

Lake County

Technical Specifications

Mosquito Wash Bay Tavares Maintenance Facility

**Lake County, Florida
June 1, 2009**

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SECTION 02110

SITE CLEARING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Site clearing work includes, but is not limited to:

Removal of trees and other vegetation.

Topsoil stripping.

Clearing and grubbing.

Removing above grade improvements.

Removing below grade improvements.

1.02 RELATED SECTIONS:

Section 02200 - Earthwork

1.03 JOB CONDITIONS:

A. Traffic:

Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements:

Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

Protect bench marks and existing work from damage or displacement.

Protect improvements on adjoining properties and on Owner's property.

Restore damaged improvements to original condition as acceptable to parties having jurisdiction.

C. Regulatory Requirements:

Conform to applicable local code for disposal of debris.

1.04 EROSION CONTROL:

Whether otherwise shown on the plans or not, provide adequate protection to eliminate contamination of streams, canals, lakes, reservoirs and other impoundments by oil, fuels, bitumen, calcium chloride or other harmful materials. Take positive steps to minimize erosion and resultant siltation.

Where air pollution is a factor, water the haul roads and construction areas to help reduce the dust.

Where soil or other materials from the work area have been allowed, for whatever reason, to enter public lands, roads or streams, the Contractor shall remove the materials and repair any damage to the public facility.

Permanent erosion control features shall be installed as early as possible. Do not expose large areas of erodible earth at any one time and make every effort to protect against such erosion.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Topsoil:

Sandy clay surface soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter and without weeds, roots, and other objectionable material.

PART 3 - EXECUTION

3.01 SITE CLEARING:

Remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction.

Remove items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust.

Dispose of unsuitable or excess topsoil same as specified for waste material.

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Restore damaged improvements to original condition as acceptable to parties having jurisdiction.

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Where air pollution is a factor, water the haul roads and construction areas to help reduce the dust.

Where soil or other materials from the work area have been allowed, for whatever reason, to enter public lands, roads or streams, the Contractor shall remove the materials and repair any damage to the public facility.

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PART 2 - PRODUCTS

2.01 MATERIALS:

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Sandy clay surface soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter and without weeds, roots, and other objectionable material.

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Remove items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

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Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust.

Dispose of unsuitable or excess topsoil same as specified for waste material.

3.02 CLEARING and GRUBBING:

The trees selected by the Project Engineer for saving shall be protected from construction equipment by the Contractor in a manner approved by the Project Engineer and meeting the criteria for such protection as required by the applicable governmental agency.

Clear site of trees, shrubs, and other vegetation.

Completely remove stumps, roots, and other debris protruding through ground surface.

Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to density equal to adjacent original ground unless otherwise shown on the plans.

3.03 REMOVAL OF IMPROVEMENTS:

Remove existing above-grade and below-grade improvements necessary to permit construction and other work.

Remove abandoned underground piping or conduit interfering with construction.

3.04 DISPOSAL OF WASTE MATERIALS:

Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of offsite in legal manner.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Provide all labor, tools, materials, equipment and supervision necessary for excavation and site grading as specified herein.

1.02 RELATED WORK:

Section 02110 - Clearing and Grubbing

1.03 STANDARDS:

Comply with state and local environmental standards and as specified herein.

1.04 EARTHWORK:

Borrow material to be used for fill shall be tested for radon level. The contractor shall collect three samples of material at the borrow pit and submit them to a certified laboratory for testing. Radon levels shall not exceed 2pCi/g. The contractor shall submit certifications to the architect showing that the borrow material meets this criteria before bringing any material to the project site.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXCAVATION:

Excavation shall conform to the limits indicated on the plans or specified herein. This work shall include shaping and sloping and other work necessary in bringing the excavation to the required grade, alignment and cross section.

All suitable materials removed by the excavation shall be used as far as practicable in the formation of the embankments, subgrades, shoulders, and other places as directed. No excavated material shall be wasted without permission and where necessary to waste such material, it shall be disposed of as directed by the Owner. Waste excavated material shall be considered property of the Owner and disposed of as directed by the Owner.

3.02 AREA EXCAVATION:

The area of excavation shall be as indicated on the construction plans.

3.03 FILLING AND COMPACTING:

Replace excavated material as necessary. Place fill in layers and compact to a minimum density at optimum moisture as required.

3.04 EMBANKMENT:

Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a stable finished grade surface.

Embankments shall be formed of suitable material placed in layers of not more than 8 inches in depth measured loose and rolled and/or vibrated with suitable equipment until compacted. Each layer shall be uniformly compacted, using equipment that will achieve the required density. As compaction operations progress, each layer shall be shaped and manipulated as necessary to assure density throughout the embankment or backfill. Moisture content shall be such that the specified density can be reached and, if necessary, water shall be added or the material manipulated to assist drying. Thickness of layers may be increased provided the equipment and methods used are proven by field density testing to be capable of compacting thicker layers to specified densities. Layer thickness shall be decreased if equipment and methods used are proven to be incapable of compacting layers to specified densities.

Embankment on building sites shall be compacted to a density of not less than 100 percent of its maximum density as determined by AASHTO T 99, Method C.

The bottoms of the drainage retention areas shall not be compacted so as to not reduce the soil infiltration capacity.

Final earthwork elevations shall be within 0.2 feet of the proposed elevations.

3.05 MAINTENANCE AND PROTECTION OF WORK:

The Contractor shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the site due to the action of wind or water. He shall repair at his expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of work.

3.06 FINAL DRESSING:

Before final acceptance, the Contractor shall dress all earthwork to the planned line, grade and cross section. Ditches shall be shaped so that no water is impounded, unless otherwise shown on the plans. Earthwork shall be shaped to match adjacent grades, structures, etc.

3.07 SUBGRADE STABILIZATION

Methods of Subgrade Stabilization: Subgrade shall be stabilized by either: (i) addition of approved materials to the existing subgrade, or (ii) manipulating materials already in existence in the subgrade to achieve the desired results. It is the intent of this Specification that the subgrade be uniform, compact, capable of carrying reasonable loads, meet the required density and the required bearing value specified in the plans and/or these Specifications.

Mixing and Compacting: Additive materials shall be spread uniformly over the entire surface to be stabilized using a mechanical spreader, for a length that will provide sufficient distance to promote uniform mixing. A spreading tolerance of three inches in excess of plan width will be tolerated on each side.

Mixing shall be done with rotary tillers or other equipment meeting the Engineer's approval, for the full depth shown in the plans, and for the full width of the stabilizing limits.

The Contractor may, if he so elects, mix the materials in a plant of an approved type in lieu of the spreading and mixing operation described above.

Where the subgrade is of rock, the Engineer shall determine whether or not it is necessary to undercut and stabilize the subgrade and, if he determines the rock subgrade is extensive enough in nature to waive the requirement for subgrade stabilization, he shall so notify the Contractor in writing.

At the completion of the mixing, any particles within the limits of the stabilizing area not passing a three and one half inch sieve shall be removed or broken down.

After mixing has been completed and requirements for bearing value, uniformity and particle size have been satisfied, the stabilized area shall be compacted to at least 96 percent of its maximum density as determined by AASHTO T180. If the moisture content of the material is improper for attaining the specified density, either water shall be added or the material permitted to dry to the proper moisture.

Spreading, mixing and compacting shall be done as one lift unless otherwise specified in the plans.

After stabilizing and compacting operations have been completed, the subgrade shall be firm and substantially unyielding, to the extent it will support construction equipment, and will have the bearing value required by the plans. All soft and unyielding material and any other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, with proper allowance for subsequent compaction.

Maintenance of Completed Subgrade: The Contractor shall be wholly responsible for maintaining the completed subgrade free from ruts, depressions, damage from hauling or handling of materials, tools and equipment. Such responsibility shall include any repairs, replacements, etc. of curbs, curb and gutter, sidewalks or other structures which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. The subgrade shall be restored to an acceptable condition prior to placement of base.

Tolerances in Bearing Value Requirements: The following under-tolerances from the specified bearing value will be allowed as based on tests performed on samples obtained after mixing operations have been complete:

SPECIFIED LIMEROCK BEARING RATION	MAXIMUM PERMITTED UNDER TOLERANCE
LBR 40	5.0
LBR 35	4.0
LBR 30 or Under	2.5

Local Materials:

Local materials used for stabilizing may be high bearing value soils or sand-clay materials. The portion of the material passing the 40 mesh sieve shall have a liquid limit not greater than 30 and a plasticity index not greater than ten. Local materials may, if so approved by the Engineer, be blended to achieve the above requirements but, if so blended shall be tested and approved before spreading on the roadway.

Commercial Materials:

Commercial materials used for stabilization may consist of commercial limerock, lime-rock overburden or crushed shell. For limerock and limerock overburden, the percentage of carbonates of calcium and magnesium shall be at least 70, and the plasticity index shall not exceed ten. The gradation of limerock and limerock overburden shall be such that 97 percent of the material will pass a one inch sieve.

Crushed shell for this use shall be mollusk shell (oyster, mussels, clams, cemented coquina, etc.). Steamed shell shall not be permitted. At least 97 percent by weight of the crushed shell shall pass the three and one-half inch sieve and at least 50 percent by weight of the total material shall be retained in the No. 4 sieve. In addition, no more than 15 percent by weight of the total material shall pass the No. 200 sieve when washed over the sieve. In the event the shell meets the above criteria without crushing, the crushing will not be required.

END OF SECTION

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

The work included under this Section consists of excavating, backfilling and compacting as required for the construction of the utility system consisting of piping and appurtenances as shown on the Drawings and specified herein.

B. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
2. Optimum Moisture: Percentage of water in a specific material at maximum density.
3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jackhammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
4. Suitable: Suitable materials for fills shall be noncohesive, nonplastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck. The Contractor shall furnish all additional fill material required.
5. Unsuitable: Unsuitable materials are highly organic soil (Peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.

C. Plan For Earthwork:

The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Proposal for the work to be done will reflect all costs pertaining to the work.

1.02 QUALITY ASSURANCE

A. A testing laboratory employed by the Owner will make such tests as are deemed advisable. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for all testing shall be paid by the Owner. However, any and all tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the Contractor and the cost of any tests shall be deducted from payments due the Contractor.

B. Standards:

1. OSHA 29 CFR Subpart P - Excavations and Trenches a) 1926.650, 1926.651, 1926.652.
2. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry.

1.03 JOB CONDITIONS

A. Test borings made on the site and the surface exploration data are available upon request and are for the Contractor's information only.

B. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price, as provided in the Schedule of cost for Changes in Quantities.

1.04 PROTECTION

A. Sheeting and Bracing:

1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, power poles, etc. from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Engineer/RPR is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.

2. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
3. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and certification of this shall be provided by the Professional Engineer.
4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
5. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the Owner may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Engineer/R.P.R. may direct that timber used for sheeting and bracing be cut off at any specified elevation.
6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the Engineer/R.P.R.
7. The right of the Engineer/R.P.R. to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Groundwater Observation Wells:

1. Prior to excavation, the Contractor shall install groundwater observation wells at locations to be approved by the Engineer adjacent to structures under construction for the purpose of measuring water levels during excavation. The observation well shall consist of a screen, casing and cap of approved size and material of construction. The observation well shall be placed in a 2-1/2-inch bore hole which shall be carried to an elevation at least 2 feet below final bottom grade of structure. The annular space surrounding the intake point and the riser pipe shall be sealed in such a way as to prevent infiltration from surface water. The observation well shall be developed in such a manner as to insure proper indication of subsurface water levels adjacent to the well.
2. The Contractor shall be responsible for maintaining the observation wells and for observing and recording the elevation of groundwater in them until adjacent structure is completed and backfilled. Each observation well shall be observed and recorded daily. Measurements shall be supplied daily to the R.P.R. and Engineer. The Engineer may require that the observation wells reflect true groundwater levels by adding water to the well recording the drop in level from the time the water was added. A plugged observation well shall be redeveloped as necessary to indicate true groundwater levels.
3. The observation well shall be abandoned when directed by the Engineer/R.P.R. and in a manner acceptable to the Engineer.

C. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida, to design the dewatering systems for all structures. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Professional Engineer. The Professional Engineer shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
5. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking of the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the Engineer or the authority having jurisdiction, at no cost to the Owner.
6. Floatation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by the Contractor.
8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill material shall be subject to the approval of the Engineer.
2. All fill material shall be free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete or other rubble larger than two (2) inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1 - in.	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-12

D. Class 1 Soils*: Manufactured angular, granular material, 1/4 to 1 1/2 inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0- 5

E. Class II Soils**:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
3. SW: Well-graded sands and gravelly sands, little or no fines. More than fifty percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than fifty percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

* Soils defined as Class I materials are not defined in ASTM D2487.

** In accordance with ASTM D2487, less than 5 percent pass No. 200 sieve.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
3/8 inch	100
No. 10	85-100
No. 40	20-40
No. 200	0-12

G. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing:

1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth, within 10 feet of the lines of the excavation.
2. Strip and stockpile topsoil on the site at the location to be determined by the Owner.

3.02 EXCAVATION

A. General: Excavations for roadways, structures and utilities must be carefully executed in order to avoid interruption of utility service.

B. Excavating for Roadways/Structures/Utilities:

1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.

a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be measured by the Engineer to indicate to the satisfaction of the Owner that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.

b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such

that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.

c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.

2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the work.

4. Encounters with subsurface obstructions shall be hand excavated.

5. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the Engineer/R.P.R. at the Contractor's expense.

6. The bottom of excavations shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

7. All pavements shall be cut prior to removal, with saws or approved power tools.

8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

9. All locations and elevations as required herein must be permanently documented by the Contractor, on the Record Drawings prior to the Engineer's approval of the Application for Payment for that work.

10. When force main pipe is less than 10 feet from a water main, the depth of cover shall be increased to 5 feet or 18 inches below the water main, whichever is greater.

3.03 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The Contractor will be required at his expense to excavate below grade and refill with crushed stone (gradation 57 or 89) or other approved fill material if the Engineer determines that adequate dewatering has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations and construct embankment according to the following schedule. (Proctor standard shall be ASTM D-698):

STRUCTURES AND ROADWORK

<u>Area</u>	<u>Material</u>	<u>Compaction</u>
Beneath Structures	Structural Fill	12" lifts, compacted to 95% maximum density as determined by AASHTO T-180. Fill should not be placed over any in-place soils until those deposits have been compacted to 95% Modified Proctor.
Around structures	Structural Fill	8" lifts, 95% of maximum density as determined by AASHTO T-180. Use light rubber-tired or vibratory plate compactors.
Beneath Paved Surfaces	Common Fill	12" lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12" lifts, 95% by maximum density as determined by AASHTO T-180.

B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulation and in such a manner that it does not create a nuisance or safety hazard.

D. Embankments shall be constructed true to lines, grades and cross sections shown on the plans or ordered by the Owner. Embankments shall be placed in successive layers of not more than 8 inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.

E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the Owner. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Owner's approval will be in writing.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING

PART I - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to perform all trenching, removal of unsuitable or unsatisfactory material, backfilling and compaction for utilities required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to, all trenching; all backfilling; compaction, disposal of waste and surplus materials; and all related work such as sheeting, bracing and dewatering.

B. The Contractor shall examine the site and review the available data prior to submitting his proposal, taking into consideration all conditions that may affect his work. The Owner and Engineer will not assume responsibility for variations of subsurface conditions.

C. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, for safety precautions and programs incident to the work and regulations, ordinances, codes and orders applicable to the furnishing and performance of the work.

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. American Association of State Highway and Transportation Officials (AASHTO) Standards:

M145-82 The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes.

T180-74 Moisture-Density Relations of Soils Using a 10-lb. (4.54 kg) Rammer and an 18-inch (457 mm) Drop. (Modified Proctor Test).

T 191-61 Density of Soil In-Place by the Sand-Cone Method.
(R 1982)

C. Florida Department of Transportation; "Standard Specifications for Road and Bridge Construction", (FDOT) 1996 edition.

ASTM D2487: "Unified Classification System."

1.04 DEFINITIONS:

A. Common Fill: Common fill shall consist of any material classified as SW, SW-SM, SW-SC, SP, SP-SM, or SP-SC under Unified Classification System (ASTM D2487) which does not contain stones larger than 2 inches in any dimension and which has no more than 12 percent of its material by weight passing the No. 200 sieve.

B. Unsatisfactory Materials: Unsatisfactory materials shall be materials that do not comply with the requirements for common fill. Unsatisfactory materials include, but are not limited to, those materials containing roots and other organic matter, trash, debris, and stones larger than 2 inches, and materials classified in AASHTO M145 as groups A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5 and A-7-6. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

C. Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 2 inches in any dimension, or maximum size stones as defined by the pipe manufacturer, whichever is smaller.

D. Unstable material shall consist of material without the sufficient bearing capacity to support the utility pipe conduit or appurtenance structure.

E. Select Common Fill: Select common fill shall meet the requirements for common fill specified above with the exception that select common fill shall not have more than 5 percent of its material by weight passing the No. 200 sieve. Also, the maximum allowable aggregate size for select common fill shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

F. Degree of compaction: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in AASHTO T180. Field verification will be obtained by the test procedure presented in AASHTO T191. The term "maximum density" shall mean the maximum density determined under AASHTO T180.

G. Bedding Rock: Coarse aggregate structural bedding and support for utilities appurtenances and structures equal to FDOT Number 57, or as required by pipe manufacturer's recommendations for water mains.

1.05 PROTECTION

A. Prior to commencing trenching or dewatering, the Contractor shall take precautions to ensure that existing structures, which may be subject to settlement or distress resulting from trenching or dewatering are protected. Such precautions shall include establishing reference elevation markings on structures which are adjacent to new work and monitoring them to ascertain evidence of settlement or distress throughout construction. If settlement or distress becomes evident, modifications to the trenching, dewatering or protection procedures shall be made to prevent additional settlement or distress and any damage caused to the structure shall be repaired at the Contractor's expense.

B. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of trenches, to prevent any movement which could in any way diminish the width of the trench below that necessary for proper construction, and to protect adjacent structures and other facilities from undermining or other damage. The stability of all excavated faces shall be maintained in compliance with the Occupational Safety and Health Administration's excavation safety standards, 29 C.F.R. S. 1926.650 Subpart P until final acceptance of the work. The Contractor shall also comply with all applicable requirements of the Florida "Trench Safety Act" (90-96, Laws of Florida), and all other applicable rules and regulations.

C. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove all water entering trenches, and shall keep such trenches dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the utilities to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. Dewatering shall be conducted in such a manner as to preserve the undisturbed bearing capacity and composition of the subgrade soils at the proposed bottom of the trench. Grading shall be done as may be necessary to prevent surface water from flowing into the trench, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavations is maintained.

1.06 SUBMITTALS

A. Submit to the Owner for review, the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction, and backfilling for the various portions of the work. Review shall be for informational purposes only. The Contractor shall remain responsible for the adequacy and safety of the methods.

1.07 SOIL TESTING

The Owner will employ the services of a testing laboratory to perform all soils testing.

B. The Owner shall have sole authority over the frequency of testing and shall direct the testing laboratory in its work. The Owner may order the excavation down to any depth of backfilled material which has not been tested and have a test performed. The Contractor shall excavate for the test and backfill after the test at no additional cost to the Owner. The Contractor

shall re-excavate to the depth required and re-compact any areas found to be improperly backfilled.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Only common fill or select common fill, as defined above, may be used as backfill unless otherwise directed by the Owner.

PART 3 - EXECUTION

3.01 TRENCHING

A. The trench shall be excavated as recommended by the manufacturer of the pipe to be installed and as shown on Drawings. Trench walls below the top of the pipe shall be vertical to the extent possible to 1 foot above the proposed top of pipe. From 1 foot above the top of the pipe, trench walls shall be sloped 1:1 vertical to horizontal ratio. The maximum width of trench in the vertical pipe zone shall not exceed the pipe outside diameter plus a 9 inch allowance on each side of the pipe.

B. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom half of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. The trench bottom shall be free from unyielding material. Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with select common fill compacted to minimum 95% AASHTO T-180.

C. Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select common fill or bedding rock as directed by the Owner.

D. Unless otherwise specified or indicated on the Contract drawings, pipe trenches shall be of a depth to provide a minimum cover of three feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. The pipe shall be buried a minimum of three feet from the top of the pipe to the existing grade or three feet below the proposed adjoining road surface grade, whichever results in the greatest depth.

3.02 DEMUCKING

A. The Contractor shall remove all muck in all areas where it is encountered. The muck shall be excavated to the depth required for complete removal, and disposed of at an approved dump site in accordance with all applicable rules and regulations. The Contractor shall notify the Owner if muck is encountered on the site.

3.03 MISCELLANEOUS EXCAVATION

A. The Contractor shall perform all the remaining miscellaneous excavation. The Contractor shall make all excavations necessary to permit the completion of the work as shown on the Drawings and specified herein.

3.04 BACKFILLING

A. Backfill material shall consist of common fill or select common fill as defined herein and as shown on the drawings. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 12 inches loose thickness for other than hand-operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent of the maximum dry density as determined by AASHTO T180 for cohesionless soils unless otherwise specified. The bottoms of all excavations shall be compacted to at least 95 percent of the maximum density prior to backfill.

B. Trench Backfilling: For trenches, unyielding material removed from the bottom of the trench and unsuitable or unstable material removed from the trench shall be replaced with select common fill as specified. Replacement materials and backfill materials shall be select common fill and shall be placed in layers not exceeding 6 inches loose thickness from the bottom of the trench to 12 inches above the top of pipe. Backfill materials from 12 inches above the pipe to finished grade in unpaved areas and finished subgrade in paved areas shall be common fill placed in layers not exceeding 12 inches loose thickness. In unpaved areas, each layer of replacement material, or backfill material, shall be compacted to at least 95 percent of maximum density. In paved areas, each layer of replacement material, or backfill material, shall be compacted to at least 98 percent of maximum density. The bottoms of all trenches shall be in an undisturbed condition or, if disturbed, shall be compacted to at least 95 percent of maximum density to a depth of at least 1-foot below the trench bottom. Specified densities shall be as determined by AASHTO T180.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface or subgrade, or layer of soil material. Prevent free water from appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air-dry, soil material that is too wet to permit compaction to specified density.

2. Soil material that has been removed because it is too wet to permit compaction, but is otherwise satisfactory, may be stockpiled or spread and allowed to dry until moisture is reduced to a satisfactory value.

3.05 SURPLUS MATERIAL

A. Excavated material or borrow fill to be used in construction shall be neatly piled so as to inconvenience, as little as possible, the public and adjoining property owners until used or otherwise disposed of. Suitable excavated material may be used for fill, trench backfill or backfill on the different parts of the work as required. Surplus fill shall become the property of the Contractor, and shall be removed and disposed of by him off the site.

B. The Contractor shall remove and dispose of all pieces of rock (ledge) and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere in the work insofar as it is available. Any deficiency in the backfill material shall be made up with satisfactory material provided by the Contractor at no additional cost to the Owner. Rock may be used in embankment fill only with approval of the Owner.

C. The right is reserved to make minor adjustments or revisions in lines or grade, if found necessary, as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction of utilities.

END OF SECTION

SECTION 02222

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

This section includes excavation, bedding, and backfilling for utilities necessary to perform all work necessary to prepare for laying the piping or main, including clearing, digging the trench, preparing the pipe bed, compacting, and preparing the surface restoration, and disposal of surplus material.

Maintain in operating condition existing utilities, active utilities, and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Comply with permits and regulations according to General Conditions.

1.02 SUBMITTALS:

Shop Drawings or details pertaining to excavation and backfill are not required unless use of materials, methods, equipment, or procedures contrary to Drawings or these specifications are proposed. Do not perform work until required shop drawings have been accepted by Owner and Engineer.

1.03 JOB CONDITIONS:

Set all lines, elevations, and grades for utility system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

1.04 TRENCH SAFETY:

Care shall be taken to strictly observe all applicable, State, local and Federal standards with respect to the safety of persons during excavation and backfill. The contractor shall recognize OSHA excavation safety standards, agree to abide by them, and identify the costs to comply. The bidder, therefore, acknowledges that the total bid price includes costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida), effective October 1, 1990.

1.05 JACK AND BORE, DIRECT BORE CONSTRUCTION (IF APPLICABLE):

Jack and bore, direct bore construction shall be conducted in accordance with the Florida Department of Transportation Utilities Accommodation Guide.

1.06 TESTING:

Testing shall be conducted in accordance with AASHTO T-180, modified proctor density test. Tests shall be conducted on all trench backfill within 10 feet of pavement or proposed pavement areas and under all existing paved areas.

Frequency tests shall be conducted at each public roadway crossing and at no less than 300-foot intervals along the pipeline or on each pipeline run between manholes, inlets or junction boxes in accordance with these specifications. There shall be at least one test per layer placed.

Test report results shall be furnished to the Owner and Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Bedding Material

Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U.S. Sieve Size	Passing by Weight, Percent
1 Inch	100
3/4 Inch	90 - 100
3/8 Inch	20 - 55
No. 4	0 - 10
No. 8	0 - 5

PART 3 - EXECUTION

3.01 EXCAVATION, TRENCHING, AND BACKFILLING:

Performing excavation as indicated or specified. During excavation, pile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

Remove excavated materials not required or not suitable for backfill or embankments and waste as specified.

Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

3.02 TRENCH EXCAVATION:

Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. The amount of trench to be open at any one time shall be limited at the discretion of the Engineer to minimize public inconvenience and/or damage to life or property. Not more than 1,000' feet of trench shall be opened ahead of pipe laying operations, unless greater length of trench is approved by the Engineer.

All existing utilities such as pipes, poles and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the Owner.

Any pipes, conduits, wires, mains footings, or other underground structures encountered in trenching operations shall be carefully protected from injury or displacement. Any damage thereto shall be fully, promptly and properly repaired by the Contractor to the satisfaction of the Engineer and the Owner thereof.

Failure of the plans to show the exact location, nature or extent of any sub-surface obstruction shall not be the basis of a claim for extra work.

All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheated, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to and exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on undisturbed soil or bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

The minimum width of the trench shall be equal to the outside diameter of the pipe at the bell plus six inches on each side of the pipe. All other trench width requirements for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

3.03 SHEETING AND BRACING:

Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheeting may be removed after excavation has been backfilled sufficiently to protect against damaging or injurious caving.

3.04 PIPE BEDDING:

Accurately cut trenches for pipe or conduit that is installed to designated elevations and grades to line and grade 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 6" layers, measured loose, to at least 1'0" above top of pipe.

3.05 TRENCH BACKFILLING:

A. Criteria

Do not backfill trenches until required tests are performed, utility systems, as installed, comply with specified requirements, and are accepted by applicable governing authority. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling

After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in lifts or layers not exceeding 8" of loose material. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698 or AASHTO T-99.

C. Compaction

Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Compaction Testing

Independent testing laboratory shall perform test at intervals not exceeding 300 feet of trench for each 12" of compacted trench backfill and furnish copies of test results as specified.

3.06 RESTORATION OF SURFACE:

The top surface of the trench fill shall be restored to the original or planned condition. Paved sections shall conform in grade to the adjacent area. Restoration shall be completed as promptly as practicable and shall not be prolonged until the end of the construction period.

3.07 DEWATERING:

If dewatering activity is required, unless specifically authorized by the Engineer, all pipe shall be laid "in the dry". The Contractor shall minimize the length of excavation in advance of pipe laying so as to minimize the amount of trench dewatering required. The Contractor shall dewater before trench excavation, utilizing one or more of the following approved methods: well point system, trench gravity underdrain system, or sumps with pumps.

Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining of high vacuum, and at the same time, of handling large volumes of air as well as water.

If the material encountered at trench grade is suitable for the passage of water without destroying the sides or bottom of the main trench, sumps may be provided at intervals to the side of the main excavation, and pumps may be used to lower the water level by taking their suction from these sumps. In the event such pumps are employed, care shall be exercised to prevent the movement of pipe foundation material and to this end a bed of crushed stone may be required.

The Contractor shall be responsible for disposing of all water resulting from trench dewatering operations, and shall dispose of the water without damage or undue inconvenience to the work, the surrounding area, or the general public. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements, or other structures.

END OF SECTION

SECTION 02400

SITE DRAINAGE

PART-1 - GENERAL

1.01 SCOPE OF WORK:

Installation and furnishing of all materials, equipment, and accessories to be used in the construction of the storm sewer and site drainage system.

1.02 STORM DRAINAGE STRUCTURES:

Pipe
Inlets, Manholes and Junction Boxes
Concrete Curb
Sidewalk

1.03 RELATED WORK:

Section 02222: Excavation, Backfilling, and Compacting For Utilities.

1.04 JOB CONDITIONS:

Set lines, elevations, and grades for drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

PART-2 - PRODUCTS

2.01 PIPE USED SHALL MEET THE FOLLOWING SPECIFICATIONS::

Round Concrete Pipe (over 12" in dia.) ASTM C76-70

Asphalt Corrugated Metal Pipe AASHTO M36-70 and M190-70

PVC pipe (12" in diameter or less) ASTM D 3034

2.02 INLETS, MANHOLES AND JUNCTION BOXES:

Inlets, manholes and junction boxes shall be constructed of precast concrete or cast-in-place concrete. A maximum of 12 inches of brick risers may be used for precast units. If cast-in-place is used, no allowance for riser changes will be allowed with brick.

Concrete shall be Class I, as specified by the Florida Department of Transportation Standard

Specifications for Road and Bridge Construction Latest Edition.

Mortar for brick masonry shall be of one part portland cement to three parts sand. Hydrated lime in an amount not to exceed ten percent of the amount of cement used may, at the Contractor's option, be added to the mortar. Masonry cement, delivered in packages properly identified with the brand name of the manufacturer and showing the net weight as well as whether it is Type 1 or Type 2, may be used in lieu of mixed mortar, provided it has not been in storage for more than six months.

Grating and frames fabricated from structural steel shall be galvanized in accordance with the requirements of ASTM A123.

Forms may be of wood or metal construction, shall be constructed true to line and grade and shall be approved by the Engineer before being filled with concrete.

The Contractor may substitute precast inlets, manholes and junction boxes in lieu of cast-in-place units. Such precast units shall be in accordance with ASTM C478 or with Florida Department of Transportation Standards.

PART-3 - EXCAVATION

3.01 INLETS AND MANHOLES:

Excavation shall be in accordance with Section 02222 of these Specifications.

If the Contractor elects to construct units of cast-in-place concrete, the concrete shall be placed in the approved forms to the depths shown on the plans and thoroughly vibrated. After the concrete has hardened sufficiently, it shall be covered with suitable material and kept moist for not less than three days.

Reinforcing steel for cast-in-place construction shall be in place, securely tied and properly spaced prior to placement of the concrete.

After the concrete or mortar has cured, the frame of the casting shall be set in a full mortar bed composed of one part portland cement to two parts fine aggregate.

Inlet and outlet pipes shall be of the same size and kind as the connection pipe. They shall extend through the walls for a distance beyond the outside surface sufficient for the intended connections and the concrete constructed around them so as to prevent leakage along their outer surface. The inlet and outlet pipe ends shall be flush with the inside face of the wall.

Inlets, manholes and junction boxes shall be backfilled completely by use of mechanical tampers and in six-inch (6") compacted layers.

3.02 PIPES AND PIPE CULVERTS:

Trenches for pipe culverts, storm sewers, sanitary sewers, water lines and other conductors shall be excavated to the required depth and to a width sufficient to provide adequate working room. For pipe lines placed above the natural ground line, the embankment shall be placed and compacted to an elevation of at least two feet above the top of pipe and at least four pipe diameters each side of the pipe before excavating the pipe trench. It is the express intent of this specification that all pipes will be placed in trenches.

For all pipe culverts, storm sewers and sanitary sewers of 24 inches or more inside diameter the pipe bedding shall be shaped to conform to the outside of the pipe, for a depth of not less than ten percent of its total outside height and recesses provided to receive the bell. For pipes of less than 24 inches inside diameter, the trench bottom may be either flat or shaped to fit the pipe, except that the recesses for bells are required in any event. The pipe barrel shall be fully supported by the trench bottom.

Where rock, boulders or other hard, lumpy or unyielding materials are encountered in the trench bottom, they shall be removed to a depth at least twelve inches (12") below the bottom of pipe and the resultant excavation backfilled. Muck or other soft material considered by the Engineer to be unsuitable as foundation for the pipe shall be removed to the depth required to obtain a firm foundation and backfilled.

All pipes shall be carefully laid, true to line and grade, with hubs up-grade and the tongue end fully entered into the hub. When pipe with quadrant reinforcement, or circular pipe with elliptical reinforcement, is used the pipe shall be installed in a position such that the manufacturer's marks designating "top" and "bottom" of the pipe shall not be more than five degrees from the vertical plane through the longitudinal axis of the pipe. Any pipe which is not in true alignment or which shows any settlement after laying shall be taken up and re-laid without additional compensation.

For all round concrete pipe, other than side drain pipe, the pipe joints shall be sealed by use of round rubber gaskets. Those gaskets shall meet the requirements of Article 5.9 of ASTM C361. Pipe joints shall meet the requirements of Article 941-1.5 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition. The gasket and joints shall be free of grit, dirt and other foreign matter at the time the joints are made. In order to facilitate closure of the joint, application of an approved vegetable soap lubricant immediately prior to closing the joint will be permitted. For concrete pipe used as side drain the joints shall be welded before the inside mortar is placed and before succeeding section of the pipe are laid, the lower half of the joint portion of the pipe in place shall be filled with cement mortar and the upper half of the tongue portion of the next joint wiped with cement mortar, both in sufficient thickness to bring the inner surface of the abutting pipe flush and even when the pipe is laid. After the pipe is laid, the inside of the joint shall be wiped and finished smooth and a mortar bead not less than 3/4 inches thick shall be formed completely around the outside of the joint.

For concrete pipe laid with rubber gasket joints, any deviation from true alignment or grade which would result in a displacement from the normal position of the gasket of as much as 1/4 inch, or which would produce a gap exceeding 1/2 inch between sections of pipe for more than

1/3 of the circumference of the inside of the pipe will not be acceptable and, where such occurs, the pipe shall be re-laid without additional compensation. Where minor imperfections in the manufacturing of the pipe causes a gap greater than 1/2 inch between pipe sections, the joint will be acceptable provided the gap does not extend more than 1/3 the circumference of the inside of the pipe. No mortar, joint compound, or other filler which would tend to restrict the flexibility of the gasket joint will be applied to the gap.

Corrugated steel pipe shall be field jointed with locking bands as specified by AASHTO M36-70. The joints shall be gasketed with a rubber or neoprene gasket of a design shown to secure a soil tight or water tight joint. The gasket for annular pipe joints shall be at least seven inches wide and at least 3/8 inch thick and at least one inch thick and at least one inch and five inches wide for helical pipe joints. Suitable alternate joints will be considered by the Engineer if the Contractor requests such consideration. Field joints for aluminum pipe except the material used in the bands and band connectors shall be of the same alloy as the culvert sheeting and shall meet the requirements of AASHTO M196.

Immediately prior to final inspection, coated corrugated steel pipe shall be cleaned and inspected for breaks or other damage to the coating or to the pipe itself and any repairs necessary shall be made by the Contractor. Grade required shall be cut down or extended and made to conform to the required grade.

PVC pipe laying shall proceed up grade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleared of all dirt and stones and other foreign material. The spigot ends of the pipe shall be lubricated lightly with a lubricant specified by the pipe manufacturer and approved by the project engineer. Sufficient pressure shall be applied to the pipe so as to properly seat the socket in the bell of the pipe. All pipes shall be laid straight, true to the lines and grades shown on the plan.

Where manholes are to be raised, the adjustment may be made, if the Contractor so chooses, by the use of adjustable extension rings of the type which do not require the removal of the existing manhole frame. The extension device shall provide positive locking action and shall permit adjustment in height as well as diameter. The particular type of device used shall meet the approval of the Engineer.

3.03 CONCRETE CURB & SIDEWALK:

A. Concrete Curb

All concrete curb shall be constructed in accordance with the Florida Department of Transportation Standard Specifications of Road and Bridge Construction, Section 520.

B. Concrete Sidewalk

This work shall consist of constructing cement concrete sidewalks in accordance with these specifications and within reasonable close conformity to the lines, grades and dimensions shown on the drawings established by the Engineer. Materials for sidewalk construction shall be 2500

psi, concrete and Class I (DOT) steel wire fabric AASHTO Designation M-55. The foundation for the bed shall be formed a depth of 4 inches below and parallel with the finished surface of the sidewalks, unless otherwise indicated on the drawings or specified. Unsuitable material shall be removed and replaced with approved material, and the foundation shall be thoroughly compacted and finished to a firm, even surface. Edge dimensions shall conform to the plan details, with one #5 continuous bar on each side.

