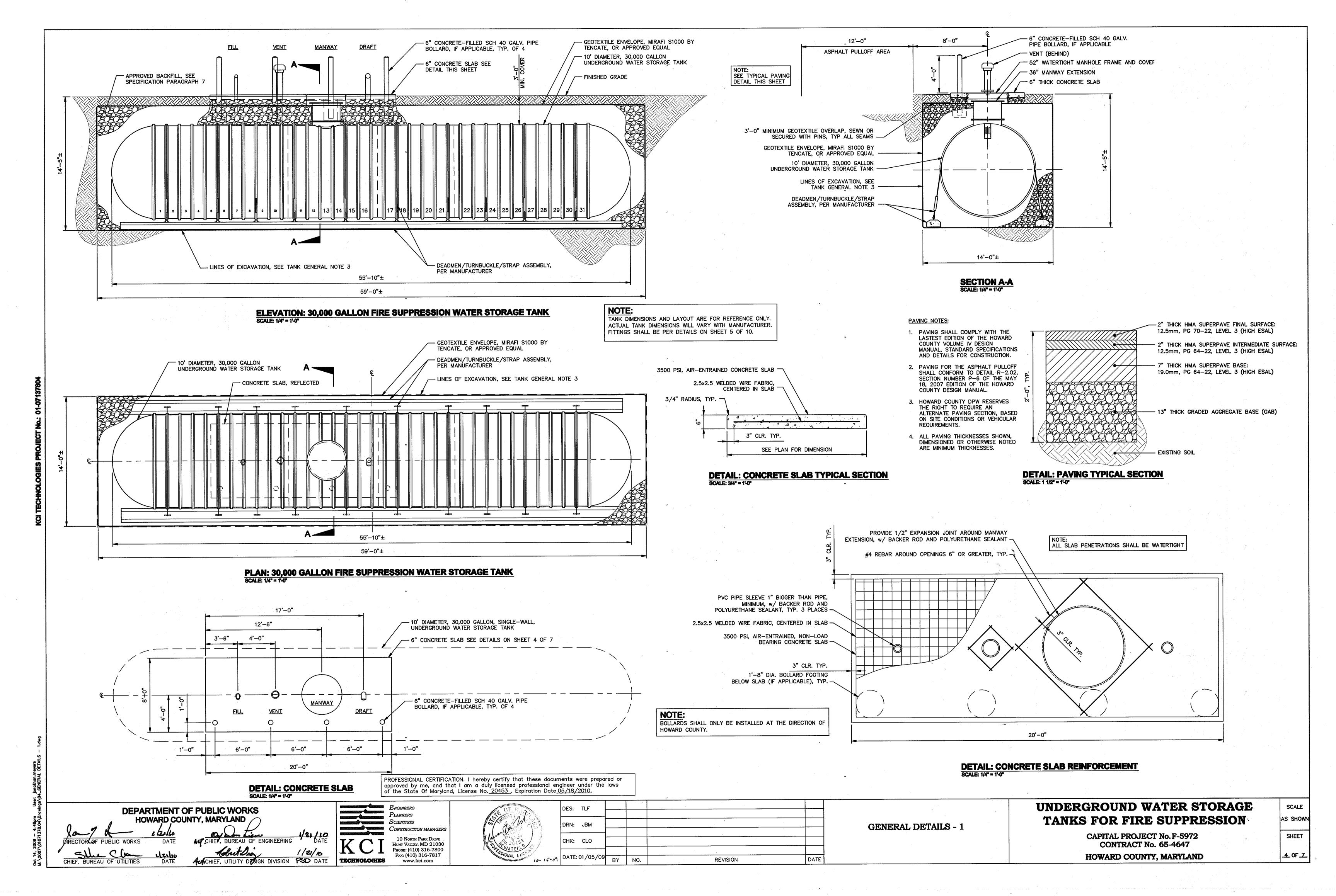
> CAPITAL PROJECT No. F-5972 CONTRACT No. 65-4647 HOWARD COUNTY, MARYLAND

