

## **SECTION 02050 - DEMOLITION**

### **PART 1 - GENERAL**

#### **RELATED WORK**

Tree and Plant Protection: Site Clearing, Section 02110 and General Notes.

#### **QUALITY ASSURANCE**

Contractor Qualifications: Minimum of 5 years experience in demolition of comparable structures.

#### **Requirements of Regulatory Agencies:**

1. Comply with requirements of codes.
2. Comply with requirements of local Public Health Authority.
3. Comply with local utility companies and/or utility districts.
4. Coordination by the Contractor with the Engineer for vital systems affected prior to commencement of construction.

#### **SUBMITTALS**

Certificates of severance of utility services.

Permit for transport and disposal of debris.

Demolition procedures and operational sequence for review by Owner's Representative.

#### **JOB CONDITIONS**

##### **Protection:**

Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect structures, and utilities remaining intact.

Protect designated trees and plants from damage.

Maintaining Traffic:

Ensure minimum interference with roads, street, driveways, sidewalks, and adjacent facilities.

Do not close or obstruct streets, sidewalks, alleys or passageways without permission from authorities having jurisdiction.

If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

**PART 2 - PRODUCTS (NOT APPLICABLE)**

**PART 3 - EXECUTION**

SCHEDULE

Do not commence work until conditions are acceptable to Owner's Representative.

PREPARATION

Arrange for, and verify termination of utility services to include removing meters and capping lines.

DEMOLITION

Sprinkle debris, and use temporary enclosures to limit dust to lowest practicable level.

Break concrete and masonry into sections less than 3 ft. in any dimension.

Remove on-grade slabs as shown on drawings.

Repair damage to adjacent structures.

Protect existing foundations and portions of building structures which are to remain.

At intersections of pavement to be removed with pavement to remain, use a saw equipped with a carborundum blade to make a clean cut at the transition.

Removal of water and sewer lines shall be coordinated and according to the City of Milton.

DISPOSAL

Remove demolition debris daily.

Do not store or burn materials on site.

Transport demolition debris to off-site and dispose of in a legal manner.

## SECTION 02110 - SITE CLEARING

### PART 1 - GENERAL

#### RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification Sections in this project manual, apply to this Section.

#### SUMMARY

Site clearing work includes, but is not limited to:

- Protection of existing trees to remain.
- Protection of existing improvements.
- Removal of trees and other vegetation.
- Topsoil stripping.
- Clearing and grubbing.
- Removing above-grade improvements.
- Removing below-grade improvements.

#### PROJECT CONDITIONS

**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.

**Protection of Existing Improvements:** Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

Protect improvements on adjoining properties.

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

**Improvements on Adjoining Property:** No Improvements on Adjoining Property is included under this contract.

**Salvable Improvements:** Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

**Protection of Existing Trees and Vegetation -** Protect existing trees and other vegetation

## SITE CLEARING

indicated to remain in place, against unnecessary cutting, breaking or skinning roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing. Submit plans detailing the temporary guards to the Engineer.

Water vegetation to remain within limits of the contract work as required to maintain their health during the course of construction operations.

Provide protection for roots over 1 inch in diameter cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

### **PART 2 - PRODUCTS**

Not applicable to this Section.

### **PART 3 - EXECUTION**

#### SITE CLEARING

General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.

Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.

Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

Remove heavy growths of grass from areas before stripping.

## SITE CLEARING

See Topsoil Notes on Construction Plans

Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required to prevent wind erosion.

Dispose of unsuitable or excess topsoil same as specified for disposal of excess material excavated in Earthwork section.

Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

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

Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

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 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

### DISPOSAL OF WASTE MATERIALS

Removal: Remove waste materials and debris from work site and dispose of in a legal manner.

Burning: Burning will not be permitted on site.

End of Section 02110

## **SECTION 02200 – EARTHWORK**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of contract, including General and Supplementary Conditions and other Specification Sections within this project manual, apply to this Section.

#### **SUMMARY**

This Section includes the following:

Extent of earthwork is indicated on drawings. This work consists of grading in order to achieve finished elevations shown on the construction plans.

Preparation of subgrade for slabs, walks, concrete swales and pavements is included as part of this work.

Drainage fill course for support of building slabs is included as part of this work.

All graded surfaces shall be smooth and uniform, without abrupt changes in slope or grade. Areas to be covered with paving shall be fine graded to the required elevations and slopes. Finished surfaces in all other areas may vary up to 0.1 feet from the required elevations.

Excavating and backfilling of trenches for storm sewer is included in work of this section.

Backfilling of trenches within building lines is included as part of this work.

Excavating and Backfilling for Mechanical/Electrical Work: Excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances is included as work of this section.

#### **DEFINITIONS**

Excavation consists of removal of material encountered to subgrade elevations indicated or below subgrade elevations as directed by the Engineer and subsequent disposal or stockpiling of materials removed, in accordance with the requirements of the owner.

Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

Under footings, foundation bases, or retaining walls, fill unauthorized excavation by

## EARTHWORK

extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.

In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

**Additional Excavation:** When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.

**Subgrade:** The undisturbed earth or the compacted soil layer immediately below base, fill, or topsoil materials.

**Structure:** Buildings, foundations, slabs, tanks, curbs, endwalls, mitered end sections, inlets, manholes, or other man-made stationary features occurring above or below ground surface.