Forms shall be of wood or metal, straight, free form warp, and of sufficient strength when staked to resist the pressure of the concrete without springing. If wood, they shall be nominal 2-inch planks surfaced on the inside and the top; or if of metal, they shall be of approved section. Forms shall have a depth equal to the depth of the concrete and shall be thoroughly cleaned and oiled before concrete is placed against them. Forms that are worn, bent, or damaged shall not be used.

Sidewalks shall be constructed in separate slabs 15 feet in length except for closures. These slabs shall be separated by transverse premolded expansion joint filler, if an inch in thickness, for the full depth of the concrete. Transverse premolded expansion joint filler shall also be placed adjacent to existing structures where directed. The slabs between expansion joints shall be divided into blocks 5 feet in length, by scoring transversely. Where the slabs are more than 5 feet in width they shall be scored longitudinally in the center. Transverse and longitudinal scoring shall extend for a depth of at least the thickness of the concrete slab.

Premolded expansion joint filler, of an inch in thickness for the full depth of the concrete, shall be placed longitudinally where the sidewalk slab is to be constructed in contact with curbs.

Where existing light standards, poles, fire hydrants, and similar structures are within the limits of the sidewalk area, the concrete around such structures shall be scored in a block 8 inches wider than the maximum dimension of the structure at the sidewalk elevation. Prior to placing the concrete around such structures, premolded expansion joint filler, of an inch in thickness, shall be placed around the structure for the full depth of the concrete in the sidewalk.

The concrete shall be placed in the forms and tamped and spaded to prevent honeycomb and until the top of the structure can be floated smooth and the edges rounded to the radius shown in the plans. A light broom finish shall be applied once the concrete has set enough to be permanently marked.

Side forms shall not be removed within 12 hours after the concrete has been placed. After removal of the forms, minor honeycombed areas shall be filled with mortar composed of 1 part of cement and 2 parts of fine aggregate. Major honeycombed areas will be considered as defective work, and shall be removed and replaced at no expense to the Owner.

All expansion joints, and scoring cracks where required, shall be sealed with joint sealing material having ASTM designation D1190.

After the concrete has cured for a period of not less than 72 hours, the spaces adjacent to the sidewalk shall be backfilled with approved material in layers of not more than 4 inches in depth,

which shall be thoroughly compacted mechanically to the required elevation and cross-section.

This work will be measured as square yards.

END OF SECTION

SECTION 02500

ROADWAY BASE COURSE

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Furnish and install roadway and parking area base course in accordance with the contract drawings and specifications.

REFERENCED PUBLICATIONS:

A. Florida Department of Transportation “standard specifications for road and bridge construction” latest edition, hereafter referred to as FDOT Standard Specifications.

RELATED SECTIONS:

Section 02200 – Earthwork

Section 02511 – Asphaltic Concrete Paving

PART 2 - PRODUCTS

2.01 Base course material shall be in accordance with FDOT Standard Specifications, Section 200, Limerock Base.

A. Limerock may be of either Miami or Ocala formation and shall meet the following requirements:

- 1) Minimum percentage of carbonates of calcium and magnesium in the limerock material shall be seventy percent.
- 2) Maximum percentage of water sensitive clay material shall be three percent by weight.
- 3) Maximum Liquid Limit shall not exceed thirty-five.
- 4) Plastic Index shall not exceed ten .
- 5) At least ninety-seven percent of the material, by weight, shall pass a three and one half inch sieve and the material shall be graded uniformly down to dust. All crushing or breaking-up, which is necessary to meet this requirement, shall be done before the material is placed on the roadbed.
- 6) Material shall not contain cherty or other extremely hard pieces, or lumps, balls or pockets of sand or clay size materials in sufficient quantity as to be detrimental to the proper bonding, finishing or strength of the limerock base.

2.02 PRIME COAT:

A. Materials

Unless otherwise called for on the plans or in Special Provisions, material used in the prime coat shall be Cut-Back Asphalt, Grade RC-70 or RC-250 or Emulsified Asphalt, Grade RS-2. Cutback Asphalt shall meet the requirements of AASHTO M81 except that the penetration range shall be 60-120 instead of 80-120. Emulsified Asphalt shall meet the requirements of AASHTO M140 (for anionic) and M208 (for cationic). The viscosity requirements for Grade RS-2 shall not apply. Other types and grades of bituminous material may be allowed if it can be shown that the alternate material will properly perform the function of prime coat material.

Cover material shall consist of a sand bituminous hot-mix containing from two to four percent Asphalt Cement, viscosity Grade AC-20 and fine aggregate consisting of a clean sand or screenings. Sand shall contain no more than ten percent material by weight, passing the No.200 sieve. Screenings shall not contain any material retained on a three eighth inch sieve and not more than ten percent, by weight, passing the No.200 sieve.

PART 3 - EXECUTION

3.01 Equipment

Limerock shall be spread by mechanical rock spreaders equipped with a device to strike the rock off uniformly to laying thickness and capable of producing an even distribution of the rock. In areas where the use of a mechanical spreader is impractical, and with the approval of the Architect, limerock may be spread by means of a dozer or grader blade.

Hauling, Spreading and Compacting: As much as possible, rock shall be hauled over rock previously placed. Hauling over the subgrade is permitted, provided that any soft spots that develop in the subgrade as a result of that hauling shall be immediately repaired to the satisfaction of the Architect.

When the specified compacted thickness of the base is six inches or less, the base shall be constructed in one layer. For bases of greater than six-inch thickness, the base shall be constructed in two or more layers, with the final layer approximately one-half the total thickness, but in no case less than four inches. Before compaction effort starts, all segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

After the limerock has been spread, it shall be brought to the proper moisture content by wetting or drying. When water is added, it shall be uniformly mixed in by disking to the full depth of the course which is being compacted. Wetting or drying operations shall be across the full width and the full depth of the course being compacted.

The limerock base for roadways shall be compacted to a density of not less than ninety-five percent of the maximum density as determined by AASHTO T180. Limerock base for shoulder

paving or under sidewalks or driveways shall be compacted to a density of not less than ninety-five percent of the maximum density as determined by AASHTO T180.

Density tests shall be made on each day's final compaction operation on each course. The frequency of those tests shall be as specified herein. All bladeing, manipulation or other operations shall be complete prior to performing the tests.

If, at any time, subgrade material should become mixed with the base material, the contaminated base material shall be removed and replaced with suitable material. If the subgrade has been affected to the degree its integrity is questionable, then that subgrade shall be replaced as well.

3.02 FINISHING BASE:

Limerock base shall be finished to true line, grade and cross-section. As soon as the finishing operation is complete, the finished surface shall be checked with a template cut to the required cross-section and with a fifteen foot straightedge laid parallel to the road. The straightedge shall be placed in alternating overlaps to assure complete coverage. Any straightedge shall be placed in alternating overlaps to assure complete coverage. Any irregular ties greater than three eighths inch shall be corrected by scarifying and removing or adding rock as needed after which the area shall be re-compacted and re-tested.

Thickness of base shall be measured at the intervals as specified herein. Base which is deficient by more than five percent of its planned thickness shall be corrected by scarifying, adding rock, reshaping and recompacting for a distance of one hundred feet each side of the edge of the deficient area. As an exception to this requirement, where only one area is deficient and that area is less than twenty feet long, or less than one percent of the total day's base work, whichever is smaller, then the Architect may waive the requirement for reconstructing the area providing the deficiency is less than ten percent of the planned thickness.

3.03 APPLICATION OF PRIME COAT:

Before any bituminous material is applied, all loose material, dust, caked clay, dirt and other foreign material which might prevent proper bond with the existing surface shall be removed for the full width of the application.

Bituminous material shall be applied by pressure distributor equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. The outside nozzle at each end of the spray bar shall have an opening of not less than twenty-five percent nor more than seventy-five percent in excess of the interior nozzles. All other nozzles shall have uniform openings and shall be spaced so as to provide an even distribution of the bituminous material on the surface.

The surface to be primed shall be lightly sprinkled with water and rolled with a traffic roller immediately before applying the bituminous material.

The moisture content of the base material shall not exceed ninety percent of the optimum moisture of the material at the time the prime material is applied. The bituminous material shall be applied by a pressure distributor at a temperature between 100 degrees F. and 150 degrees F. that will ensure even distribution.

The rate of application shall be not less than 0.10 gallon per square yard. Sand-bituminous hot-mix shall be applied at the rate of ten pounds of mix per square yard.

The entire surface, after covering, shall be rolled with a traffic roller to obtain a reasonable dense mat.

3.03 FIELD QUALITY CONTROL:

An Independent Testing Laboratory approved by the Owner and paid by the contractor, shall be retained to perform construction testing on site except as may be amended in the supplemental conditions.

Fill Placed in Areas to be paved: At least one compaction test of every 2,000 sq. ft. of each eight lift or layer.

If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

The following tests shall be performed on each type of material used as compacted fill as part of construction testing requirements:

Moisture and Density Relationship: ASTM D 698.

Mechanical Analysis: AASHTO T-88.

Plasticity Index: ASTM D 424.

Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements.

Sand-Cone Method: ASTM D 1556.

Nuclear Method: ASTM D 2922.

Base course construction testing shall be performed as follows:

Base Material Thickness: Perform one test for each 8,000 sq. ft. in-place base course.

Base Course Compaction: Perform one test for each 2,000 sq. ft. of in-place course.

Test each source of material for base course in accordance with applicable state highway specifications.

Owner, Engineer and Contractor shall be provided with copies of reports within twenty-four hours of time test was performed.

In event that any test performed fails to meet these Specifications, Owner and Contractor shall be notified immediately by Independent Testing Laboratory.

Owner reserves right to employ Independent Testing Laboratory and to direct any testing that is deemed by Owner to be necessary. Contractor shall provide free access to site of testing activities.

END OF SECTION

SECTION 02511

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Furnish and install asphaltic concrete paving, including prime and tack coat in accordance with the contact drawings and specifications.

1.02 REFERENCED PUBLICATIONS:

A. “Standard Specifications for Road and Bridge Construction,” Florida Department of Transportation (latest edition), hereafter referred to as “FDOT Standard Specifications”

1.03 RELATED SECTIONS:

Section 02500 – Roadway Base Course

1.04 SUBMITTALS

A. Design Mix:

Before any asphalt surface is constructed, the Contractor shall submit actual design mix for asphalt to the Project Manager for acceptance.

B. Material Certificates:

Furnish copies of materials certificates signed by material producer and Contractor certifying that each material item complies with, or exceeds, specified requirements.

1.04 JOB CONDITIONS

A. Weather Limitations:

Apply prime and tack coats when ambient temperature is above 50 percent, and when temperature has not been below thirty-five degrees for twelve hours immediately prior to application. Do not apply when base is wet or contains excess moisture.

Construct asphalt concrete surface course when atmospheric temperature is above forty degrees and when base is dry. Base course may be placed when air temperature is above thirty (30) degrees and rising.

B. Grade Control:

Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

This section specifies the material, the compositions, and the job mix formula for Type S asphaltic concrete pavements as specified in Section 331 of the Standard Specifications. The requirements for plant and equipment for these pavements are specified in Section 320 of the FDOT Standard Specifications. The Contractor shall submit a job mix formula as required by FDOT Standard Specification, Section 331.4.3, prior to the start of production.

2.02 PRIME AND TACK COAT

Governing specifications for materials shall be as per FDOT Standard Specifications, Section 300, Prime and Tack Coats for Base Courses.

PART 3 - EXECUTION

3.01 PREPARATION

Remove loose material from compacted base surface to check for unstable areas and areas requiring additional compaction. Do not begin paving work until deficient base areas have been corrected and are ready to receive paving.

3.02 PRIME COAT

Apply bituminous prime coat to base surfaces where asphaltic concrete paving will be constructed.

Apply bituminous prime coat in accordance with FDOT Standard Specification, Section 300-6.

Apply at minimum rate of 0.20 to 0.50 gal./sq. yd. over compacted base. Apply material to penetrate and seal, but not flood, surface.

Cure and dry as long as necessary to attain penetration and evaporation of volatile.

3.03 TACK COAT

Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete and surfaces abutting or projecting into asphalt concrete pavement.

Apply tack coat to full depth asphalt and sand asphalt base. Apply emulsified asphalt tack coat between each lift or layer of full depth asphalt and sand asphalt bases and on surface of such bases where asphaltic concrete paving will be constructed.

Apply emulsified asphalt tack coat in accordance with FDOT Standard Specification Section 300-7.

Distribute at rate of 0.05 to 0.15 gal./sq.yd. of surface.

Allow tack coat to dry until at proper condition to receive paving.

3.04 PLACING MIX

Place asphalt concrete mixture on prepared surface, spread, and strike off. Spread mixture at following minimum temperatures:

When ambient temperature is between forty degrees F and fifty degrees F: Two hundred eight-five degrees F.

When ambient temperature is between fifty degrees and sixty degrees F: Two hundred eighty degrees F.

When ambient temperature is higher than sixty degrees F. Two hundred seventy-five degrees F.

Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

3.05 PAVER PLACING

Place in strips not less than 10'-0" wide, unless otherwise acceptable to Owner. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for section before placing surface course.

3.06 JOINTS

Make joints between old and new pavements, or between successive days work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.07 ROLLING

Begin rolling when mixture will bear roller weight without excessive displacement.

Compact mixture with hot-hand tampers or vibrating plate compactors in areas inaccessible to rollers.

3.08 BREAKDOWN ROLLING

Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

3.09 SECOND ROLLING

Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

3.10 FINISH ROLLING

Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

3.11 PATCHING

Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

3.12 PROTECTION

After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.13 FIELD QUALITY CONTROL

Independent Testing Laboratory, selected and paid by Contractor, shall be retained to perform construction testing of in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Asphalt surface and base course shall be randomly cored at a rate of one core for every 20,000 square feet of paving. However, no less than three cores in light duty areas and three cores in heavy-duty areas shall be obtained. Asphalt pavement samples shall be tested for aggregate gradation and bitumen content for conformance with the mix design. The asphalt pavement shall also have Extraction and Marshall Stability tests taken on the material placed each day. Density of asphaltic concrete surface course shall be 93 percent of job mix Marshall Laboratory density.

3.14 ACCEPTANCE OF MIXTURE

Plant Mixture

1. Acceptance of the bituminous mixture at the plant will be based on the Contractor's testing lab results. Asphalt must meet a minimum Marshall Stability of 1500 lbs. Extraction and Gradation results shall meet the variance acceptable values provided in Table 331-6. One sample shall be tested in the morning and one in the afternoon for each day's paving.

Any load or loads of mixture, which in the opinion of the Project Manager or Owner are unacceptable due to being segregated, aggregates improperly coated, or an excessively high or low temperature, shall be rejected for use in the work. The Owner may reject the asphalt or direct the Contractor to remove the asphalt due to failure to meet any F.D.O.T. requirements.

Field Density Requirements

Field density requirements shall conform to F.D.O.T. – Section 330-10.3.

3.15 THICKNESS

In-place compacted thickness shall not be less than thickness specified on the drawings.

3.16 SURFACE SMOOTHNESS

Test finish surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

Base Course Surface: 1/4"

Wearing Course Surface: 3/16"

Check surface areas at intervals necessary to eliminate ponding areas.

Repair or remove and replace unacceptable paving as directed by Owner.

Areas of deficient paving thickness shall receive a minimum 3/4" overlay until specified thickness of the course is met or exceeded.

END OF SECTION

SECTION 02520

SITE WORK CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Construction of concrete curb and gutter, concrete valley gutters and sidewalk, as shown on the Drawings and as herein specified.

B. Related Work Specified Elsewhere

Section 02221: Trenching, Backfilling and Compacting

C. Supplementary Specifications

All Florida Department of Transportation Standard Specifications for Road and Bridge Construction - 1991 (FDOT Standard Specs) herein referred to and/or herein amended form a part of these technical specifications.

1.02 QUALITY ASSURANCE

A. Qualifications of Installer

At all times during execution of this portion of the work, provide at least 1 person who is thoroughly familiar with the type of materials being installed and is directly responsible for all work performed under this section.

B. Quality Control Requirements

Requirements shall be as set forth in other related specifications as herein referred to.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete

All work under this section shall be of Class II concrete, as set forth in FDOT Standard Specifications.

B. Steel

All reinforcing steel shall be Grade 60 Reinforcement, in accordance with the provisions set forth in FDOT Standard Specifications Section 415 "Reinforcing Steel".

C. Joint Materials

All joint materials shall be in accordance with the provisions set forth in FDOT Standard Specifications Section 932-1 "Joint Materials".

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. Concrete Gutter, Curb Elements and Traffic Separator

Concrete curb and gutter and concrete valley gutter construction shall be in accordance with FDOT Standard Specifications 520 "Concrete Gutter, Curb Elements and Traffic Separator", except as hereinafter amended and as shown on the Drawings.

B. Concrete Sidewalks

Construction shall be in accordance with FDOT Standard Specifications Section 522 "Concrete Sidewalk", except as hereinafter amended and as shown on the Drawings.

END OF SECTION

02580

PAVEMENT MARKINGS

PART-1 - GENERAL

1.01 SCOPE OF WORK:

Furnish all tools, equipment, materials, machinery, appurtenances and labor, unless otherwise specified to establish all pavement markings for fire lanes, lane striping, parking, stall striping, handicapped symbols and other necessary striping for traffic control and public safety.

The Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities.

Flagman shall be utilized, where necessary, along with barricades, warning signs, and warning lights.

1.02 RELATED WORK

Florida Department of Transportation Standard Specifications for road and bridge construction latest edition (referred to herein as "Standard Specifications").

PART-2 - PRODUCTS

2.01 MATERIALS:

The paint utilized for striping shall be Thermoplastic compound meeting AASHTO M 249-79 as detailed in Section 711-2 of the Standard Specifications. The paint colors shall be selected as follows:

Exterior Sidewalk Curbs:	Yellow (Per D.O.E.)
Lane Striping:	White
Handicapped Symbols:	Blue
Parking Stall Striping:	White

PART-3 - EXECUTION

3.01 PREPARATION:

Application surface shall be swept and cleaned to eliminate loose materials and dust per Section 710-6.3 of the FDOT Standard Specifications.

3.02 APPLICATION:

All paint shall be applied in accordance with the manufacturer's recommendations and Section 711-4 of the FDOT Standard Specifications.

Paint shall be applied with mechanical equipment to provide uniform and straight edges.