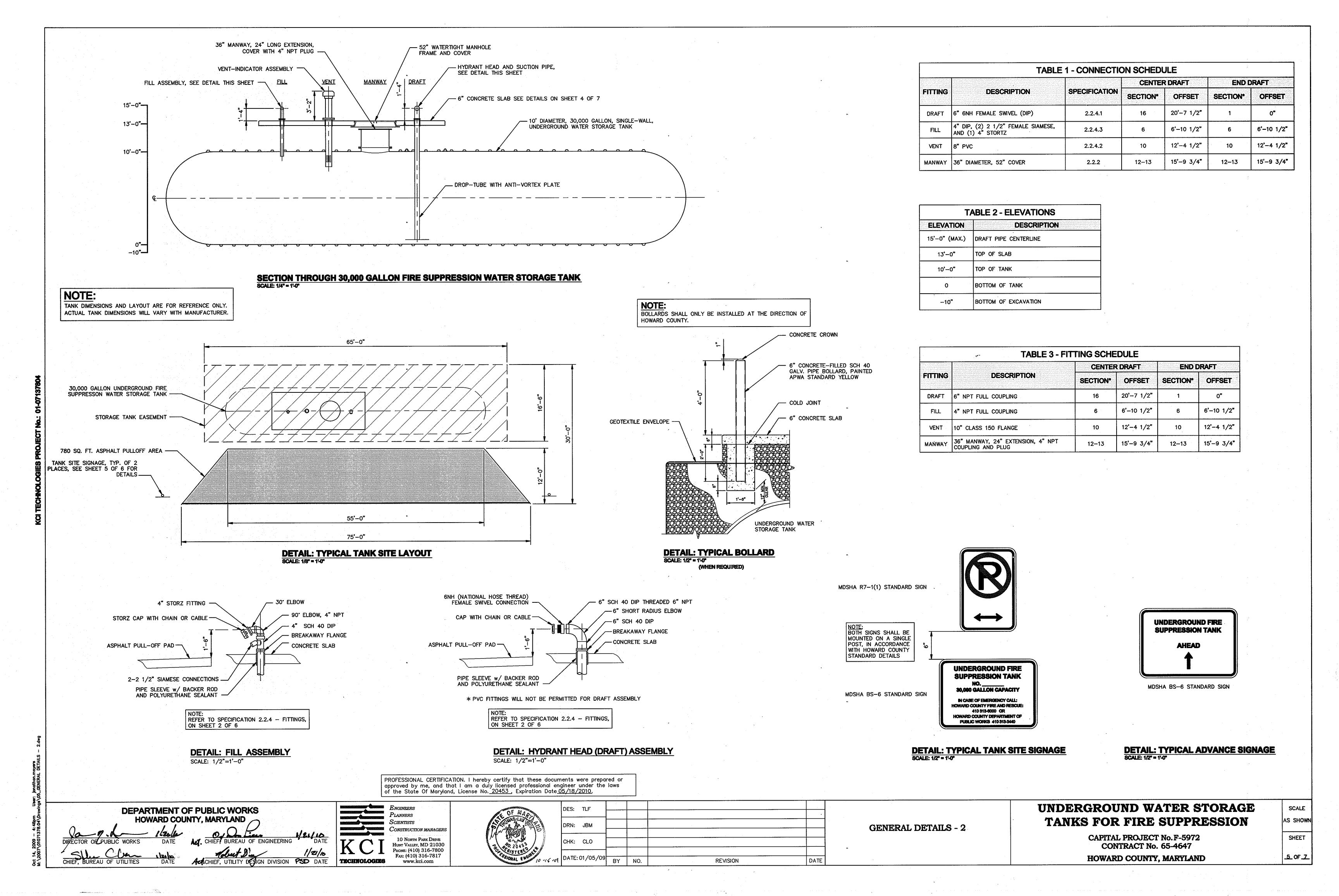
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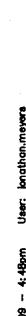
SCALE

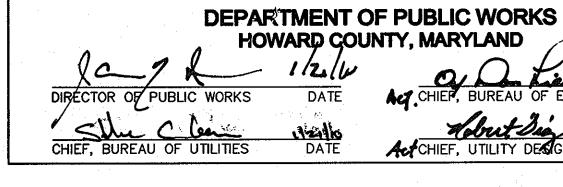
AS SHOWN

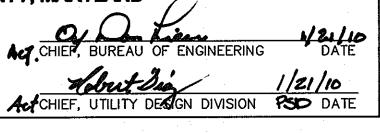
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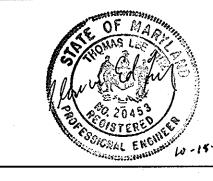