### SUBMITTALS

**Test Reports:** Submit the following reports directly to Engineer from the testing services, with copy to Contractor:

Test reports on borrow material.

Verification of suitability of each footing subgrade material, in accordance with specified requirements.

Field reports; in-place soil density tests.

One optimum moisture-maximum density curve for each type of soil encountered.

Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

### QUALITY ASSURANCE

**Codes and Standards:** Perform excavation work in compliance with applicable

## EARTHWORK

requirements of authorities having jurisdiction. All material and construction methods shall be in accordance with Section 120 of the Standard Specification for Roads and Bridges, State of Florida, Department of Transportation, latest edition, unless otherwise noted in these contract documents.

Testing and Inspection Service: Contractor shall engage geotechnical testing laboratory (engineer registered in Florida) to perform soil testing and inspection service for quality control testing during earthwork operations. Contractor shall replace materials removed for testing purposes.

The Contractor shall notify testing laboratory 24 hours prior to work being ready for testing. Contractor shall coordinate with and assist testing laboratory.

### PROJECT CONDITIONS

Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner and the City of Milton immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Engineer, utility owner, and the City of Milton

Do not interrupt existing utilities serving any facility during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

Provide minimum of 48-hour notice to Engineer, and appropriate utility company and receive written notice to proceed before interrupting any utility.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies and the City of Milton for shutoff of services if lines are active.

Use of Explosives: Use of explosives is not permitted.

Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

## **EARTHWORK**

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

Perform Excavation by hand within drip line of trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with moistened burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

### **PART 2 - PRODUCTS**

#### **FILL**

Soils used as fill shall be clean sands, less than 15 percent passing the number 200 sieve. The sand shall have a maximum dry density of at least 95 pounds per cubic foot according to the modified Proctor Compaction Test, (ASTM D1557). Soil materials shall be free of debris, waste, frozen materials, vegetation, organics, and other deleterious matter.

All soils used as fill should be compacted to a minimum of 95% of the soil's modified Proctor maximum dry density.

Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups SM, SP-SM and SP.

Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

In order to insure proper bond and prevent slipping between the original ground and fill, the surface of the original ground shall be scarified to a depth of at least three inches. Each layer of fill material shall be compacted until the required density is achieved.

#### **DRAINAGE FILL**

Clean sand "SP" with not more than 5% passing a #200 sieve.

#### **CUT**

Where required, the site shall be excavated to the subgrade elevations as indicated. Excavated materials that are suitable shall be used in the fill sections of the site. Any excess material shall be hauled away from site.

### **PART 3 - EXECUTION**

## EARTHWORK

### GENERAL

The site shall be stripped of existing structures, all organic materials, all vegetation (including some large hardwood trees as designated to be removed), root systems, organic topsoil, debris, and any other deleterious material, in phases, so as to prevent and impede erosion and sedimentation. The exposed subgrade shall be compacted to a minimum soil density of 95% of the Standard Proctor Test (ASTM D698) with large traffic sized non-vibratory equipment. Any areas of unsuitable or compressible materials shall be removed or undercut to a stable subgrade material or if a stable subgrade is not encountered, a minimum of three feet below the compacted subgrade. The undercut area should then be backfilled with clean coarse sand fill materials and compacted to 95% of the Modified Proctor Test (ASTM D1557). The site can be filled, by placing and mechanically compacting 6-8 inch lifts with large traffic sized non-vibratory equipment. Each lift should be compacted to a minimum soil density of 95% of the Modified Proctor Test unless specified otherwise, prior to placement of successive lifts.

### COMPACTION OF SUBGRADE, CUT AND FILL:

Compaction requirements shall be as determined by the Modified Proctor Method, ASTM D1557 or Standard Proctor Modified ASTM D698 on existing soils, with a soil at or near optimum moisture content. The top 12 inches in cut areas, shall be compacted to 96% minimum of the Standard Proctor Test. Fill soils beneath paved areas or structures shall be compacted to a minimum density of 95% of the Modified Proctor test unless otherwise specified. The top 8 inches of sub-grade fill material shall be compacted to a minimum soil density of 95% of the Modified Proctor Test. All roots and other materials that would diminish the efficiency of the compaction operation shall be removed prior to compacting. Field tests shall be made by a soils testing laboratory (engineer registered in Florida) at the minimum rate of one test per 500 square yards per structure at 12 inches below finished subgrade in cut sections and one test per 500 square yard per layer in fill sections. In pavement sections at least one test for every 500 sy of pavement areas and one foot of vertical fill. Contractor to pay for testing.

Footings: The soil immediately beneath footings shall be compacted with a large mechanical plate tamper or jumping jack to a minimum soil density of 98% of the Modified Proctor Test. If moisture conditions are elevated and pumping is encountered, the footings shall be undercut and backfilled with compacted soils. The depth of the undercutting will depend on the width of the footings and the conditions present at the time of construction. If these conditions are encountered, the Contractor shall contact the geotechnical engineer for the conditions to be evaluated and a recommendation made.

Remove and replace or scarify and air dry soil materials that are too wet to permit compaction to specified density. Only suitable materials free from excessive moisture shall

## **EARTHWORK**

be used for fill or backfill. Suitable soil materials that have been removed because they are too wet and compaction cannot occur, may be stockpiled or spread and allowed to dry. Assist in drying may be by discing, harrowing, or pulverizing until the moisture content is reduced to a satisfactory value.