END OF SECTION

SECTION 02700

SANITARY SEWER SYSTEM

PART-1 - GENERAL

1.01 SCOPE OF WORK:

This Section consists of the installation and furnishing of all materials, equipment, and accessories to be used in the construction of the sewage collection system.

1.02 RELATED SECTIONS:

Section 02222 - Excavating, Backfilling and Compaction for Utilities:

All trenching, filling, and backfilling, shall conform to the requirements of Section 02222, except for pipes placed outside the road bed, backfill composition need be only sufficient to assure no unusual settlement will occur and the pipes will remain in place without movement.

1.03 SHOP DRAWINGS:

In general, the following shop drawings shall be submitted to the Engineer when applicable for approval prior to construction:

HDPE or Polyvinylchloride Pipe.
Manufacturer's Certified Test Reports on Castings.
Mill Test Certificates on Ductile Iron Pipe.

PART-2 - PRODUCTS

Pipe, Fittings and Specials: The following pipe and fitting materials are acceptable:

2.02 POLYVINYLCHLORIDE PIPE:

Plastic gravity sewer pipe and fittings shall be unplasticized polyvinylchloride (PVC) and conform to the requirements of A.S.T.M. Designation D3034, SDR 35, ASTM F-789 for sizes four (4) inches to eighteen (18) inches, PS-46, or ASTM F679 for sizes eighteen (18) inches to twenty-seven (27) inches dia. PVC pipe and fittings shall be as manufactured by Johns-Manville, Diamond Plastics or approved equal.

Pipe, fittings and specials shall be furnished with a factory-molded and bonded joint and shall be multiple ring seat type, compression gasket joint. In sizes fifteen inches and larger, the joint may be furnished with O-rings in lieu of the multiple ring seat type. Joints shall conform to the requirements of ASTM Designation C425-75.

PART-3 - EXECUTION

3.01 LAYING PIPE:

Upon satisfactory installation of the pipe bedding, as specified in Section 02222, Excavating, Backfilling and Compaction for Utilities, a continuous trough for the pipe barrel and recesses for the pipe bells shall be excavated by hand digging so that, when the pipe is laid in the trench, true to line and grade, the pipe barrel will receive continuous uniform support and the bell will receive no pressure from the trench bottom.

The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

Pipe laying shall proceed up grade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt and stones and other foreign material. The spigot ends of the pipe shall be lubricated lightly with a lubricant specified by the pipe manufacturer and approved by the Engineer. Sufficient pressure shall be applied to the pipe so as to properly seat the socket in the bell of the pipe. All pipe shall be laid straight, true to the lines and grades shown on the plans, in each manhole section.

Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or the weather is unsuitable for such work, except by permission of the Engineer. At all times when work is not in progress, the exposed ends of all pipes shall be fully protected by a board or other approved stopper to prevent earth or other substances from entering the pipe.

Sewer pipe shall be laid with a minimum separation of ten (10) feet from a parallel water pipe line.

Any pipe which is disturbed or found to be defective after laying shall be taken up and relaid or replaced.

3.02 POLYVINYLCHLORIDE PIPE:

A. Transportation

Care shall be taken during transportation of the pipe that it is not cut, kinked or otherwise damaged.

B. Handling Pipe Lengths

Ropes, fabric or rubber protected slings and straps shall be used when handling pipes.

C. Storage

Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects that could damage the pipe.

Stacking of the polyvinylchloride pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperatures and conditions.

When necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

D. Handling Pipe Line

The handling of the joined pipe line shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects.

Sections of the pipes with deep cuts and gouges shall be removed.

E. Lowering Pipe Into Trench

Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.

F. Special Precautions

Polyvinylchloride pipe connected to heavy fittings, manholes, and rigid structures shall be supported in such a manner that no subsequent relative movement between the pipe and the joint with the rigid structures is possible.

G. Service Connections, Wye Units and Service Pipe

Service connections and wye units of the type called for on the drawings shall be provided in accordance with the details as shown or indicated on the drawings.

3.03 CONCRETE ENCASEMENT:

Class C concrete encasement shall be constructed in accordance with details shown on the drawings. Encasement shall be constructed where:

The sewer or service pipe has less than thirty inches of cover over the top of the pipe and the final top of pavement or ground line.

The sewer or service pipe crosses over or is at a depth that provides less than eighteen inches clear distance between pipes when crossing under water mains. Encasement shall extend a minimum of ten feet on each side of the point of crossing.

In lieu of encasing the sewer pipe as specified above, the water line may be encased in the same manner as specified for the sewer pipe.

The lateral separation of the sewer pipe and potable water piping is less than ten feet.

Conditions, other than those cited above, are such that the Engineer shall order the line encased.

If, through failure to provide suitable trench sheeting, or other causes, the maximum width for trench excavation, as specified elsewhere in these specifications, is exceeded, the Contractor shall construct concrete en-casement around the pipe for the length of the excessive excavation.

The points of beginning and ending of sewer, or service pipe encasement shall be not more than six inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

3.04 ADDITIONAL WORK:

Additional items of construction, such as cleanouts, terminal lampholes, special manholes and other items necessary for the complete installation of the system shall conform to specific details on the drawings and shall be constructed with first-class materials conforming to the applicable portions of the specifications.

Connections to existing manholes and pipe stubs shall be made without permanent damage to the existing structure. The invert channels shall be reshaped or removed, if necessary, and reconstructed to provide for smooth flow. Pipe opening in the existing manhole walls shall be made watertight with an approved grout.

3.05 TESTS, INSPECTIONS AND ACCEPTANCE OF MATERIALS AND WORKMANSHIP:

A. Workmanship

It is imperative that all sewers and appurtenances be built practically watertight and that the Contractor adhere rigidly to the specifications for materials and workmanship. Sewage may need to be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewer, or sections thereof, will be tested and gauged and if leakage is above the allowable limits specified, the sewer will be rejected.

B. Inspection

On completion of each block or section of sewer, or such other times as the Owner may direct, the block or section of sewer is to be cleaned, tested, and inspected. Each section of the sewer is to show, on examination from either end, a full circle of light between manholes.

Each manhole, or other appurtenances to the system also shall be of the specified size and form, be watertight, neatly and substantially constructed, with the top set permanently to exact position and grade.

All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced, all deposits removed and the sewer left true to line and grade, entirely clean, and ready to use.

3.06 LIMITS OF INFILTRATION, EXFILTRATION AND TESTING:

The allowable limits of infiltration, exfiltration or leakage for the entire system or any portion thereof, including house service lines, shall not exceed a rate of 0.1 gallons per foot of pipe per twenty-four hours for all sizes of pipe throughout the system. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per manhole per twenty-four hours.

Infiltration, if taken between any two adjacent manholes, shall not exceed 0.1 gallon per twenty-four hours per foot of sewer for all sizes and all locations. This testing of lines between adjacent manholes will not be required except to localize the position of a leak in a portion of the system that exceed the allowable leakage limit or as directed by the Engineer.

Any part or all of the system may be tested for infiltration or exfiltration, as directed by the Owner or the Engineer. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or by other approved methods.

The exfiltration test will be conducted by filling the portion of the system being tested with water to a level which will provide: a minimum head on a service lateral connected to the test portion of two feet; or, in the event there are no service laterals in the test portion, a minimum difference in elevation between the crown of the highest portion of the sewer and the test water level of five feet.

Tests shall be conducted on portions of the system not exceeding three manhole runs or more than 1000 feet of main sewer, or as otherwise directed by the Engineer. Tests shall be run continuously for three hours. Where infiltration or exfiltration exceeds the allowable limits also specified herein, the defective pipe, joints, or other faulty construction shall be located and repaired by the Contractor. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits. Testing shall be performed as the job progresses and shall be started after 2000 feet of pipe is laid.

The Contractor shall provide all labor, equipment and materials and conduct all testing required, under the direction of the Engineer.

At the Contractor's option, testing requirements of the sanitary sewer lines may be fulfilled by low pressure air testing.

The section of pipe to be tested must be isolated by completely plugging all outlets. All plugs must be braced to prevent slippage and blow-out due to internal pressure. One of the plugs must be equipped with an air inlet tap for connection of an air hose.

When air pressure is applied it should be monitored and controlled so that at no time will it exceed five (5) pounds per square inch gage (psig). The air pressure should be maintained between 4.0 and 3.5 psig for a period of at least two minutes in order to stabilize the air temperature. During this period plugs may be checked for tightness.

After the air temperature has been allowed to stabilize, the air supply is to be disconnected and the pressure allowed to decrease to 3.5 psig. At 3.5 psig, a stop watch shall be started to determine the time required for the pressure to drop to 2.5 psig. This time required for a loss of 1.0 psi at an average pressure of 3.0 psig can be used to compute the rate of air loss. However, the average pressure must be 3 psi greater than the average back pressure of any ground water in order for the test to have significance and therefore, if the ground water surface is higher than the sewer centerline, the air test pressure is to be increased by 1 psig for each 2.3 feet by which the water surface is higher than the pipe centerline.

The pipeline will pass the low pressure air test if the loss of air is not greater than a rate of 0.0015 cubic feet per minute per square foot of the internal pipe surface. The loss of air will be considered acceptable if the time for the pressure to drop 1 psi is not less than that shown in the following table:

LENGTH OF PIPE INDICATED FOR Q=0.0015

SPECIFICATION TIME FOR LENGTH (L) SHOWN MIN:SEC)

		3	4									
	2	LENGTH	TIME									
1	MIN.	FOR	FOR									
PIPE	TIME	MIN.	LONGER									
DIA.	MIN	TIME	LENGTH									
(IN)	SEC	(FT)	(SEC)	100FT	150FT	200FT	250FT	300FT	350FT	400FT	450FT	
4	5:40	5:40	5:40	5:40	5:40	5:42	6:24					
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692L	17:00	19:13	25:38	22:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.470L	19:50	26:10	35:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	
33	31:10	72	25.852L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	
36	34:00	66	30.768L	51:17	75:55	102:34	128:12	153:50	179:29	205:07	230:46	

If leakage exceeds these amounts, the contractor shall determine the cause of the leakage and make such repairs or replacements as found necessary and repeat the test, doing such work and repeating the test as often as necessary until the sewer is found to comply with the requirements of this test. Testing shall be performed as the job progresses and shall be started after 2000 feet of pipe is laid.

The Contractor shall provide all labor, equipment and materials and conduct all testing required, under the direction of the Engineer.

3.08 PAYMENT:

Before payment for sewer line is authorized, all sections of sewer line for which payment is requested shall:

- 1) have passed an infiltration, exfiltration or air test in accordance with these specifications;

- 2) be accompanied by certified density test reports for trench backfill within the paved roadway limits at the locations and frequencies specified in Section 2222 and;
- 3) be lapped in accordance with these specifications.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work included in this section consists of providing all labor, materials and equipment necessary for providing and installing formwork for concrete.
- B. Related Work Described Elsewhere:
 - 1. Section 03200 - Concrete Reinforcement
 - 2. Section 03300 - Cast-in-Place Concrete
- C. General Design: The Contractor shall be responsible for the design of all formwork and for safety in its construction, use and removal.

1.02 QUALITY ASSURANCE

- A. Qualifications: Formwork shall be constructed in accordance with the specified standards, as well as all pertinent codes and regulations. Where provisions of pertinent codes conflict with the requirements of this section of these specifications, the more stringent provisions shall govern.
- B. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards:
 - 1. Standard Building Code
 - 2. ACI 347 "Recommended Practice for Concrete Formwork".
 - 3. Local codes and regulations

1.03 SUBMITTALS

- A. Materials: Submit manufacturer's literature on form ties, spreaders, corner formers, form coatings and bond breakers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to one of the following, a combination thereof, or equivalent as approved by the Engineer.

1. Lumber: Douglas Fir-Larch No. 2 grade, seasoned, surfaced on four sides.
2. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association. (Minimum 3/4-inch thickness)

B. Form Ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole. Use embedded rods with integral waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will not be permitted.

C. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

D. Chamfer Strips: Chamfer strips shall be polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 1-inch chamfer (unless indicated otherwise) at exposed edges of concrete members.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure resulting from the placement and vibration of concrete and shall be sufficiently rigid to maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar, and shall be adequately braced against lateral, upward or downward movement.

B. Coating of Forms: Apply form coating to board forms prior to placing reinforcing. Keep form coatings off steel reinforcing, items to be embedded and previously placed concrete.

C. Form Erection:

1. Provide a means of holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects of the finished concrete. Insure that forms may be removed without injury to the surface of the finished concrete.

2. Provide a positive means of adjustment of shores and struts. Insure that all settlement is taken up during concrete placing.

3. Temporary openings shall be provided in wall forms to limit the free fall of concrete to a maximum of 6 feet unless an elephant trunk is used. Such openings shall be located to facilitate placing and consolidation and shall be spaced no more than 8 feet apart. Temporary openings shall also be provided in the bottom of wall and column forms and elsewhere as necessary to facilitate cleaning and observation immediately prior to placing.

4. Do not embed any form-tying device or part thereof other than metal in concrete.

5. Form surfaces of concrete members except where placement of the concrete against the ground is shown on the drawings. The dimensions of concrete members shown on the drawings apply to formed surfaces, except where otherwise indicated.

D. Form Reuse: Reuse only forms which maintain a uniform surface texture on exposed concrete surfaces. Apply light sanding between uses to obtain such a uniform texture. Plug unused tie rod holes with corks, shave flush, and sandpaper on the concrete surface side.

E. Removal of Forms:

1. Forms and shoring for elevated structural slabs, girders, and/or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and reshore. The following table indicates the minimum allowable time after the last concrete is placed before forms, shoring, and/or bracing may be removed.

<u>Structural Item</u>	<u>Minimum Allowable Time</u>
Bottom side of slabs, girders, beams	When concrete reaches specified 28-day compressive strength
Vertical sides of girders, beams	48 hours
Walls not supporting vertical or horizontal loads	48 hours
Walls supporting vertical or horizontal	When concrete reaches specified 28-day compressive strength
Footings, pipe encasements, pipe supports	24 hours

2. Do not remove forms from concrete which have been placed with outside air temperature below 50F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete. Immediately after forms are removed, the surface of

the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

F. Formed Openings: Openings shall be of sufficient size to permit final alignment of the items within it without deflection or offsets of any kind and to allow space for packing where the items pass through the wall to ensure water tightness around openings so formed. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated and specified. Reinforcing steel shall be at least 2 inches clear from the opening.

G. Embedded Items: Set anchor bolts and other embedded items accurately and hold securely in position in the forms until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check all nailing, blocks, plugs and strips necessary for the attachment of trim, finish and similar work prior to concreting.

H. Pipes and Wall Spools Cast in Concrete:

1. Install wall spools, wall flanges and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools to the reinforcing steel.

2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will be possible during construction.

I. Form Tolerances:

1. Failure of the forms to produce the specified concrete surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no cost to the Owner.

2. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

Maximum Tolerance

Sleeves and Inserts	+1/4" to -1/4"
Projected ends of anchors	+1/4" to -0.0"
Anchor bolt setting	+1/4" to -1/4"
Finished concrete, all locations	+ 1/4" to -1/4" in 10-feet of length

The planes or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and Inserts	Centerline of sleeve or insert
Projected ends of anchors the drawings	Plane perpendicular to the end of the anchor as located on
Anchor bolt setting	Centerline of anchor bolts
Finish concrete	The concrete surface as located on the drawings

3. Where equipment is to be installed, comply with manufacturer's tolerances if more severe than above.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of providing reinforcing steel and welded wire mesh for cast-in-place or precast concrete structures.

B. Related Work:

1. Concrete Formwork: Section 03100
2. Cast-In-Place Concrete: Section 03300

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall meet all requirements of the current editions of the following standards:

1. Standard Building Code.
2. ACI 318 Building Code Requirements for Reinforced Concrete.
3. ACI 315 Details and Detailing of Concrete Reinforcement.
4. CRSI Manual of Standard Practice, MSP-2.

1.03 SUBMITTALS

A. Complete shop drawings shall be submitted for approval, including bar lists and placing drawings. Drawings shall show the type, spacing and location of metal bar supports, the grade of the reinforcing and the name of the manufacturer. The type of coupler splice devices shall be designated.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed bars of a USA manufacturer.
- B. Welded Wire Fabric: ASTM A185, galvanized.

C. Metal Bar Supports: CRSI MSP-2, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports.

D. Coupler Splice Devices: Cadweld, tension couplers capable of developing the ultimate strength of the bar, as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal and where approved by the Engineer.

2.02 FABRICATION

A. Fabrication shall not begin until the approval of the shop drawings by the Engineer has been received. Fabrication shall meet all requirements of the specified standards. Unless otherwise indicated, the following shall apply:

1. Hooks shall be standard hooks.
2. Bottom bars shall extend a minimum of 6 inches into supporting members.
3. Cover is to the outermost stirrup, tie or bar.
4. Splices are permitted only where indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and ACI 315. Top and bottom bars in slabs formed on earth shall be supported on precast concrete block supports except where such bars are properly supported from formwork. Precast concrete block supports are not required in slabs formed on tremie concrete but may be used at the Contractor's option.

B. Placing Reinforcing: Placing of reinforcing and welded wire fabric shall be as indicated on the Drawings and as recommended by CRSI MSP-2 and ACI 315. Reinforcing shall be securely tied and supported to prevent displacement during concrete placement.

C. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires, plus two inches. Fabric shall not be extended through expansion joints or construction joints in slabs on grade except as otherwise indicated.

D. Coupler Splice: Unless indicated on the Drawings or where conventional lap splices cannot be achieved, full positive tension connections shall be provided. Such devices shall be installed in accordance with the recommendations of the manufacturer.

E. Dowels: Dowels shall be wired in position prior to placing concrete.

- F. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being embedded in concrete.
- G. Welding: Welding of reinforcing will not be permitted.
- H. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of providing cast-in-place concrete.

B. Related Work Described Elsewhere:

1. Concrete Formwork: Section 03100
2. Concrete Reinforcement: Section 03200

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of the following standards:

1. Standard Building Code
2. Local Codes and Regulations
3. ACI 318-83, Building Code Requirements for Reinforced Concrete

B. Plant Qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C 94.

C. Evaluation and Acceptance of Concrete: Evaluation and acceptance of concrete will be in accordance with ACI-318, Chapter 4.

1.03 SUBMITTALS

A. Materials and Shop Drawings: The following information shall be submitted for approval. No concrete shall be furnished until submittal has been approved.

1. Plant Qualification: Satisfactory evidence shall be submitted indicating
2. Materials: Satisfactory evidence shall be submitted indicating that materials to be used, including cement, aggregates and admixtures meet the specified requirements.