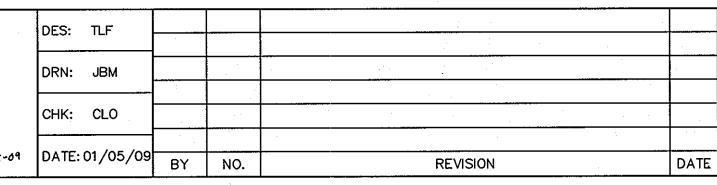












GENERAL DETAILS - 3

# UNDERGROUND WATER STORAGE TANKS FOR FIRE SUPPRESSION

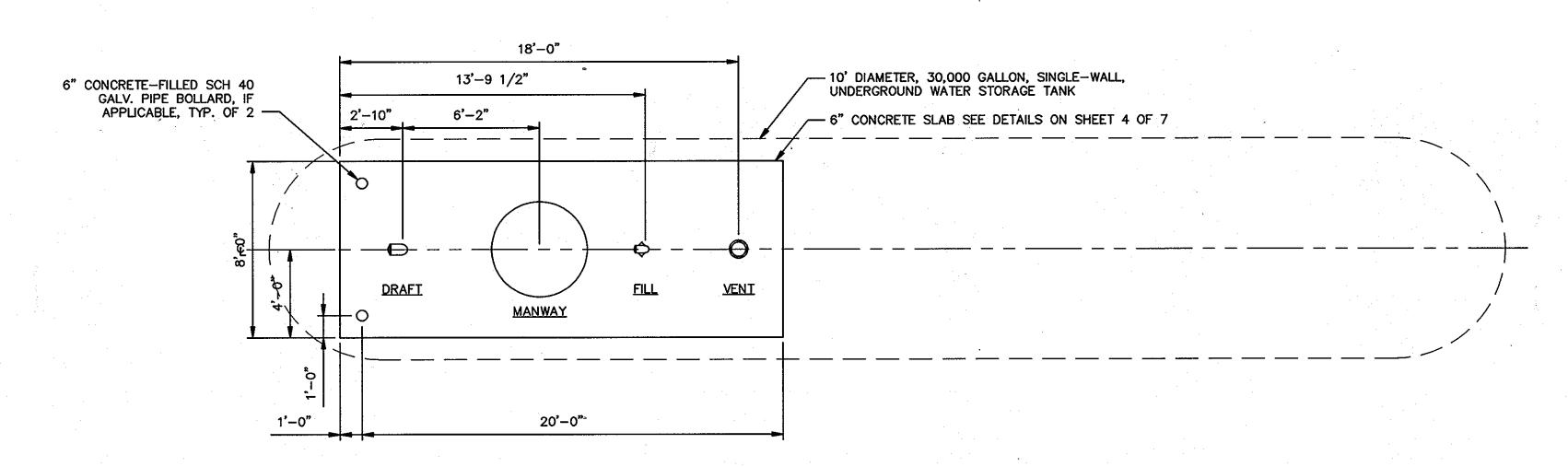
CAPITAL PROJECT No. F-5972 CONTRACT No. 65-4647 HOWARD COUNTY, MARYLAND

SCALE

AS SHOWN

SHEET

6 OF 7

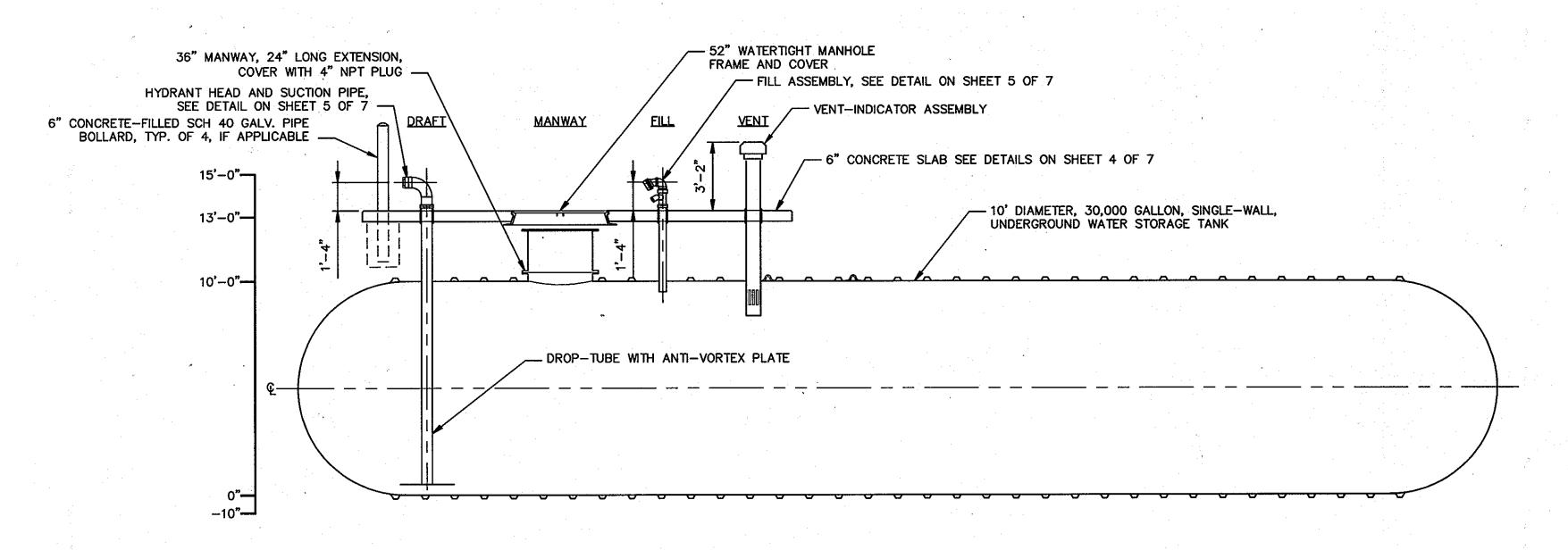


PLAN: 30,000 GALLON FIRE SUPPRESSION WATER STORAGE TANK, END-DRAFT CONFIGURATION

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

BOLLARDS SHALL ONLY BE INSTALLED AT THE DIRECTION OF HOWARD COUNTY.

NOTE:
TANK DIMENSIONS AND LAYOUT ARE FOR REFERENCE ONLY. ACTUAL TANK DIMENSIONS WILL VARY WITH MANUFACTURER.



SECTION THROUGH 30,000 GALLON FIRE SUPPRESSION WATER STORAGE TANK, END-DRAFT CONFIGURATION SCALE: 1/4" = 1'-0"

PROFESSIONAL CERTIFICATION. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State Of Maryland, License No. 20453, Expiration Date 05/18/2010.