### **STABILIZED SUBGRADE**

Subgrade stabilization shall be done in accordance with applicable portions of these specifications.

### **EXCAVATION**

Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

### **STABILITY OF EXCAVATIONS**

All excavation work shall conform to OSHA Publication "Excavations 2226," 1990 Revision, and OSHA Excavation; Final Rule 29, CFR, Part 1926, October 31, 1989. The Contractor will provide written assurance of compliance with the law and with the laws of Florida Chapter 90-96.

The Contractor's method of providing protective support to prevent cave-ins shall be submitted with the Bid and conform to OSHA requirements. Slope excavations, shoring, and trench box usage in the field be based on tabulated data and designed by the Contractor.

Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

Provide permanent steel sheet piling or pressure treated CCA timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2'-6" below final grade and leave permanently in place.

The Contractor shall do all shoring required to perform and protect the excavation and as necessary for the safety of the employees.

### **DE-WATERING**

## **EARTHWORK**

Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

The Contractor shall prevent the accumulation of water in the excavated areas, and shall remove by pumping or other means, any water that accumulates in the excavation. The Contractor shall prevent the accumulation of water in both structural and trench excavations and shall remove by well point system or by other means, water which accumulates in the excavation. The Contractor shall provide, install, operate and maintain pumps, well points, sumps, suction and discharge lines, and other de-watering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

The Contractor shall be responsible for and ensure all effluent water from the de-watering operations meets or exceeds FDEP and ACOE water quality standards prior to entering jurisdictional water bodies.

### **STORAGE OF EXCAVATED MATERIALS**

Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess excavated materials not acceptable for use as backfill or fill offsite in a legal manner.

### **EXCAVATION FOR STRUCTURES**

Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

## **EARTHWORK**

Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

### **EXCAVATION FOR PAVEMENTS**

Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

### **TRENCH EXCAVATION FOR STORM PIPES CONDUIT AND IRRIGATION PIPES**

Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.

For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

### **OTHER EXCAVATIONS (As Applicable per Plans)**

Excavation for manholes, catch basins, junction boxes and other accessories shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment of timber that may be used to protect them. Backfill of earth around manholes shall be filled with thoroughly compacted sand or gravel at the expense of the Contractor.

Excavations for footings and foundations shall be made to the dimensions and elevations indicated on the drawings, and extending a sufficient distance from footings and

## **EARTHWORK**

foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottom to required lines and grades to leave solid base to receive other work.

Excavations for Mechanical or Electrical structures shall be made to the dimensions and elevations indicated on the drawings and a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and inspection. Do not disturb bottom of excavations intended for bearing surface.

Excavation for all structures shall be made to the dimensions and elevation indicated on the drawings. Where the excavation is made below the indicated elevations, the excavation shall be restored to the proper elevation with concrete fill, or the heights of the walls and footings shall be increased. Such fill or increased height of walls and footings shall be furnished by the Contractor without extra compensations, except where additional excavation is ordered to obtain proper bearing in which case the contract price will be adjusted to cover such additional work.

### **COLD WEATHER PROTECTION**

Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

### **BACKFILL AND FILL**

General: Place soil material in layers to required subgrade elevations, for each area classification listed below.

Under grassed areas, use satisfactory excavated or borrow material.

Under walks and pavements, use satisfactory excavated or borrow material, or a combination.

Under piping and conduit and equipment, use satisfactory excavated or borrow materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

Concrete is specified in appropriate section.

## EARTHWORK

Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.

Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

Removal of trash and debris from excavation.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

### BACKFILLING:

Trenches shall be backfilled with excavated materials, free from large clods or stones. Backfill shall be deposited in layers not to exceed 6-inches (6") in thickness, moistened, and compacted to density equal to or greater than 95% of the maximum density of the Standard Proctor Method, to a minimum depth of 12-inches over the pipe. The remainder of the backfill shall be placed in 8-inch layers compacted to 95% maximum density of the Standard Proctor Test unless the backfill is beneath paved or building areas in which case it shall be compacted to 98% of a Standard Proctor Test.

Selected Materials shall be used for all backfill, Trash shall not be allowed to accumulate in spaces to be backfilled, and this space shall be well cleared before backfill is placed.

No fill material shall be placed, spread or rolled while the ground or fill is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until the moisture content and density of the fill are as previously specified.

## EARTHWORK

### GRADING

General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

Concrete Swales: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

Walks: Shape surface of areas under pavement to line, grade and cross-section, with finished surface not more than 1/2" above or below required subgrade elevation.

Pavements: Shape surface of areas under pavement to line, grade, and cross-section with finish surface not more than 1/2 inch above or below required subgrade elevation.

Compaction: After grading, compact subgrade surfaces to the depth and densities specified and as directed by the Geotechnical Engineer.

### BUILDING SLAB DRAINAGE COURSE: (As Applicable)

General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to the indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted drainage course is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

### FIELD QUALITY CONTROL

## **EARTHWORK**

Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.

If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.

Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Engineer.

Paved Areas: Perform at least one field density test of subgrade for every 500 sq. yd. of paved area. In each compacted fill layer, perform one field density test for every 500 sq. yd. of paved area. Location of tests shall be as determined by the Engineer.

Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed. Frequency of testing shall be as determined by the testing service and Engineer.

If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained at no additional cost.