3. Design Mix: The design mix to be used shall be prepared by qualified persons and submitted for approval. Submit affidavit as to design mix performance over the preceding six months. The design of the mix is the responsibility of the Contractor subject to the limitations of the Specifications. Approval of this submission will be required only as minimum requirements of the Specifications have been met. Such approval will in no way alter the responsibility of the contractor to furnish concrete meeting the requirements of the Specifications relative to strength and slump.

4. Ready Mix Concrete: Provide delivery tickets or weighmasters certificate per ASTM C 94, including weights of cement and each size aggregate, amount of water in the aggregate, and amount of water added at the plant. Write in the amount of water added on the job.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement:

1. Cement for all concrete shall be domestic Portland cement that conforms to the requirements of ASTM Designation C 150 Type I, Type II or Type III. All sanitary sewer manholes, wet wells, pumping stations, tanks and structures exposed to wastewater shall be constructed with Type II cement. Type III cement for high early strength concrete shall be used only for special locations and only with the approval of the Engineer. Type I cement may be used for buildings and tremie concrete.

2. Only one brand of cement shall be used in any individual structure unless approved by the Engineer. Cement which has become damaged, partially set, lumpy or caked shall not be used and the entire contents of the sack or container which contains such cement will be rejected. No salvaged or reclaimed cement shall be used.

3. Fly Ash shall not be used in either Class A or Class B concrete.

B. Aggregates:

1. ASTM C 33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No. 89.

2. In addition to requirements of ASTM C 33 for structures exposed to wastewater, the following shall apply:

- a. Soft particles: 2.0 percent
- b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1.0 percent
- c. Total of soft particles and chert as a soft impurity: 2.0 percent

- d. Flat and elongated particles (long dimension more than 5 times short dimension): 15.0 percent
- C. Water: Clean and free from injurious amounts of deleterious materials.
- D. Air Entraining Admixture: ASTM C 260.
- E. Water Reducing and Retarding Admixture: ASTM C 494, Type D. Admixture shall not contain calcium chloride.
- F. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concrevice 1001-LPL or approved equal.

2.02 MIXES

A. General Requirements:

1. Mix Design: Proportioning shall be on the basis of field experience and/or trial mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests and standard deviation shall be submitted. Proportioning for small structures may be by the water/cement ratio under special approval by the Engineer. Concrete mix design shall comply with the Standard Building Code requirements.
2. Air Content: 5 percent plus or minus 1 percent (Class A and B).
3. Slump: 4 inches plus or minus 1 inch.
8 inches plus or minus 1 inch for tremie concrete.
4. Water cement ratio = 0.45 maximum (all concrete exposed to hydrostatic loading), 0.50 maximum (all other concrete).
5. Minimum Compressive Strength at 28 days:
 - a. Class A, 4,000 psi Wastewater structures inclusive of tanks, ditches, pumping stations, tremie concrete and other structures in contact with treated waters.
 - b. Class B, 3,000 psi Building structures, encasements, thrust blocks, and pipe supports, etc. not in contact with treated waters.

B. Production of Concrete:

1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise indicated.
 2. Air Entraining Admixture: Air entraining admixture shall be charged into the mixture as a solution and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water.
 3. Water Reducing and Retarding Admixture: Water reducing and retarding admixture shall be added and measured as recommended by the manufacturer. The addition of the admixture shall be separate from the air entraining admixture. The addition of the admixture shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Admixtures shall be stored, handled and batched in accordance with the recommendations of ACI 68.
- C. Delivery Tickets: In addition to the information required by ASTM C 94, delivery tickets shall indicate the cement content and the water/cement ratio.
- D. Temperatures: The temperature of the concrete upon delivery from the truck shall not exceed 90°F.
- E. Modifications To The Mix: No modifications to the mix shall be made in the plant or on the job which will decrease the cement content or increase the water-cement ratio beyond that specified. No modifications of any kind shall be made except by a qualified and responsible representative of the concrete producer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Preparations Before Placing: No concrete shall be placed until the approval of the Engineer has been received. Approval will not be granted until forms are thoroughly clean, and reinforcing and all other items required to be set in concrete have been placed and thoroughly secured. The Engineer shall be notified a minimum of 24 hours before concrete is placed.
- B. Conveying:
1. General: Concrete shall be handled from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete. No concrete shall be placed more than 90 minutes after mixing has begun for that particular batch.

2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear opening equal to no less than one-third of the maximum interior horizontal area, or five times the maximum aggregate size being used. Side slopes shall be no less than 60 degrees. Controls on gates shall permit opening and closing during the discharge cycle.
3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing during the placing of concrete.
4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of concrete for more than 6 feet.
5. Chutes: Chutes shall be metal or metal lined, and shall have a slope not exceeding one vertical to two horizontal, and not less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used only if they discharge into a hopper before distribution.
6. Pumping Equipment: Pumping equipment and procedures, if used, shall conform to the recommendations contained in the report of ACI Committee 304 on "Placing Concrete by Pumping Methods," ACI 304.2R-71. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1-1/2 inches.
7. Conveying equipment Construction: Aluminum or aluminum alloy pipe for tremies or pump lines and chutes, except for short lengths at the truck mixer shall not be permitted.
8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete operation.

3.02 APPLICATION

A. Placing:

1. General: Concrete shall be deposited continuously, or in layers of such thickness (not exceeding 2 feet in depth) that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness.
2. Supported Elements: At least two hours shall elapse after depositing concrete in columns or walls before depositing in beams, girders, or slabs supported thereon.
3. Segregation: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to procedures which will cause segregation.
4. Concrete Under Water: All concrete, except that indicated on the Drawings as Tremie concrete, shall be placed in the dry.

B. Seals and Tremie Concrete:

1. General:

a. Wherever practicable, all foundation excavations shall be dewatered and the concrete deposited in the dry. Where conditions are encountered which render it impracticable to dewater the foundation before placing concrete, a concrete foundation seal shall be placed. The foundation shall then be dewatered, and the balance of the concrete placed in the dry.

b. When seal concrete is required to be placed, the satisfactory performance of the seal in providing a watertight excavation for placing structural concrete shall be the responsibility of the Contractor. Seal concrete placed by the Contractor, which subsequently fails to perform properly, shall be repaired as necessary to perform its required function, at the expense of the Contractor.

2. Method of Placing: Concrete deposited under water shall be carefully placed in the space in which it is to remain by means of a tremie, a closed-bottom dump bucket of not less than one cubic yard capacity, or other approved method, and shall not be disturbed after it is deposited. All seal concrete shall be deposited in one continuous pour. No concrete shall be placed in running water. All form work designed to retain concrete under water shall be watertight, and the design of the form work and excavation sheeting shall be by a Professional Engineer, registered in the State of Florida.

3. Use of Tremie: The tremie shall consist of a tube having a minimum inside diameter of ten inches, and shall be constructed in sections having tight joints. No aluminum parts which have contact with the concrete will be permitted. The discharge end shall be entirely seated at all times, and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper, after which the flow shall be stopped by lowering the tremie. The means of supporting the tremie shall be such as to permit the free movement of the discharge end over the entire top surface of the work, and shall permit it being lowered rapidly when necessary to choke off or retard the flow. The flow shall preferably be continuous, and in no case shall be interrupted until the work is completed. Special care shall be exercised to maintain still water at the point of deposit.

4. Use of Bottom-dump Bucket: When the concrete is placed by means of a bottom-dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be raised very slowly during the discharge travel; the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture. Aluminum buckets will not be permitted.

5. Time of Beginning Pumping: Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72 hours after placement of the concrete.

C. Consolidating Concrete:

1. General: Concrete shall be consolidated by means of internal vibrators operated by competent workmen.
 2. Vibrators: Vibrators shall have a minimum head diameter of at least 2 inches, a minimum centrifugal force of 700 pounds and a minimum frequency of 8,000 vibrators per second.
 3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be supplemented by others having a minimum head diameter of 1-1/2 inches, a minimum centrifugal force of 300 pounds and a minimum frequency of 9,000 vibrations per second.
 4. Spare Vibrator: One spare vibrator for each three in use shall be kept on the site during all concrete placing operations.
 5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. The duration of each insertion shall be from 5 to 15 seconds. Concrete shall not be transported in the forms by means of vibrators.
- D. Protection: Rainwater shall not be allowed to increase the mixing water, nor to damage the surface finish. Concrete shall be protected from construction overloads. Design loads shall not be applied until the specified strength has been attained.

3.03 CONCRETE FINISHING AND CURING

- A. All slabs exposed to view shall receive a steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.
- B. All other slabs and footings shall receive a smooth steel trowel finish.
- C. All walls of structures or parts of buildings exposed to view shall receive the following finish. Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie holes. In addition, any surface not receiving a special applied finish, shall receive a slurry finish consisting of one part cement and one and one-half parts sand by damp loose volume. Dampen surfaces and then apply the slurry with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap. Surfaces which will receive a special applied finish shall be of even color, have no pits, pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff bristle fiber brush shall produce no dusting or dislodging of cement or sand.

D. All concrete shall be wet cured a minimum of 7 days; or if not to receive special finishes, coatings or concrete toppings, an Engineer approved curing compound may be utilized.

E. All surface defects shall be repaired by removing defective concrete down to sound concrete and repairing with patching mortar. Finished repair shall match adjacent concrete and be cured as specified.

3.04 TESTING

A. A testing laboratory approved by the Owner will make such tests as are deemed advisable. The Contractor shall pay for all tests indicating a failure to comply with the Specifications. The Contractor shall keep the laboratory informed of his schedule.

B. Standard laboratory compressive test cylinders will be obtained by the laboratory when concrete is discharged at the point of placing (i.e., discharge end of pumping equipment), and cylinders will be made and cured in accordance with the requirements of ASTM Designation C 31. A set of 4 cylinders will be obtained for each 50 cubic yards or fraction thereof placed each day, for each type of concrete. The cylinders will be cured under laboratory conditions and will be tested at 7 and 28 days of age, respectively, in accordance with the requirements of ASTM Designation C 39.

C. The testing laboratory will make slump tests of Class A and Class B concrete as it is discharged from the mixer at the point of placing. Slump tests will be made for each 25 cubic yards or "pour" of concrete placed. Slump tests may be made on any batch, and failure to meet specified slump requirements will be sufficient cause for rejection of that batch.

END OF SECTION

SECTION 11999

Biologic Recycle/Discharge System

Product Specification

Product Category: Biological Water Treatment System

Model Number: BIO-20D-1M10

Manufacturer: Mi-T-M Corporation, 8650 Enterprise Drive, Peosta, IA 52068, Phone: 800-367-6486.

Biological Water Treatment System

1.0 General Description

The Biological Water Treatment System will be designed to treat and discharge vehicle and equipment wash-water originating from a pressure washer, steam cleaner, hose, or similar cleaning device. The water treatment system will be self-contained on an 8' by 4' 304L stainless steel skid. The water treatment system will be no higher than 4'. The water treatment system will use fixed-film microbes to treat the wastewater. The water treatment system will have the capacity of processing up to 20 gallons per minute. The water treatment system will be complete with water level control floats. All of the equipment in this section shall be supplied by a single supplier as a packaged system. The pump used for this system shall be a $\frac{3}{4}$ h.p.,(3-0214) above ground sump pump to be mounted on the side of the water treatment system. The water treatment system shall be a Bio-20D-1M10 Biological Wastewater Treatment System as manufactured by Mi-T-M Corporation, 8650 Enterprise Drive, Peosta, IA 52068, phone: 1-800-367-6486.

2.0 Performance

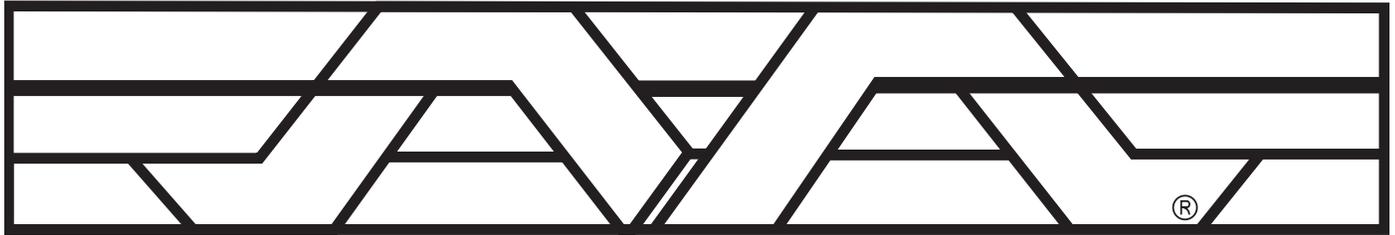
General. The biological wash-water treatment system shall be capable of treating and discharging pressure washer, steam cleaner, or garden hose water generated from the cleaning of vehicles, machinery or equipment. The water treatment system will:

- 2.1. Treat the water with fixed film microbes, which will colonize on over 2,300 square feet of biological media.
- 2.2. Be capable of removing from the water trace amounts of a wide range of organic material, such as; gasoline, diesel fuel, greases, oils, herbicides, and pesticides.
- 2.3. Be capable of removing oil and grease to below 100 ppm.
- 2.4. Process water up to 20 gallons per minute.

3.0 Equipment Description

- 3.1 Electrical Requirements. The system will be fully operational by the use of a 230 volt, single phase, 20 amp power source.
- 3.2 Bio-Reaction Tank. The bio-reaction tank shall be made of Stainless Steel and be (L) 8' x (W) 4' x (H) 4' and able to hold up to 890 gallons of water.
- 3.3 Biological Media. The bio-reaction tank shall house biological media with a minimum of 2,300 square feet of surface area for biological colonization.

- 3.4 Mazzie Injection. The unit shall have a 60 cfm regenerative blower which shall force air to 8 air diffusers located in the base of the aluminum bio-reaction tank.
- 3.5 Control Panel. The control panel will be constructed of a NEMA 4 housing. Conveniently displayed on the control panel will be controls for the system's power, process pump, and blower.



Mi-T-M[®] CORPORATION

8650 Enterprise Drive, Peosta IA 52068

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www.mitm.com

OPERATORS MANUAL FOR Mi-T-M[®]

BIO-20D-1M10

BIOLOGICAL DISCHARGE SYSTEM

⚠ CAUTION

RISK OF INJURY!

READ MANUAL BEFORE OPERATING!

**This manual is an important part of the Biological Discharge System
and must remain with the unit when you sell it!**

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⚠WARNING

This product contains one or more chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

! IMPORTANT !

ALUMINUM TANK AND CHEMICAL USE

The chemicals listed below should not be used in any aluminum tank because of reactions with the alloy. These chemicals may cause premature failure of your tank. Use of any of the listed chemicals will void any warranty expressed or implied by Mi-T-M with regard to your water treatment system.

CHEMICALS TO AVOID:

Aluminum Chloride, Ammonia, Ammonia Hydroxide, Barium Salts, Calcium Chloride, Carbon Tetrachloride, Caustic Soda, Chlorine, Chloroform, Hydrochloric Acid, Hydrogen Peroxide, Methyl Chloride, Oxalic Acid, Ozone, Perchloric Acid, Phosphoric Acid, Potassium Carbonate, Potassium Hydroxide, Sodium Carbonate, Sodium Chloride, Sodium Hydroxide, Sulfuric Acid, Trichloro-acetic Acid, Zinc Chloride.

If you are unsure about a chemical reacting with your aluminum tank, please consult with your Mi-T-M representative.

INTRODUCTION

Congratulations on the purchase of your new Mi-T-M Biological Discharge System! You can be assured your Mi-T-M Biological Discharge System was constructed and designed with quality and performance in mind. Each component has been rigorously tested to ensure the highest level of acceptance.

This operator's manual was compiled for your benefit. By reading and following the simple safety, installation, operation, maintenance and troubleshooting steps described in this manual, you will receive years of trouble free operation from your new Mi-T-M Biological Discharge System. The contents of this manual are based on the latest product information available at the time of publication. Mi-T-M reserves the right to make changes in price, color, materials, equipment, specifications or models at any time without notice.

! IMPORTANT !

These paragraphs are surrounded by a "SAFETY ALERT BOX". This box is used to designate and emphasize Safety Warnings that must be followed when operating this Biological Discharge System.

Accompanying the Safety Warnings are "signal words" which designate the degree or level of hazard seriousness. The "signal words" used in this manual are as follows:

DANGER: Indicates an imminently hazardous situation which, if not avoided, **WILL** result in death or serious injury.

WARNING: Indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided **MAY** result in minor or moderate injury.



The symbols set to the left of this paragraph are "Safety Alert Symbols". These symbols are used to call attention to items or procedures that could be dangerous to you or other persons using this equipment.

ALWAYS PROVIDE A COPY OF THIS MANUAL TO ANYONE USING THIS EQUIPMENT. READ ALL INSTRUCTIONS BEFORE OPERATING THIS BIOLOGICAL DISCHARGE SYSTEM AND ESPECIALLY POINT OUT THE "SAFETY WARNINGS" TO PREVENT THE POSSIBILITY OF PERSONAL INJURY TO THE OPERATOR.

Once the unit has been removed from the crate, immediately write in the serial number of your unit in the space provided below.

SERIAL NUMBER _____

Inspect for signs of obvious or concealed freight damage. If damage does exist, file a claim with the transportation company immediately. Be sure that all damaged parts are replaced and that the mechanical and electrical problems are corrected prior to operation of the unit. If you require service, contact Mi-T-M Customer Service.

CUSTOMER SERVICE

CALL OUR TOLL-FREE NUMBER

for the Sales or Service Center nearest you!

800-553-9053

Please have the following information available for all service calls:

1. Model Number
2. Serial Number
3. Date and Place of Purchase

CONTENTS OF THE BIOLOGICAL DISCHARGE SYSTEM

Carefully unpack your new Mi-T-M Biological Discharge System. Check the contents against the packing list. Contact the freight line if a damage claim is required on any component. The following items are the basic equipment sent with your Biological Discharge System.

1. Sump pump
2. Blue float for sump pit (protects sump pump low level)
3. Biological Discharge System Platform
4. Water test kit
5. Manual

SPECIFICATIONS

MODEL	BIO-20D-1M10
Maximum Flow	20 GPM
Electrical	230 Volt 1Phase 11Amps
Sump Pump	1/2 HP
Operating Capacity	795 gallons

PURPOSE

The Mi-T-M Biological System was designed to offer a solution to waste disposal that is economical, efficient and foremost, *environmentally safe*. As we move into the 21st century, environmental waste codes are becoming more and more strict. Surcharges and fines are being mandated to companies that are unable to operate within acceptable guidelines. Chemicals used to treat waste water often create by-products which in themselves cause additional code violations. Mi-T-M Corporation has solved this problem by engineering a Bio-System that utilizes *microbes*, not chemicals, to literally feed off of the waste in the water allowing the final output to be cleansed of any hazardous by-products. We at Mi-T-M realize the need to protect and respect our environment and therefore, our Bio-Systems operate under specific microbe guidelines, utilizing microbes that (1) is natural, not genetically formulated and (2) will not cause disease.

Mi-T-M has been involved in water products for over twenty-eight years. Our commitment to quality is passed on to our customers, our commitment to the environment is passed on to our children.



IMPORTANT SAFETY WARNINGS



WARNING: When using this product, basic precautions should always be observed, including the following:

READ ALL SAFETY WARNINGS BEFORE USING BIOLOGICAL DISCHARGE SYSTEM

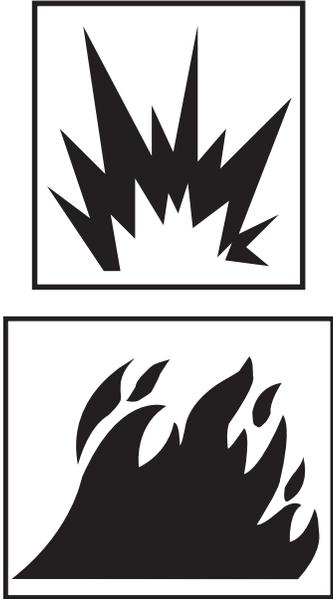
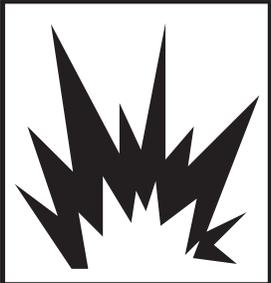
HAZARD	POTENTIAL CONSEQUENCE	PREVENTION
<p data-bbox="180 268 532 327">RISK OF ELECTRIC SHOCK OR ELECTROCUTION</p> 	<p data-bbox="561 268 972 489">Serious injury or death could occur if the Biological Discharge System is not properly grounded. Your Biological Discharge System is powered by electricity and may cause electric shock or electrocution if not installed properly.</p> <p data-bbox="561 1087 972 1171">Electrical shock may occur if Biological Discharge System is not operated properly.</p> <p data-bbox="561 1325 972 1409">Serious injury or death may occur if electrical repairs are attempted by unqualified persons.</p>	<p data-bbox="995 268 1529 352">Installation of this unit, including all electrical connections, must comply with all local, state and national codes.</p> <p data-bbox="995 369 1529 541">This product must be grounded. Connect to a GFCI circuit breaker when available. If the unit should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. Do not ground to a gas supply line.</p> <p data-bbox="995 558 1529 705">Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the system is properly grounded.</p> <p data-bbox="995 722 1529 869">Always be certain the unit is receiving proper voltage (+/- 5% of the voltage listed on the nameplate). Before installing electrical connections, be certain the power switches are in the "OFF" position.</p> <p data-bbox="995 886 1529 907">Keep all connections dry and off the ground.</p> <p data-bbox="995 924 1529 1071">Do not touch pump, pump motor, discharge piping or water when the unit is connected to the power supply; regardless of whether the unit is operating correctly or experiencing an operation failure.</p> <p data-bbox="995 1087 1529 1171">DO NOT allow metal components of the Biological Discharge System to come in contact with live electrical components.</p> <p data-bbox="995 1188 1529 1314">Never operate the Biological Discharge System with safety guards/covers removed or damaged. Ensure all electrical covers are securely in place when unit is operating.</p> <p data-bbox="995 1331 1529 1436">Any electrical wiring or repairs performed on this Biological Discharge System should be done by Authorized Service Personnel in accordance with National and Local electrical codes.</p> <p data-bbox="995 1453 1529 1801">Before opening any electrical enclosure, always shut off the Biological Discharge System and drain the water. Disconnect the Biological Discharge System from the power source. If the power disconnect is not in sight, lock it in the open position and tag it to prevent power usage. (Never assume the Biological Discharge System is safe to work on just because it is not operating, it could restart at any time! Always disconnect from the power source.) Allow the Biological Discharge System components to cool down.</p>



IMPORTANT SAFETY WARNINGS



READ ALL SAFETY WARNINGS BEFORE USING BIOLOGICAL DISCHARGE SYSTEM

HAZARD	POTENTIAL CONSEQUENCE	PREVENTION
<p>RISK OF EXPLOSION OR FIRE</p> 	<p>Serious injury or death could occur from an explosion or fire caused by a system electric spark.</p>	<p>This unit must be placed in an area that is well ventilated, free of flammable vapors, combustible dust, gases or other combustible materials.</p>
<p>RISK OF BURSTING</p> 	<p>Serious injury or death could occur from bursting caused by excessive pressure in the system.</p> <p>Serious injury may occur if attempting to start the Biological Discharge System when the pump is frozen.</p>	<p>Do not mistreat the pressure gauges on the system. Pressure gauges will malfunction if they are subjected to excessive pressure, vibration, pulsation or temperature or if they are placed in an environment which causes corrosion of parts. Incorrect readings on a pressure gauge could mislead the operator and place him in a dangerous working condition.</p> <p>Do not use a booster pump or any type of additional pumping system. Pressurizing the suction of the pump may cause the pump body to explode.</p> <p>Do not use this Biological Discharge System to pump flammable material! An explosion could occur from a gas vapor buildup inside the system.</p> <p>In freezing temperatures, the unit must always be warm enough to ensure there is no ice formation in the pump. Do not start the Biological Discharge System if it has been in a freezing environment without first allowing the pump to thaw.</p>
<p>RISK OF BURNS</p> 	<p>Serious injury may occur from touching the electrical motor. This area can remain hot for some time after the Biological Discharge System is shutdown.</p>	<p>Never allow any part of your body to contact the electrical motor until cooled.</p>



IMPORTANT SAFETY WARNINGS



READ ALL SAFETY WARNINGS BEFORE USING BIOLOGICAL DISCHARGE SYSTEM

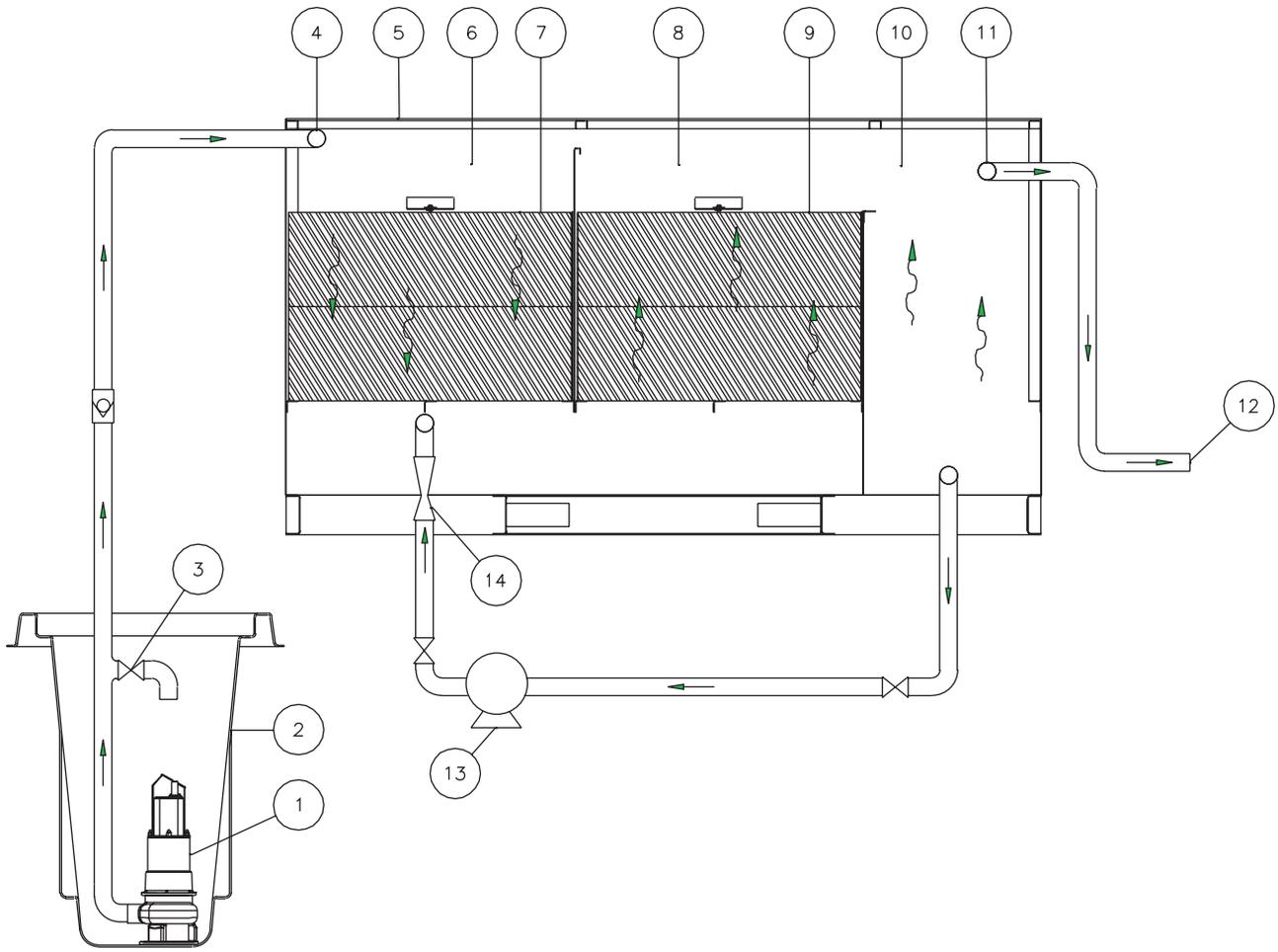
HAZARD	POTENTIAL CONSEQUENCE	PREVENTION
<p>RISK FROM MOVING PARTS</p> 	<p>Serious injury may occur to the operator from moving parts on the Biological Discharge System.</p>	<p>Do not operate the unit without all protective covers in place.</p> <p>Follow the maintenance instructions specified in the manual.</p>
<p>RISK OF BODILY INJECTION</p> 	<p>Injury may occur from the Biological Discharge System.</p>	<p>DO NOT DRINK THE WATER IN THE BIOLOGICAL DISCHARGE SYSTEM!! This is non-potable water and is not suitable for consumption.</p> <p>DO NOT allow children to operate this unit.</p> <p>DO NOT overreach or stand on unstable support.</p> <p>Wet surfaces can be slippery, wear protective foot gear and keep good footing and balance at all times.</p> <p>Know how to stop the Biological Discharge System. Be thoroughly familiar with controls.</p> <p>Before servicing components, ALWAYS shut off the Biological Discharge System.</p> <p>Consult Material Safety Data Sheets (MSDS) for safe handling of system, especially oxidizers and acids.</p>



!SAVE THESE INSTRUCTIONS!



BIOLOGICAL DISCHARGE SYSTEM FLOW CHART



FLOW DIAGRAM-BIO-20D-1M10-040302-KS

BIOLOGICAL DISCHARGE SYSTEM FLOW CHART

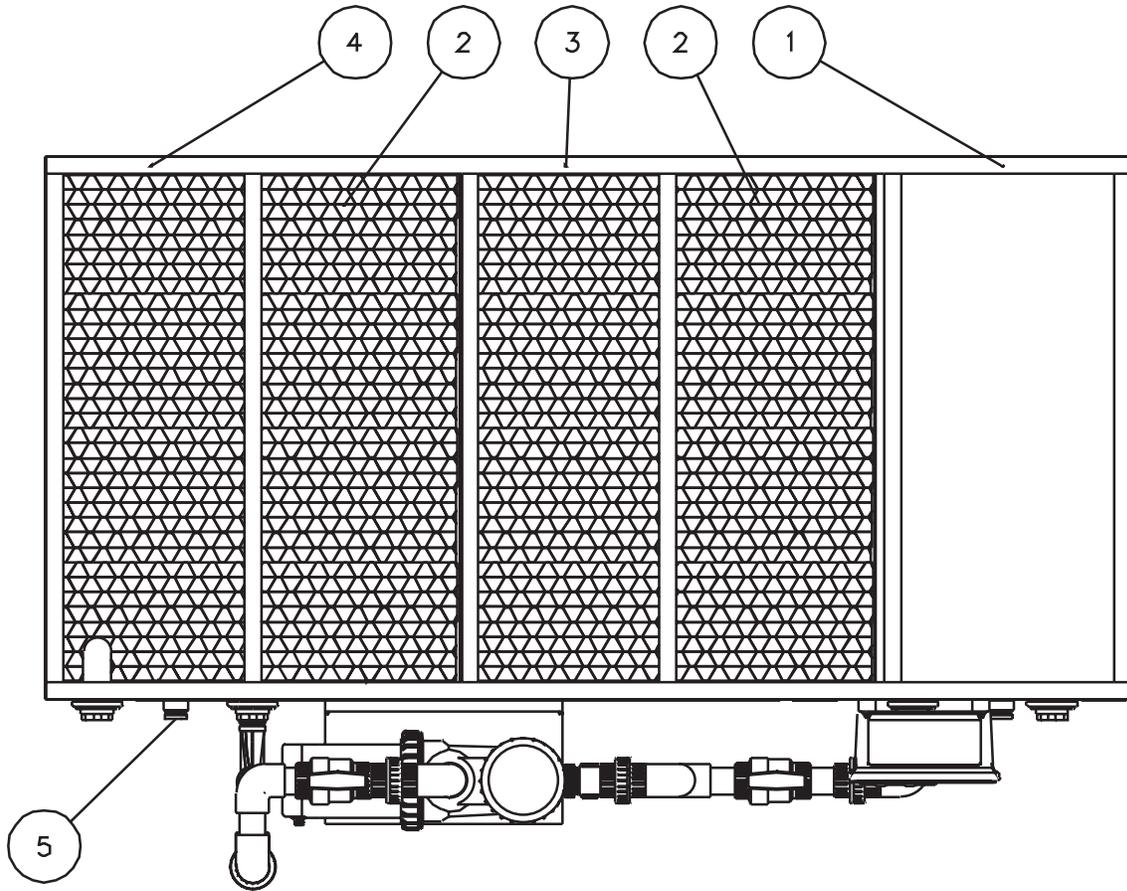
The **Sump Pump (1)** draws water from the **Sump Pit (2)** and brings it to the **Inlet (4)** of the Biological Discharge System. the Inlet flow **Control Valve (3)** can be used to control the flow of water into the unit. The **Biological Discharge Tank (5)** is made up of several sections that are separated by weirs. The wastewater enters the top of the **First Chamber (6)** and moves down through the **Biological Media (7)**. the media packs provide a surface for the microbes to live on. As water passes through the **Biological Media (7)**, the microbes feed off of the organic compounds in the water, producing by-products of carbon dioxide and water.

From the **First Chamber (6)**, the wastewater moves under the weir, into the **Second Chamber (8)**, rising up through the **Biological Media (9)** and over the weir. From there the water travels under another weir to the **Third Chamber (10)**. From the **Third Chamber (10)** water flows to the **Outlet (11)**, then flows out through the **Discharge Outlet (12)**.

Microbes also need air to live; an **Aerator Pump (13)** pumps water to the **Air Injector (14)** that use venturris to pull air into the water. From there the air bubbles move up through the **Biological Media (7)**. Without the air in the Biological Recycling System, the microbes will not be able to live.

BIOLOGICAL DISCHARGE SYSTEM FEATURES

FEATURES BIO-20D-1M10-071002-KS



BIO-20D-1M10 FEATURES

BIO-DISCHARGE FEATURES					
REF. #	DESCRIPTION	REF. #	DESCRIPTION	REF. #	DESCRIPTION
1	Holding Tank	8	Sump Pump Switch	15	Tank Lid
2	Biological Media	9	Aerator Pump Switch	16	Inlet
3	Second Chamber	10	Aerator Pump Inlet Valve	17	Aerator Pump Outlet Valve
4	First Chamber	11	Control Panel	18	Aerator Pump
5	Drain Port	12	Outlet	19	Air Intake
6	Side Fork Lift Holes	13	End Fork Lift Holes (6' or greater fork required.)	20	Air Injector
7	Master Switch	14	Product Tank Lid		

INSTALLATION

ATTIRE:

1. Proper attire is essential to your safety. It is advised to utilize whatever means necessary to protect eyes, ears, and skin.
-

INSTALLATION:

1. A Collection Pit System must already be an established structure before installing the Biological Discharge System. A well designed pit system is critical for the proper operation of the discharge system. Consult your Mi-T-M dealer for installation requirements.
2. Place the Biological Discharge System platform on a hard, level surface in an area free of flammable vapors, combustible dust, gases or other combustible materials.
3. Set the unit so you have access to the filters, Control Panel and Drain Ports.
4. Do not place unit in an area:
 - a. with insufficient ventilation.
 - b. where environmental hazards (i.e. rain and snow) can come in contact with the Biological Discharge System.
 - c. in a freezing environment.
5. Check all union connections for tightness.
6. Install schedule 80 PVC connections to the water inlet of the Biological Discharge System.
7. Install the Sump Pump in the Sump Pit as shown below.
8. Install plumbing from the Sump Pump using 1 1/2" minimum connection sizes.
9. Install the float in the Sump Pit. Allow a 2" tether and enough room for them to move freely without interfering with the plumbing.
 - a. Float-Blue: Pit low level shut-off. Attach this float 10" above the Sump Pump inlet.

INSTALLATION



WARNING

RISK OF ELECTROCUTION! TO REDUCE THE RISK OF ELECTROCUTION, KEEP ALL CONNECTIONS DRY AND OFF THE GROUND.

10. A qualified electrician must hook up the electrical system.
 - a. Verify the electrical supply at the power source is off.
 - b. Be certain all switches on the Control Panel are in the "OFF" position.
 - c. Run water tight conduit
 1. From the Sump Pump and Float to the Control Panel.
 2. From the local disconnect to the Control Panel. The electrician will need to drill holes in the Control Panel for the conduit.
 - d. Make connections to the terminal strips as shown in the wiring diagram on the following page.
11. Install plumbing using 2" minimum connections from Holding Tank Outlet to a sanitary sewer or storage tank for further processing or disposal. Do not send the water back to the Sump Pit.