## **EROSION CONTROL**

The Contractor shall be responsible for the prevention of erosion from the site, the control of turbidity generated on site and for maintaining graded surfaces, for the duration of the project. The Contractor shall take whatever steps necessary to prevent erosion and will be responsible for any damages that might occur to down-land properties as a result of

## **EARTHWORK**

increased run-off from the site during sitework construction. Erosion control methods shall be in accordance with requirements of authorities having jurisdiction.

### MAINTENANCE

Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### EXISTING UTILITY LINES:

Attention is called to the fact that the Contractor is responsible for contacting all utility companies to obtain locations of all existing utilities or obstructions that he may encounter during construction. Locations and depths of utilities shall be the responsibility of the Contractor. After location of utilities by the appropriate utility company, it is the Contractor's liability to protect all such utility lines, including service lines and appurtenances, and to replace at his own expense any that may be damaged by the Contractor's equipment or forces during construction of the project. Contractor is to hand dig around fiber optics and gas lines. Contractor is responsible for all costs associated with cutting, breaking or disrupting utilities.

### BARRICADES, GUARDS, AND SAFETY PROVISIONS:

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained by the Contractor during the progress of the construction work. Rules and regulations of the local authorities with respect to safety provisions shall be observed.

### TRAFFIC CONTROLS:

## **EARTHWORK**

Excavations for pipe laying operation shall be conducted in a manner to cause the least interruption to traffic. When traffic must cross open trenches, the Contractor shall provide suitable bridges.

### **FLOW DRAIN AND SEWER MAINTENANCE:**

Adequate provision shall be made for the flow of sewers, drains, and water courses encountered during construction, and the structures which may have been disturbed shall be satisfactorily restored by the Contractor.

### **PROPERTY PROTECTION:**

Trees, fences, poles, manholes, and all other property shall be protected unless their removal is authorized; and any property damaged shall be satisfactorily restored by the Contractor at the Contractor's expense.

### **CLEAN-UP:**

Before final inspection and acceptance the Contractor shall clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, re-grassing if necessary, to as good a condition as existed before work started. All trenches shall be leveled, and loose material removed from pavement, gutters, and sidewalks, employing hand labor if necessary.

### **DISPOSAL OF EXCESS AND WASTE MATERIALS**

Removal: Remove from work areas, waste materials, including trash, and debris and dispose of in a legal manner.

END OF SECTION 02200

**SECTION 2210 - GRASSING**

**PART 1 - GENERAL**

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification Sections in this project manual, apply to this Section.

DESCRIPTION OF WORK:

Extent of grassing work is as specified or shown on the construction plans. Sodded areas disturbed during construction shall be re-sodded to match existing.

QUALITY ASSURANCE:

All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitation for bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by Pensacola Christian College. Seed that has become wet, moldy, or otherwise damaged in transit or in storage shall not be used. Fertilizer shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer that becomes cake or otherwise damaged, making it unsuitable for use, shall not be used. Seed, fertilizer and other grassing materials shall be stored under cover and protected, from damage that would make them unacceptable for use.

SUBMITTALS:

Approvals except those required for field installations, field applications, or field tests shall be obtained before delivery of materials or equipment to the project. The results of laboratory tests performed on the topsoil material shall be submitted. The reports shall include the pH level, the amount of organic matter, and available phosphoric acid and potash of the soil intended for use in the work. Certificate of conformance will be required for the following:

1. Grass seed shall be certified by registered, certified seed association or a registered testing laboratory not more than ten months prior to seeding.
2. Sprigs
3. Fertilizer

4. Topsoil
5. Lime
6. Mulching

**PART 2 - PRODUCTS:**

**TOPSOIL:**

If the quantity of existing stored or excavated topsoil is inadequate for planting, sufficient additional topsoil shall be furnished. Topsoil furnished shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas. Topsoil shall be without admixture of subsoil and free from Johnson grass (*Sorghum halepense*), nut grass (*Cyperus rotundus*) and objectionable weeds and toxic substances.

**SOIL AMENDMENTS:**

**LIME:**

Ground limestone (Dolomite) shall contain not less than 85 percent of total carbonates, and shall be ground to such fineness that 50 percent will pass a 100-mesh sieve and 90 percent will pass a 20-mesh sieve.

**FERTILIZER:**

Fertilizer shall be 16-16-16 formulation. The nitrogen shall be 60% urea-formaldehyde form. Fertilizer shall conform to the applicable State Fertilizer laws and shall be granulated so that 80 percent is held on a 16-mesh screen, uniform in composition, dry and free-flowing.

**MULCH:**

Clean hay or fresh straw mulch.

**GRASS MATERIALS:**

**GRASS SEED:**

Federal Specifications JJJ-S-18 and shall satisfy the following requirements:

**GRASSING**

<u>Seed</u>	<u>Pure Seed</u>	<u>Hard Seed</u>	<u>Weed Seed</u>
Argentine Bahia (Paspalum Notatum)	80%	15%	0.25%

Seed failing to meet the purity or germination requirements by not more than twenty-five percent may be used, but the quantity shall be increased to yield the required rate of pure live seed. Seed failing to meet the weed seed requirements shall not be used.

**WATERING:**

The Contractor is to water grass and sod. Contractor to coordinate same with the City of Milton.

**PART 3 - EXECUTION**

**GRADING:**

Areas to be grassed shall be graded to remove depressions, undulations, and irregularities in the surface before grassing.