NOTE: *In most cases, you must have a permit to legally dispose discharged water.*

STOP

TO ENSURE YOUR WATER DISCHARGE TREATMENT SYSTEM OPERATES SAFELY AND EFFICIENTLY, COMPLETE THE PRE-OPERATION CHECKLIST BEFORE PROCEEDING.

PRE-OPERATION CHECKLIST

Before proceeding, answer all the questions on this checklist.	YES	NO
CODES:		
1. Does the electrical wiring meet all codes?		
2. Does plumbing meet all codes?		
LOCATION:		
1. Is the unit located on a hard level surface free of flammable vapors, combustible dust, gases or other combustible materials?		
2. Is the unit located in a large ventilated area?		
ELECTRICAL:		
1. Is the unit properly grounded?		
2. Does the power supply, voltage and amperage match the data plate?		
PLUMBING:		
1. Is the plumbing sized correctly?		
2. Are all plumbing connections secure?		
GENERAL:		
1. Have all operators using this unit read and understood this entire manual?		
2. Has the unit been installed by qualified service people who followed the instructions listed in this manual?		

IF "NO" WAS MARKED TO ANY OF THESE QUESTIONS, CORRECT THE SITUATION BEFORE OPERATING.

PREPARATION

PRESTART PROCEDURES:

1. Position the valve on the Biological Discharge System in the "Start-up Mode".
2. Be certain all plumbing/hoses are tight and properly connected.
3. Be certain the incoming air pipe to the Air Intake is not obstructed.
4. Be certain all switches on the Control Panel are in the "OFF" position.

START-UP:

1. Ensure all hold down angles are fastened into Biological Tank
2. Fill Biological Discharge Tank with water.
3. Turn power from main disconnect "ON", "POWER ON" Indicator Light should be lit.
4. Turn on the Master Switch.
5. Turn on the Aerator Pump. Bubbles should appear on the surface in the first chamber. If a visual check indicates the Air Injector is not working, review Troubleshooting. Do not proceed until the Air Injector is working.
6. Turn the Sump Pump Switch.
7. Operate the Biological Discharge System for one hour before adding Mi-T-M microbes.

OPERATION

ADDING MICROBES:

1. Open and pour four 500mL containers of the Mi-T-M prepackaged microbes into the first chamber of the Biological System.
2. Begin your normal cleaning operation.
3. Continue inoculations on a weekly basis to ensure the Bio-System is operating at optimum efficiency.
4. Monitor the system closely the first few days to ensure smooth operation. See Troubleshooting if problems occur.

The Mi-T-M microbes are most active and effective when the water temperature is between 70°F and 100°F. For climates where freezing temperatures are experienced, the Biological System should be enclosed in a heated room.

MAINTENANCE

ROUTINE MAINTENANCE:

1. Pits should be kept free from large amounts of sludge.
2. For most applications, four 500 mL bottles of Mi-T-M microbes should be added to the system each 30 days to ensure a healthy colony growth in the Biological System. The media pack should feel "slimy" to the touch when the microbe colony is established. (Some applications may require more or less microbes depending on the contaminant level.)
3. The pH of the water should not be lower than 5.5 or higher than 8.5 at any given time.
4. If soap is necessary for washing, the soap should be of a neutral pH (approximately 7).

WINTERIZING:

1. Turn all switches on the Control Panel to the off position and disconnect power to the Control Panel.
2. Shut off all water connections to the Biological Discharge System
3. Open the check valve near the Sump Pit and drain the water transport line. Remove the Sump Pump from the Sump Pit.
4. Remove the drain plugs from the Biological Tank, clean the tank, Biological Media and wipe down the system
5. Loosen all unions on the exterior of the Biological Tank.
6. Loosen the plumbing on the Tank Inlet and the Holding Tank Outlet.
7. Store all chemicals at room temperature.

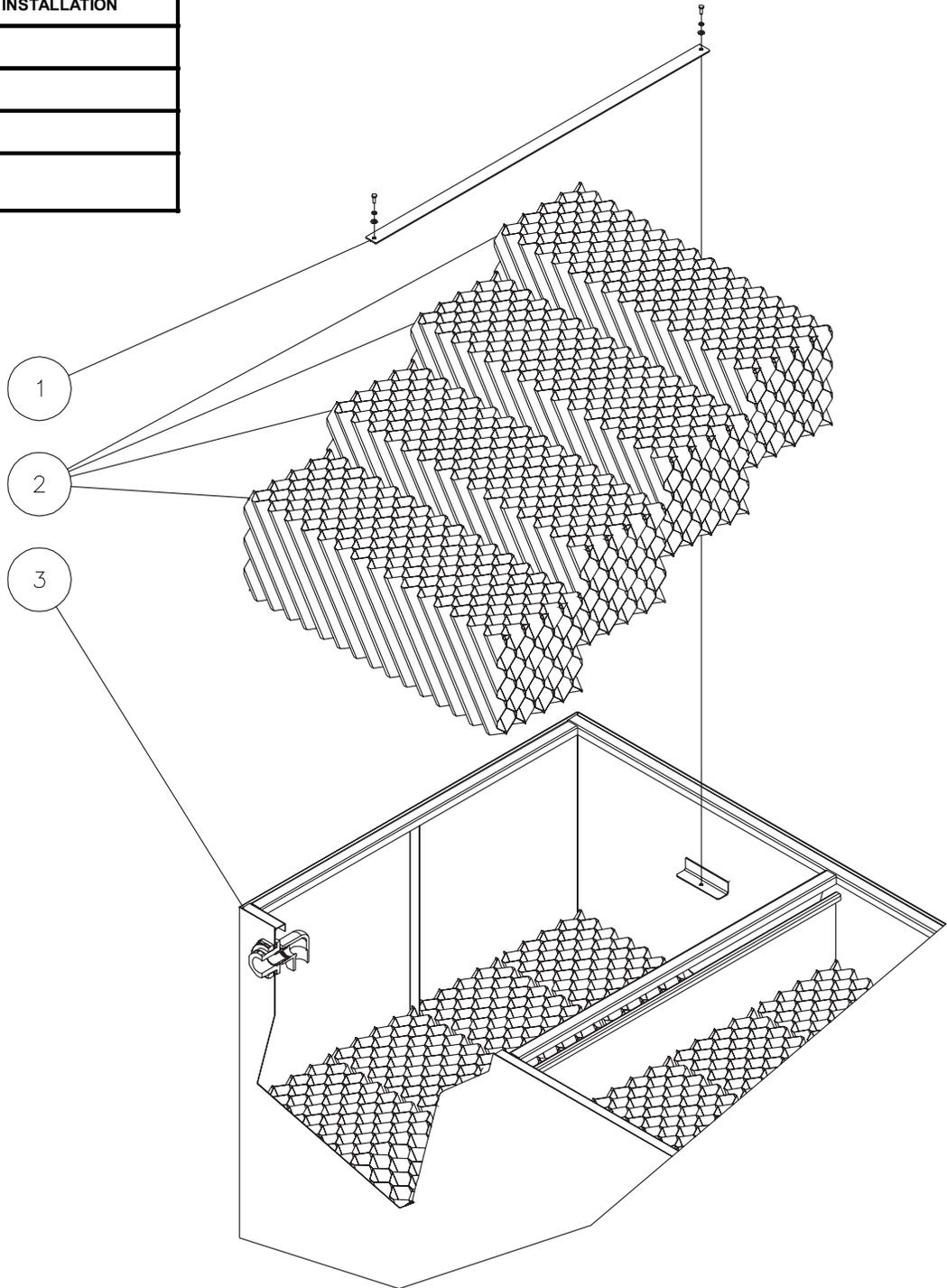
TO OPERATE UNIT AFTER WINTERIZING:

1. Follow Installation Instructions.
2. For ease of reinstalling Biological Media, place media at an angle. After media is replaced, the hold down angles must be fastened into the Biological Tank before filling. This prevents the Biological Media from rising out of the tank and also supports the tank sides.
3. Follow Prestart Procedures.
4. Follow Start-up Procedures.
5. Follow procedures for Adding Microbes as described above.

MAINTENANCE

BIOLOGICAL MEDIA INSTALLATION-071002-KS

BIOLOGICAL MEDIA INSTALLATION	
REF. #	DESCRIPTION
1	Strap
2	Biological Media
3	Biological Tank



BIOLOGICAL MEDIA INSTALLTION-BIO-20D-071002-KS

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
<i>ELECTRICAL</i>		
No power at Control Panel.	Power failure to Control Panel.	Check circuit breaker at power source or contact your local distributor.
Power Indicator Light is OFF.	Blown fuses inside Control Panel on step down transformer.	Check fuses, replace if necessary. If fuses are OK, contact your distributor.
<i>SUMP PUMP</i>		
Sump Pump will not run.	Float is not adjusted correctly in the Sump Pit.	Readjust.
	Float 1 is defective.	Replace.
	Circuit overload/breaker has tripped.	Reset breaker or replace fuse at power source.
	Motor overload.	Allow motor to cool. Motor will automatically restart when cool.
	Motor is defective.	Replace motor.
Sump Pump motor starts and stops frequently during operation.	This is a common occurrence.	Allow pits to fill.
	Sump Pump impeller is clogged.	Disconnect power and unclog impeller.
	Motor overload.	Allow motor to cool. Motor will automatically restart when cool.
	Sump Pit is not large enough.	Expand size of pit.
Sump Pump runs, but there is little or no water discharge.	Water level is below pump inlet.	Ensure Float 1 is not caught in plumbing.
	There is an air lock in the Sump Pump.	Manually fill the inlet pipe with water. Turn the Sump Pump on and off several times.
	Low voltage.	Ensure wire size is capable of handling the rated amperage of the unit. If wire size is correct, contact your distributor.
	Sump Pump impeller is clogged.	Disconnect power and unclog impeller.
	Worn pump parts.	Contact your distributor.
Sump Pump will not turn off.	Defective switch inside Float 1.	Replace.
	Pump is air locked.	Cycle pump in one minute increments several times to clear air from pump. If system includes a check valve, a 3/16" hole should be drilled in the discharge pipe approximately 2" above the discharge connections.

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
BIO-SYSTEM TANK		
Water will not flow into the Bio-System Tank.	Sump Pump is not turned on.	Move Sump Pump Switch to "ON"
	Circuit breaker has tripped or is "OFF".	Reset or turn breaker "ON".
	Dirt is lodged in the inlet check valve.	Clean.
	Sump Pump impeller is clogged.	Disconnect power and clean.
	Lines or valves contain frozen water.	Allow to thaw. Inject with warm water if necessary.
SHAFT SEALS		
Short seal life.	Unexpected temperature and chemical usage.	Replace.
Water is leaking at pump.	Damaged stationary shaft seal.	Seal ran dry. Ensure seal chamber is filled with liquid.
ODOR		
Excessive odor in water system.	Not enough microbes in the system to maintain water balance.	Increase the microbe inoculation.
	Too much waste water for microbes to digest.	Use of chemical injection or use of an additional Bio-System may be necessary.
	*****Water remains dormant in the system too long causing bacteria buildup	The Biological System and Aerator Pump should be on 24 hours per day.
AERATOR PUMP		
Pump will not run.	Aerator Switch is off.	Turn Aerator Switch on.
	Circuit overload. Breaker has tripped.	Reset breaker or replace fuse.
	Motor overload.	Allow motor to cool. Motor will automatically restart when cool.
Pump runs but little or no air to outlet.	Plumbing unions not tight.	Tighten unions.
	Inlet filter blocked or obstructed.	Remove foreign object.
	Aerator Pump filters dirty or clogged.	Contact your local distributor.
	Aerator Pump motor is operating below maximum RPM.	Contact your local distributor.
Pump is hot or turns off.	Low voltage.	Ensure wire size is capable of handling the rated amperage or the unit . If wire size is correct, contact your local distributor.
	Motor overload.	Allow motor to cool. Motor will automatically restart when cool.

REPLACEMENT PARTS

DESCRIPTION	REORDER #
Microbes-Oil, Grease and HC's; Four 500mL.....	RC-2001-0001
Microbes-Oil, Grease and HC's; Four 500mL.....	RC-2002-0001
Microbes-Oil, Grease and HC's; Four 500mL.....	RC-2003-0001
Test Strips.....	33-0314

STATEMENT OF WARRANTY

Mi-T-M warrants all parts (except those referred to below) of your new Biological Discharge System to be free from defects in materials and workmanship during the following periods:

For One (1) Year from the date of original purchase.

Defective parts not subject to normal wear and tear will be repaired or replaced at Mi-T-M's option during the warranty period. In any event, reimbursement is limited to the purchase price paid.

EXCLUSIONS

1. The motor is covered under separate warranty by its respective manufacturer and is subject to the terms set forth therein.
2. Normal wear parts:

Seals	Filters	Gaskets
O-rings	Packings	Pistons
Valve Assembly	Brushes	Microbes
Sensors		
3. Parts damaged due to:
 - normal wear, misapplication, modifications/alterations, abuse,
 - operation at other than recommended speeds, pressures or temperature,
 - the use of caustic liquids,
 - chloride corrosion or chemical deterioration,
 - fluctuations in electrical or water supply,
 - operating unit in an abrasive, corrosive or freezing environment.
4. Parts damaged by failure to follow recommended:
 - installation, operating and maintenance procedures.
5. This warranty does not cover the cost of:
 - normal maintenance or adjustments,
 - labor charges,
 - transportation charges to Service Center,
 - freight damage.
6. The use of other than genuine Mi-T-M parts will void warranty. Parts returned, prepaid to Mi-T-M's factory or to an Authorized Service Center will be inspected and replaced free of charge if found to be defective and subject to warranty. There are no warranties which extend beyond the description of the face hereof. Under no circumstances shall Mi-T-M bear any responsibility for loss of use of the unit, loss of time or rental, inconvenience, commercial loss or consequential damages.

Appendix A

SJRWMD – No Permit Required Determination

Mosquito Wash Bay



St. Johns River Water Management District

Kirby B. Green III, Executive Director • David W. Fisk, Assistant Executive Director
David Dewey, Altamonte Springs Service Center Director

975 Keller Road • Altamonte Springs, FL 32714-1618 • (407) 659-4800
On the Internet at www.sjrwmd.com.

May 12, 2009

Jeff Earhart, P.E.
Woolpert, Inc.
3504 Lake Lynda Drive, Ste 400
Orlando, FL 32817

RECEIVED

MAY 15 2009

WOOLPERT, INC.
ORLANDO

Re: Mosquito Pad Construction on developed site at 401 S. Bloxham Avenue, Tavares, FL
Permit Determination Not Permit Related #DET-069-928153
Associated with subsequent Permit Application No. 42-069-120188-1
Woolpert letter to District, dated November 5, 2008
District letter to Woolpert, dated November 18, 2008

Dear Mr. Earhart:

District staff has completed its review of your letter dated April 24, 2009, and emailed to me that day. In your letter, you wrote that the 7,000 sq ft of asphalt constructed in 1992 was 'a resurface of an existing driveway'. Presuming that the resurfacing did not require placement of any new foundation, we affirm that the resurfaced 7,000 sq ft does not count toward the impervious area threshold.

In your additional information, you wrote that the total new impervious area constructed since 1991 (presumed to mean September 25, 1991), is 1,140 sq ft. Therefore, your proposed new impervious area of 2,230 sq ft will increase the new impervious area constructed since 1991 to 3,370 sq ft. You also wrote that the proposed alteration will not increase pollutant loadings, increase peak discharge rate, or decrease onsite detention storage; and the proposed building is in an upland area.

Based on your information, it appears that the proposed construction will not meet the thresholds listed in 40C-42.022(2), Florida Administrative Code. Therefore, the proposed site alteration does not require an Environmental Resources Permit prior to construction.

This permit determination applies only to your letter and plans referenced above and our subsequent communications. If my interpretation of the information is incorrect or if any changes occur, you should contact District staff to ensure compliance with District permit requirements. This letter applies only to the requirements of the St. Johns River Water Management District and does not relieve the applicant of meeting the permit requirements of local, county or other legally constituted authorities.

For information about withdrawal of your permit application, you may contact Sandy Joiner at 407-659-4871. If you need other assistance, please call me at 407-659-4834.

Sincerely,

Wil Causseaux

K. Wilford Causseaux, PE
Department of Water Resources

cc: William Carlie, Sandra Joiner, Altamonte Springs Permit File, PDS-NPR

GOVERNING BOARD

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			W. Leonard Wood FERNANDINA BEACH

Appendix B
Geotechnical Report

Mosquito Wash Bay



**Geotechnical Engineering
Exploration and Evaluation
Lake County Mosquito Control Facility
Stormwater Pond
Lake County, Florida**

GAINESVILLE
TALLAHASSEE

JACKSONVILLE
TAMPA

LAKELAND
WEST PALM BEACH

MIAMI

ORMOND BEACH
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BUILD ON OUR EXPERIENCE

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P: 407-740-6110 | 800-457-4745 | F: 407-740-6112
WWW.NODARSE.COM



March 9, 2009
Project No. 01-09-0084-101A

Mr. Gordon Rollins
Woolpert, Inc.
3504 Lake Lynda Drive, Suite 400
Orlando, Florida 32817

Geotechnical Engineering Exploration and Evaluation
Lake County Mosquito Control Facility – Stormwater Pond
Lake County, Florida

Dear Mr. Rollins:

Pursuant to your request, **Nodarse & Associates, Inc. (N&A)** is pleased to submit this geotechnical exploration and evaluation for the abovementioned project. The purpose of this geotechnical study was to explore the subsurface conditions in the area of the proposed dry stormwater pond.

This report describes our exploration procedures, exhibits the data obtained, and presents the geotechnical engineering evaluation and hydro-geotechnical parameters to assist in the design of the stormwater system as described above.

Site and Project Description

The project is located within Section 32, Township 9 South, and Range 26 East. More specifically, the site is located immediately east of the intersection of Bryan Street and Bloxham Avenue in Tavares, Florida. The site is a mosquito control facility with existing office buildings and paved areas.

Based on discussions with you, we understand that a dry bottom stormwater pond is being planned within the southern section of the site. The depth of the pond will be about 6 inches, however the exact geometry is not known at this time.

Scope of Services

For the purpose stated above, the geotechnical exploration included the following:

- Reviewing and considering the general topographic features of the site and its immediate vicinity using the United States Geological Survey (USGS) quadrangle map, as shown on **Figure 1**.
- Considering near surface soil types and conditions as mapped by the United States Department of Agriculture (USDA)/Soil Conservation Service (SCS) Soil Survey for Lake County, as shown on **Figure 2**.
- Performing two (2) hand auger borings to depths of 10 feet within the approximate area of the proposed pond. The borings were performed at the approximate locations shown on **Figure 3**.
- Extracting one (1) permeability tube sample.
- Visually classifying the recovered soil samples obtained in the field from the borings by a Senior Geotechnical Technician and in our laboratory by a Geotechnical Engineer. Pertinent laboratory tests that included grain size (-200) were performed on selected soil samples retrieved from the field to assist in the soil classification. A Falling head permeability test was performed on relatively undisturbed samples to estimate the vertical hydraulic permeability of the soils in this area.
- Preparing this report to include field and laboratory data and other exhibits and evaluating the subsoil and groundwater conditions to form the basis for the recommendations made later in this report.

Subsurface Soil and Groundwater Conditions

The USGS Quadrangle Map covering the project site, as shown on **Figure 1**, shows that the pre-development elevation of the site to be about + 65 feet, NGVD and generally flat. The closest water bodies are Lake Eustis to the north, Lake Dora to the south and Lake Tavares and Lake Elsie to the east of the site.

The USDA Soil Survey of Lake County, Florida, as shown on **Figure 2**, was reviewed for a general description of the near-surface soil types that may be anticipated at this project site. The major shallow subsurface profile in the area explored is represented by Fm (Fill Land, Loamy Material). A brief description of the soil Fm is given below for reference.

- Fill land, loamy materials (Fm) consists of loamy soil material that has been mixed, reworked, and leveled or shaped by earth-moving equipment. It is mostly 12 to 60 inches thick. The material is highly variable within short distances but the dominant texture is sandy loam to sandy clay loam. The water table is at a depth of about 30 to 60 inches except in low-lying areas, where it is at a depth for 10 to 30 inches, and few dry areas where it is at a depth of more than 60 inches.

Encountered Subsoil

The subsoil conditions within the proposed pond were explored using two (2) hand auger borings, **AB-1 and AB-2**, drilled to depths of 10 feet below grade as shown in **Figure 3**. The results of the borings were plotted and laboratory test annotated adjacent to the borings and shown on **Figure 3**.

Borings AB-1 and AB-2 consisted of a surface layer of light grayish brown fine sand to slightly silty fine sand (**Stratum 1**) to depths of 0.5 foot to 2 feet below grade. This was followed by a layer of light orangish brown silty fine sand (**Stratum 2**) to depths of 2.5 feet to 5 feet in AB-1 and AB-2 respectively. This was followed by a layer of light grayish brown fine sand to slightly silty fine sand (**Stratum 1**) and a layer of muck to depth of 9 feet below grade in AB-1. **Stratum 2** was followed by a layer of muck (**Stratum 4**) to a depth of 9 feet below grade in AB-2. This was followed by a layer of grayish brown slightly silty fine sand with organics (**Stratum 3**) to the termination of the borings at 10 feet below grade.

Evaluation and Recommendation

The following geotechnical evaluation and recommendations are based on the data obtained during our field exploration described above, our laboratory testing results, and our experience with similar subsurface conditions and projects.

The groundwater table was encountered at depths of 4 feet to 4.5 feet below existing grade at the boring explored on March 2, 2009. It should be noted that groundwater levels will fluctuate seasonally with the local rainfall and site development and, therefore, may be different at other times. Based on the results of the borings there may be a temporary perched water table at the depth of the restrictive silty fine sand layer. We estimate that the seasonal high water level (SHWL) would be at a depth of about 2 feet below grade.

The borings disclosed a layer of light orangish brown silty fine sand (**Stratum 2**) with percent fines (-200) ranging from 12 to 18 percent. This layer was found in the depth range of 0.5 to about 2.5 feet in AB-1 and 2.0 to 5.0 feet in AB-2. This layer is considered hydraulically restrictive. We recommend that this layer be removed in the general area of AB-1 to improve the vertical infiltration in this area and improve potential recovery of the pond. The depth to the effective aquifer to be used in design should then be 2 feet below grade once **Stratum 2** is removed in AB-1 as described above. Furthermore, **Stratum 2** could be excavated deeper to improve the recovery of the pond if needed. The depth of aquifer used in the analysis can be adjusted accordingly. We recommend that the fill material used to replace **Stratum 2** should be inorganic, non-plastic, granular soil (clean sands) with less than 5 percent passing a No. 200 sieve and achieve a permeability rate greater than 15 feet per day.

A permeability tube samples were extracted at boring location, AB-1 in the depth ranges of 2.5 to 3 feet. Based on the results of the falling head permeability tests performed on the sample, the vertical hydraulic conductivity of the soils in this area is about 70 feet per day. We recommend a vertical hydraulic conductivity of 15 feet per day and a horizontal hydraulic conductivity of 30 feet per day to be used for design purposes based on the removal of **Stratum 2** in AB-1 as described above.

The above recommendations for the design parameters to be used in design are tabulated below:

Property	Stormwater System
Horizontal Hydraulic Conductivity (feet/day)	30
Unsaturated Vertical Infiltration (feet/day)	15
Fillable Porosity (%)	25
Depth to Encountered Groundwater Table	4 to 4.5 feet (see Figure 3)
Average Depth to Normal Seasonal High Water Table	2 feet
Depth to Base of Effective Aquifer	Minimum of 2 feet or top of the restrictive layer, Stratum 2
Duration of Wet Season	120 days

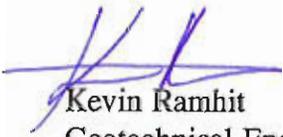
Woolpert, Inc.
Nodarse & Associates, Inc. Project No. 01-09-0084-101A
Page 5

Closure

N&A truly appreciates the opportunity to be of service to you on this project and hope you will find this report to be responsive to your needs. However, if you should have any questions concerning the contents of this report, or if we can be of further assistance, please let us know.

Very truly yours,

NODARSE & ASSOCIATES, INC.



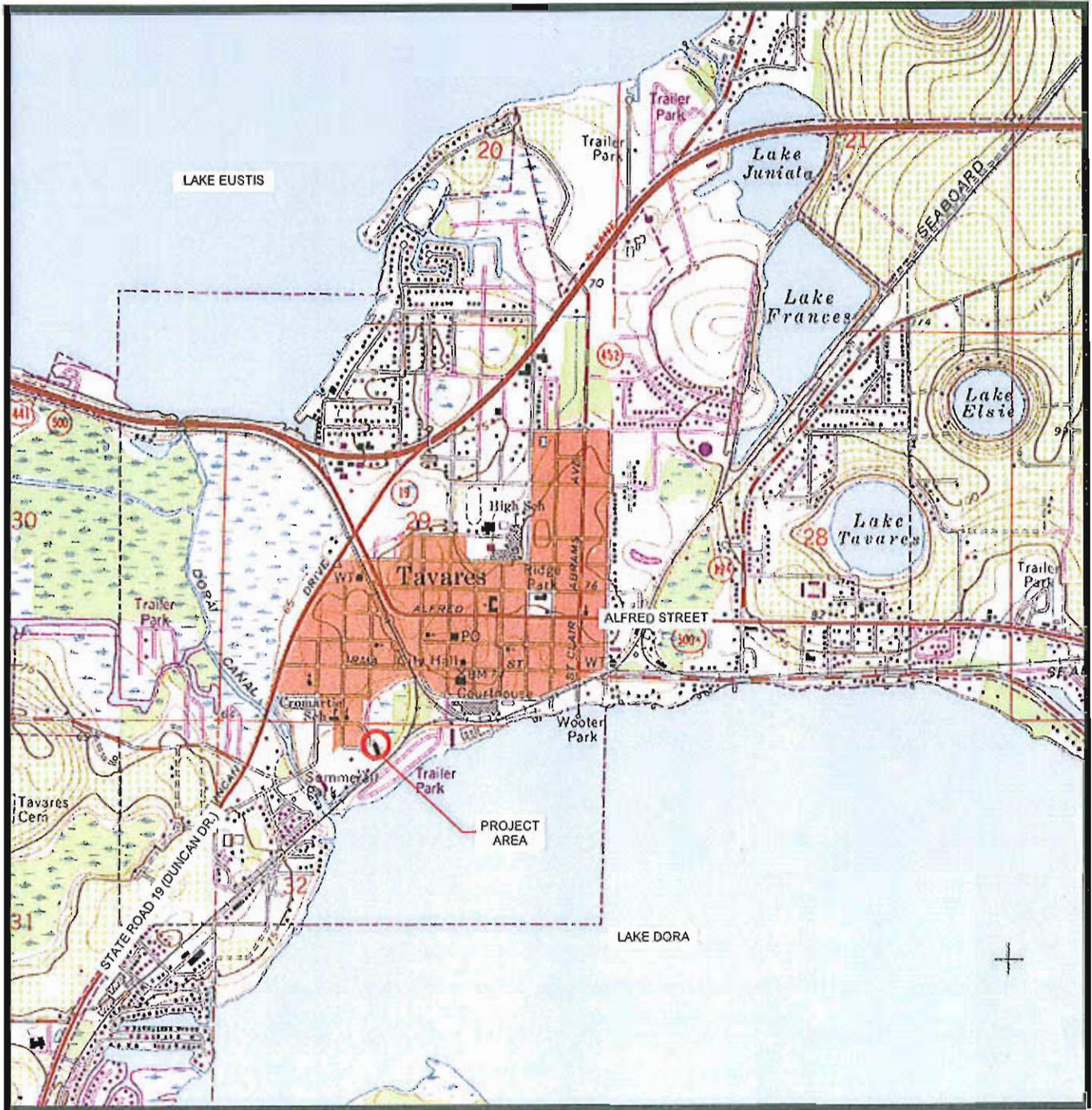
Kevin Ramhit
Geotechnical Engineer



3/11/09
Rick G. Acree P.E
Geotechnical Department Manger, VP
Fl. Registration No. 53962

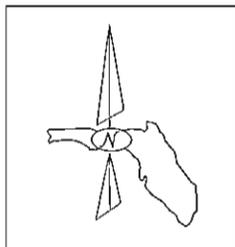
FIGURES

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REFERENCE: U.S.G.S. "EUSTIS, FLORIDA" QUADRANGLE MAP
SECTION: 32
TOWNSHIP: 9 SOUTH
RANGE: 26 EAST
SCALE: 1" = 2000'

ISSUED: 1966 REVISED: 1980

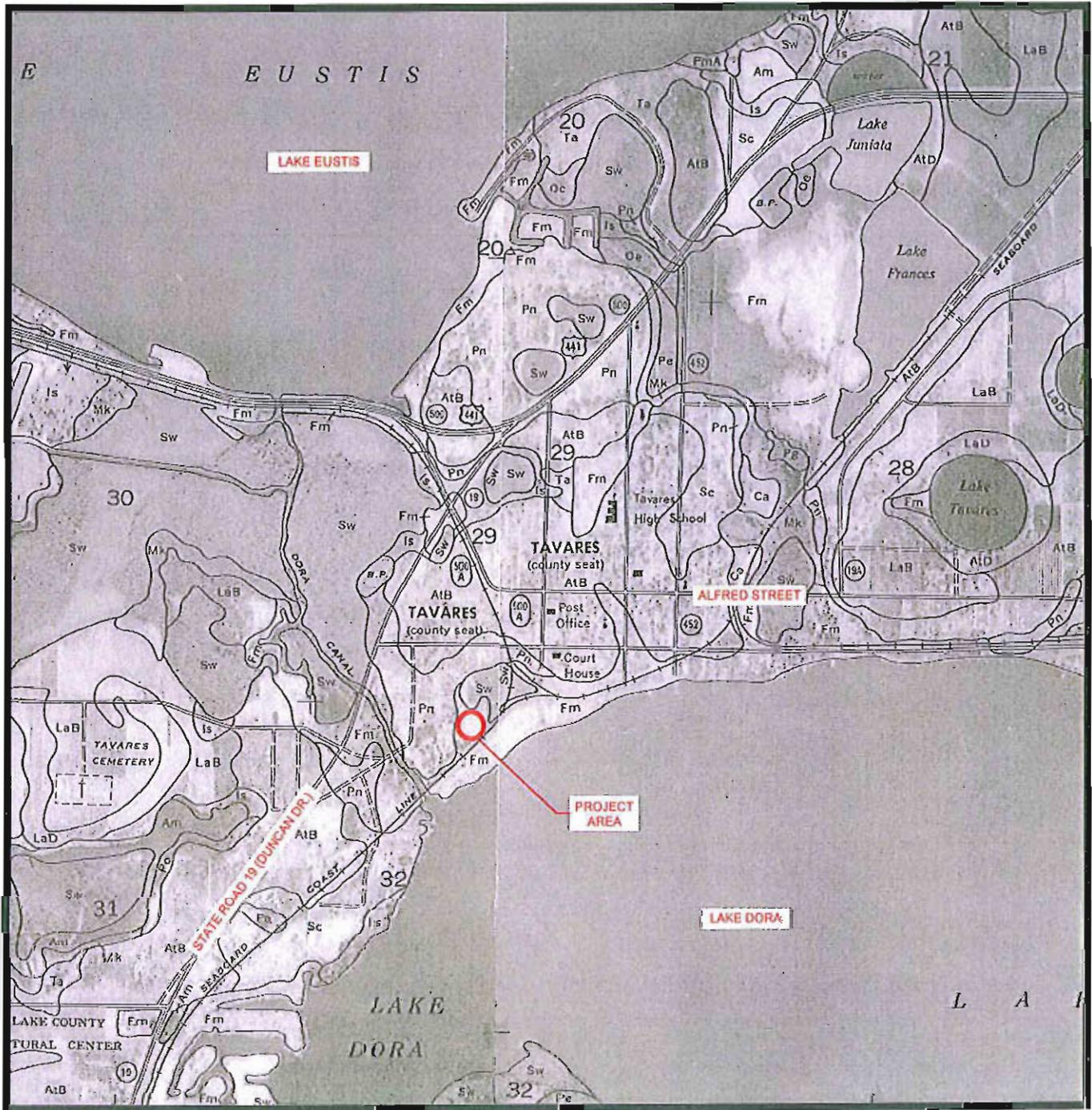


U.S.G.S. QUADRANGLE MAP
LAKE COUNTY MOSQUITO CONTROL FACILITY
STORMWATER POND
LAKE COUNTY, FLORIDA

DRAWN: MG
CHKD: KR
SCALE: 1"=2000'
DATE: 3-5-09



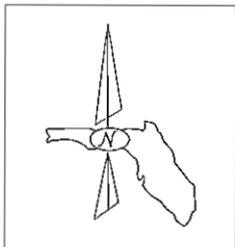
PROJ. NO: 01-09-0084-101A
FIGURE: 1



REFERENCE: U.S.D.A. LAKE COUNTY, FLORIDA SOIL SURVEY
 SECTION: 32
 TOWNSHIP: 9 SOUTH
 RANGE: 26 EAST
 SCALE: 1" = 2000'

ISSUED: 1966

REVISED: 1980



LEGEND

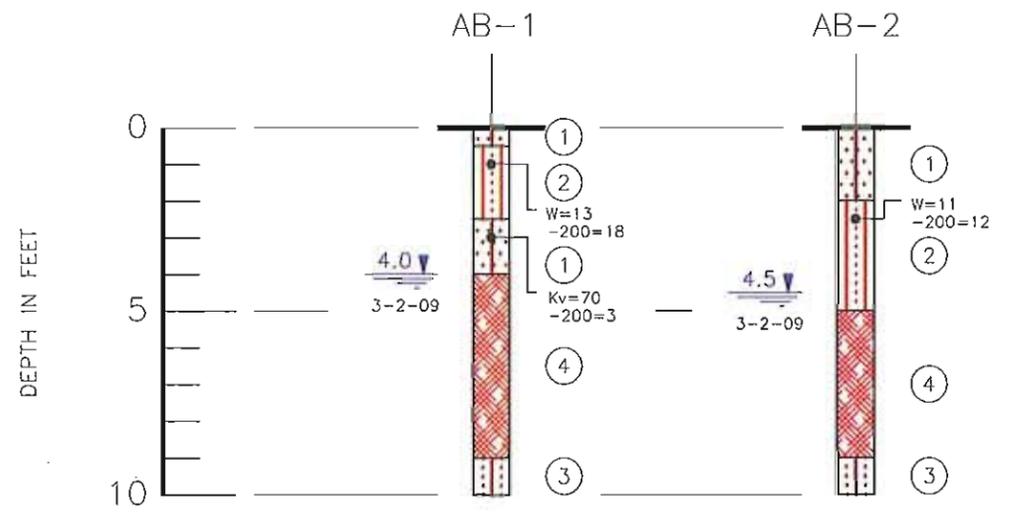
Fm FILL LAND, LOAMY MATERIALS
 Sw SWAMP

SOILS MAP
 LAKE COUNTY MOSQUITO CONTROL FACILITY
 STORMWATER POND
 LAKE COUNTY, FLORIDA

DRAWN: MG
 CHKD: KR
 SCALE: 1"=2000'
 DATE: 3-5-09

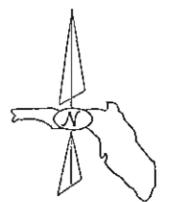


PROJ. NO: 01-09-0084-101A
 FIGURE: 2



LEGEND

- ① LIGHT GRAYISH-BROWN FINE SAND TO SLIGHTLY SILTY FINE SAND (SP)(SP-SM)
- ② LIGHT ORANGISH-BROWN SILTY FINE SAND (SM)
- ③ GRAYISH-BROWN SLIGHTLY SILTY FINE SAND WITH ORGANICS (SP-SM)
- ④ MUCK (PT)
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION
- 4.0
3-2-09 DEPTH TO GROUNDWATER LEVEL IN FEET WITH DATE OF READING
- Kv COEFFICIENT OF VERTICAL PERMEABILITY (FT./DAY)
- W NATURAL MOISTURE CONTENT (%)
- 200 FINES PASSING No. 200 SIEVE (%)



LEGEND

APPROXIMATE LOCATION OF AUGER BORING

HORIZONTAL SCALE IN FEET



BORING LOCATION PLAN AND SOIL BORING PROFILES
 LAKE COUNTY MOSQUITO CONTROL FACILITY
 STORMWATER POND
 LAKE COUNTY, FLORIDA

DRAWN: MG	
CHKD: KR	
SCALE: NOTED	
DATE: 3-5-09	
PROJ. NO: 01-09-0084-101A	FIGURE: 3

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