**PLACING TOPSOIL:**

Areas to be grassed shall have a minimum topsoil cover of two inches. Topsoil shall not be placed when the sub-grade is excessively wet, extremely dry or in a condition otherwise detrimental to the proposed planting or proper grading.

**TILLAGE:**

The area to be grassed shall be thoroughly tilled to a depth of four inches using a plow and disc harrow or rotary tilling machinery until a suitable bed has been prepared and no clods or clumps remain larger than 1-1/2 inches in diameter.

**APPLICATION OF LIME:**

The pH of the soil shall be determined. If the pH is below 5.0, sufficient lime shall be added to provide a pH between 5.5 and 6.5. The lime shall be thoroughly incorporated into the top three to four inches of the soil. Lime and fertilizer may be applied in one operation.

**APPLICATION OF FERTILIZER:**

## GRASSING

Fertilizer shall be applied at the rate of 6 pounds per 1,000 square feet and shall be thoroughly incorporated into the top three to four inches of soil.

### PLANTING SEEDS:

All areas disturbed during construction shall be seeded as specified herein. Immediately before seeds are sown and after fertilizer and lime are applied, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable, and of uniformly fine texture. Areas to be grassed shall be seeded evenly with a mechanical spreader, raked lightly, rolled with a 200-pound roller, and watered with a fine spray.

1. Seed shall be applied at the following rate:

<u>Seed</u>	<u>Rate of Application</u>
Argentine Bahia (Paspalum Notatum)	6 lbs./1000 sq. ft. 260 lbs./acre

2. Seeded areas shall be mulched at the rate of not less than 1-1/2" loose measurement over all seeded areas. Spread by hand, blower, or other suitable equipment. Mulch shall be cut into the soil with equipment capable of cutting the mulch uniformly into the soil. Mulching shall be done within 24 hours of the time seeding is completed.

### ROLLING:

After seeding and mulching, a cultipacker, traffic roller, or other suitable equipment shall be used for rolling the grassed areas. Areas shall then be watered with a fine spray.

### WINTER COVER:

All areas to be grassed shall be protected against erosion at all times. For protection during winter months (November 1st through March 31st) Italian rye grass shall be planted at the rate of four pounds per 1,000 square feet on all areas that are not protected by permanent grass.

### CLEAN-UP:

All excess soil, excess grass materials, stones, and other waste shall be removed from the site daily and not allowed to accumulate.

## GRASSING

### MAINTENANCE:

Maintenance shall begin immediately following the last operation of grassing and continue until final acceptance. Maintenance shall include watering, mowing, replanting, and all other work necessary to produce a uniform stand of grass. Grassing will be considered for acceptance at the end of the maintenance period when a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities with coverage exceeding 90 percent over any 10 sq. ft. area and bare spots not exceeding 5 x 5 inches. Contractor shall include costs of maintenance in his bid.

### ACCEPTANCE:

The Contractor shall submit to the City of Milton two copies of a written request for final acceptance of the grassing work. The request shall be submitted at least ten days prior to the anticipated date of acceptance. The condition of the grass will be noted, the Contractor will be notified if maintenance is to continue.

### MEASUREMENT AND PAYMENT:

Grassing shall be measured for payment in square yards or by lump sum only for areas indicated on the plans, or as provided in the proposal and contract.

When not listed as a separate contract pay item, grassing shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided in the proposal contract.

Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION 02210

## **SECTION 02211 - SODDING**

### **PART 1 - GENERAL**

#### RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other specifications sections within this project manual, apply to this Section.

#### DESCRIPTION OF WORK:

This work consists of sodding areas cleared during construction and not paved, or as otherwise shown on the Construction Plans. All material and construction methods shall be in accordance with sections 570, 571, or 580 of the Florida Department of Transportation Standard Specifications, Latest Edition.

Sod: Areas noted on Construction Plans shall receive sod. Sod all areas where existing sod was removed.

#### MATERIAL:

Use Argentine Bahia grass (*Paspalum notatum*). The sod shall be live, fresh, and uninjured at the time of planting and shall have a thick mat of roots with enough adhering soil to assure growth. Apply sod within 48 hours of cutting or stack and keep moist. Do not plant dormant sod or if ground is frozen.

Placement: Prepare the ground by loosening the soil and hand raking. Place sod on the prepared soil to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to avoid a continuous downhill seam. Tamp or roll lightly to ensure contact with sub-grade. Tamp the outer edges of the sod area to produce a smooth contour. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. Apply water to the sod thoroughly with a fine spray immediately after planting.

Watering: The Contractor shall water sod and grass, coordinate with the City of Milton for same.

Maintenance: Maintain sod by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, re-grading, and re-planting as required to establish a lawn free of eroded or bare areas and acceptable to the Engineer. Where inspected work and materials do not comply with requirements, replace rejected work and continue maintenance until re-inspected by Engineer and found to be acceptable. Remove rejected materials promptly from the project site. Contractor shall include costs for maintaining sod in his bid.

ACCEPTANCE: A lawn will be considered for acceptance, if, at the end of the maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

WARRANTY:

Contractor shall warranty all work and material for a period of 90 days beginning from date of acceptance of final completion.

MEASUREMENT AND PAYMENT:

Sod shall be measured for payment in square yards or by lump sum only for areas indicated on the plans, or as provided in the proposal and contract.

When not listed as a separate contract pay item, sod shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided in the proposal contract.

Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION 02211

**SECTION 02221 - TRENCH EXCAVATION, BACKFILL AND COMPACTION FOR POTABLE WATER AND SANITARY SEWERS**

**PART 1: GENERAL**

1.01 General Description of Work:

- A. Excavation, shoring, dewatering, pipe bedding, trench backfill, compaction, grading and cleanup of all pipeline trenching for the project.
- B. All work must be done in accordance with these specifications and the safety requirements of the State and OSHA standards.
- C. Drawings and general provisions of Contract, including General and Supplementary Conditions, Earthwork Specification section and other specification sections in this project manual, apply to work of this section.

1.02 Job Conditions:

- A. Accept site in condition existing during Contract time frame.
- B. Groundwater/surface water found during construction are conditions of the Contract and responsibility of Contractor.

**PART 2: PRODUCTS**

2.01 Pipe Bedding and Backfill:

- A. Determination of source of materials for bedding and backfill shall be responsibility of Contractor, but use of such materials shall be subject to approval of Engineer.
- B. Pipe bedding shall be angular material.

2.02 Sand Backfill: (Where specified on plans). Use sand or fine aggregate with source of material subject to approval of Engineering (See Earthwork Section 02200).

2.03 Cradling Rock: Use crushed rock or stone with 70-100% passing 1" sieve and no more than 50% passing 3/4" sieve. Washed and crushed oyster shells are acceptable.

#### 2.04 Controlled Density Fill:

- A. Use high slump mixture of portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal.
- B. Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

#### 2.05 Sheeting, Shoring and Bracing:

- A. Use sound timber or structural steel.
- B. Use shapes and sizes as required.

### **PART 3: EXECUTION**

#### 3.01 General:

##### A. Dewatering:

- 1. Prevent surface water from flowing into excavation.
- 2. Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering.
- 3. No sanitary sewer shall be used for disposal of trench water.

##### B. Protection of Existing Utilities:

- 1. Notify all utilities of location and schedule of work a minimum of 48 hours prior to beginning work.
- 2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility and Engineer of conflicts between existing and proposed facilities.
- 3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractor's expense.

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

### C. Sheeting, Shoring and Bracing:

1. Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
2. Leave sheeting and shoring in place where removal might cause damage to work or as otherwise indicated on drawings.
3. When moveable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

### D. Changes in Grade:

1. Minor adjustments to grades may be made from plan grades to suit unforeseen construction conflicts or conditions with approval from Engineer.
2. No additional compensation will be made for such minor changes.

## 3.02 Excavation and Trenching:

### A. General:

1. Method of excavation at Contractor's option subject to the approval of the Engineer.
2. The Contractor will use caution when excavating under tree roots and under and around structures and utilities. Excavate by hand when necessary or appropriate.
3. Stockpile and replace topsoil equal to preexisting depth for surface restoration in grassed or agricultural areas where specified or shown on plans.

### B. Trench Characteristics:

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

1. Depth: As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified or indicated.
2. Width:
  - a. Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing.
  - b. Maximum trench width of 30-inch or pipe O.D. plus 18 inches where soil conditions permit.
3. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
4. Trench bottom shall be free of large stones and other foreign material.

### 3.03 Organic or Unstable Materials:

- A. Stop work and notify Engineer.
- B. Perform remedial work as directed.
- C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

### 3.04 Rock Excavation:

- A. Excavate any rock to maintain minimum 6-inch clearance around pipe.
- B. Dispose of rock material not suitable for backfill as directed by Engineer.
- C. Use of explosives not permitted without prior written authorization from Owner and Engineer.
- D. Provide Special Hazard Insurance covering liability for blasting operations.

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

### 3.05 Bedding:

- A. Place after bottom of trench has been excavated to proper depth and grade.
- B. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for full length of pipe.
- C. Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions.

<u>Pipe Material</u>	<u>Minimum Bedding Class</u>
1. Ductile Iron Pipe	See Detail Sheets
2. Flexible or Composite Pipe	See Detail Sheets

### 3.06 Trench Backfill:

- A. Use excavated material backfill unless otherwise specified or directed.
- B. Use suitable backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities (See Earthwork Section).
- C. Initial Backfill:
  - 1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
  - 2. Carry out in an orderly fashion after authorization to cover pipe has been given.
  - 3. Allow no more than 300 feet of trench to be open at one time.
  - 4. Do not backfill until concrete or mortar has sufficiently cured.
  - 5. Record location of connections and appurtenances before backfilling.

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

6. Place by hand and hand tamp to not less than 12 inches above top of pipe, in approximately 4-inch layers.
7. Backfill simultaneously on both sides of pipe to prevent displacement.
8. Place cushion of 4 feet above pipe envelope before using heavy compacting equipment.

### D. Subsequent Backfill:

1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
2. Compaction of all backfill material shall be performed in a manner that shall not crack, crush, and/or cause the installed pipe to be moved from the established grade and/or alignment.
3. Area under pavement and walks or within buildings shall be mechanically compacted to the top of the subgrade in 8 inch lifts to a minimum of 98 percent of the Modified Proctor Test.
4. Areas not subject to vehicular traffic shall be backfilled and compacted in layers not more than 12 inches in depth.
5. Compaction method at discretion of Contractor with following exceptions:
  - a. If in Engineer's opinion compaction method presents potential damage to pipe, it will not be allowed.
  - b. Compaction of any backfill material by flooding or jetting will require prior written authorization of Engineer.
6. Mound excavated materials no greater than 6 inches in open areas only.
7. Fill upper portion of trench with topsoil as

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

specified hereinbefore.

8. No trench shall be open over night.

E. Controlled Density Fill:

1. Use where shown on plans.
2. Provide suitable forms to limit volume of controlled density fill material.
3. Protect exposed utility lines during placement.
4. Place material in accordance with suppliers' written recommendations unless directed otherwise by Engineer.

3.07 Excess Material: Dispose of waste excess excavated material as directed by Engineer.

3.08 Testing:

A. Payment of failed tests will be the responsibility of Contractor.

B. Minimum of one density test for each type of material encountered:

1. See Earthwork Section

C. In Place Density:

1. ASTM D1556 (Sand Cone)
2. ASTM D2167 (Balloon)
3. ASTM D3017 (Nuclear)

## PART 4: MEASUREMENT AND PAYMENT

4.01 Trench Excavation:

A. Trench excavation shall be considered incidental to pipeline installation.

## TRENCH EXCAVATION, BACKFILL AND COMPACTION

### 4.02 Backfill:

- A. Payment for backfill shall be made at the contract unit price per cubic yard only if a separate bid item is established in the contract.
- B. No allowance for waste shall be made.
- C. If Engineer orders an initial backfill material other than that specified in contract, it shall be paid for as an extra in price per cubic yard as compacted in place, EXCEPT if a higher class embedment is ordered by Engineer because the Contractor has over-excavated the trench width.
- D. If the Contractor over-excavates the trench width and the Engineer orders the next higher class of embedment to be used, the embedment shall be paid for as if the original specified embedment was used.
- E. If the Engineer orders the excavated material to be removed and disposed of and replaced with another material and a separate bid item is not established as a bid item, the material shall be paid as an extra.
- F. If the Contractor fails to compact the backfill to the density requirements, the Engineer may order the material removed and replaced at no cost to the Owner.

END OF SECTION 02221

## **SECTION 02500 - SITE DRAINAGE**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification Sections in this project manual, apply to work of this Section.

#### **DESCRIPTION OF WORK:**

The work covered by this section of the specifications includes the installation of storm drainage piping and drainage structures. All labor, material, equipment, appurtenances, services, permits and other work or costs necessary to construct the facilities and place them into operation shall be furnished by the Contractor.

Site Information: The Contractor shall verify by whatever means necessary, the existing utility and storm sewer locations prior to beginning work. Notify Engineer immediately of any conflicts between existing conditions and proposed work.

Coordinate with other work in project area.

### **PART 2 - PRODUCTS**

#### **MATERIALS:**

Concrete: All materials used for concrete and the design of all concrete mixes shall conform with the recommendations of the American Concrete Institute (ACI 211.). All concrete, unless noted otherwise, shall develop a 28-day compressive strength of 3000 psi, unless otherwise noted. If any concrete should fail to meet the strength requirements, the structure shall be removed as necessary to remove the defective concrete and shall then be rebuilt.

Contractor to engage a geotechnical testing laboratory (Engineer registered in Florida) to perform all sampling and testing and inspection service for quality control. Contractor shall replace materials removed for testing purposes. Contractor to cooperate and coordinate with testing laboratory.

Submit test results directly to the Engineer. The following tests shall be taken:

- 28-day compressive test of concrete, minimum of three test cylinders per 50 cubic yards of concrete poured.
- Air content, minimum one test for each day's pour.
- Slump test, minimum three tests per 50 cubic yards of concrete poured. If less than

## SITE DRAINAGE

50 cubic yards is poured, then a minimum of three tests per day.

Contractor shall replace materials removed for testing purposes.

Should any work or materials fail to meet the requirements set forth in the plans and specifications, Contractor shall pay for retesting of same.

Forms: Construct all forms accurately to the dimensions and lines shown, and brace so as not to yield. All forms for contact with concrete that will be exposed to view after completion shall have a smooth, dense surface (i.e. such as tempered Masonite) without any holes or imperfections. The alignment of the forms shall be checked frequently during the placing of concrete. If any movement occurs, stop the placing of concrete until the proper alignment is restored.

Reinforcement: Bars shall be of intermediate grade steel in accordance with ASTM Designation a 615, Grade 60. Welded wire mesh shall conform to ASTM A185 for smooth wire and ASTM A 497 for deformed wire.

All reinforcement shall be fabricated and placed in accordance with ACI 318. Welded wire mesh shall be lapped 6-inches at all edges.

The Engineer shall be notified at least 24 hours before the pouring of any concrete is to be started, and such pouring shall not be started until the reinforcement has been approved as placed.

Placing, Curing and Finishing: The mixing, placing, curing and finishing of concrete shall comply with ACI 304 and ACI 318. All exposed concrete shall be given a hard steel-troweled finish with no trowel marks remaining. No cement shall be dusted on the surface. All concrete shall be cured by coating with an approved curing membrane, or by keeping it wet for at least six days after pouring. After the forms are stripped, all exposed concrete surfaces shall be painted as needed and rubbed to a uniform finish.

Masonry: Bricks for accessories shall be hard common clay brick. Mortar shall be one part Portland cement and three parts masonry sand to which shall be added lime putty in the amount of fifty percent (50%) of the volume of cement. Special commercial mortar mixes may be used if approved by the Engineer. All masonry material shall conform to the latest applicable ASTM specifications.

Set all masonry units in full beds of mortar, with full joints and strike all joints flush.

Masonry reinforcements shall be galvanized Dur-o-wal, or approved equal, and shall be installed at every other bed joint.

Catch Basin, Drop Inlet and Junction Box Castings: All storm sewer castings shall be heavy duty traffic units with opening sizes as indicated on the construction plans. The units shall be as manufactured by the Vulcan Foundry, Denham Springs, Louisiana; Neenah

## SITE DRAINAGE

Foundry Company, Neenah, Wisconsin; McKinley Iron Works, Fort Worth, Texas; or approved equal.

Catch Basin, Drop Inlet, Junction Box, Box Culvert, Endwall, Wingwall, and Mitered End Section Construction: Concrete bases shall be poured in place on undisturbed dry subgrades to the dimensions shown on the plans.

Steps: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step. Steel-reinforced plastic or approved equal. Steps shall be integrally cast into structure sidewalls, unless otherwise indicated. The castings shall be set accurately to grade with catch basin grates set ½ inch below the finished grade.

Concrete Pipe: All concrete pipe shall conform to the requirements of ASTM C-76 for Class III O-ring reinforced concrete pipe with flexible watertight gaskets.

Test Reports: Certified records of the tests made by the manufacturer, or by a reliable commercial laboratory or by both, shall be submitted to the Engineer with each shipment of pipe.

Pipe Inspections: All pipe will be inspected upon delivery and such as does not conform to the requirements of this Contract shall be rejected and immediately removed by the Contractor. The Contractor shall furnish and provide all labor necessary to assist the Engineer in inspecting the material.

Basis of Rejection: The basis of rejection shall be as specified in applicable ASTM specifications as last revised.

### **PART 3 - EXECUTION**

#### **LAYING CONCRETE STORM PIPE:**

General: Before lowering pipe into trenches, the bottom of the ditch shall be graded so that when the pipe rests in the ditch it will have a bearing for its entire length and the bottom of the trench shall be shaped to conform to "Class C" bedding, as per the American Concrete Pipe Association's Concrete Pipe Handbook. The pipe shall be carefully examined for defects and the inside cleaned. After placing pipe in ditch, the ends shall be wiped free from all dirt, sand, and foreign material. The joints shall then be made in accordance with the recommendations of the pipe manufacturer.

All pipe shall be handled and installed in strict accordance with the manufacturer's printed instructions.

A copy of the installation manual shall be furnished to the Engineer prior to placing pipe on the job site.

## SITE DRAINAGE

Direction of Laying: The laying of pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. All pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered so that when laid they will form a sewer with a uniform invert in a straight line.

Install in accordance with applicable provisions of American Concrete Pipe Association "Concrete Pipe Field Manual", unless otherwise indicated.

Place circular concrete pipe with elliptical reinforcing so that reference lines indicating top of pipe are not more than 5 degrees from vertical plane through longitudinal axis of pipe.

Protecting Underground Surface Structures: Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains sewers, and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense under the direction of the Engineer.

Unsuitable Conditions: No pipe shall be laid in water, or when the trench conditions or weather is unsuitable for such work, except by permission of the Engineer.

### INSPECTION AND CLEAN-UP:

Inspection: It is imperative that all storm pipe, inlets, junction boxes clean-outs, headwalls, endwalls, wingwalls, and mitered end sections be built according to the plans and that the Contractor adhere rigidly to the specifications for material and workmanship.

On completion of each section of pipe, or such other time as the Engineer may direct, the section of pipe is to be cleaned, and inspected. All repairs shown necessary by the inspections are to be made, broken or cracked pipe replaced, all deposits removed and the pipe left true to line and grade as herein specified, or shown on the plans, entirely clean and free from lumps and ready for use. Each section of the pipe between structures is to show from either end on examination, a full circle of light. Each appurtenance to the system shall be of the specified size and form, be neatly and substantially constructed, with the top set permanently to exact position and grade.

Clean-up: Before final inspection and acceptance, the Contractor shall clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, to as good as condition as existed before work started. All trenches shall be leveled and loose material removed from pavement gutters and sidewalks, employing hand labor, if necessary. Contractor shall flush drainage system at end of all construction.

END OF SECTION 02500

## **SECTION 02513 - ASPHALT CONCRETE PAVING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification sections in the project manual, apply to work of this section. The standard specifications referenced in this section refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

#### **DESCRIPTION OF WORK:**

Asphaltic concrete is to be F.D.O.T. Type SP-12.5.

Extent of asphalt concrete paving work is shown on drawings. Install asphalt in one inch course lifts.

Prepared base is specified in earthwork, and appropriate base sections.

#### **SUBMITTALS:**

**Material Certificates:** Provide three copies of materials certificates, signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide three copies of the design mix certifying mix complies with technical specifications. All submittals must be approved by the Engineer prior to installation or construction. If not approved, the Contractor may be required to remove and replace at his own expense.

#### **QUALITY ASSURANCE:**

**Codes and Standards:** Comply with FDOT Standard Specifications, latest edition, and with local governing regulations if more stringent than herein specified.

#### **SITE CONDITIONS:**

**Weather Limitations:** Apply prime and tack coats when ambient temperature is above 40°F (4° C), and when temperature has not been below 35° F (1° C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

Construct asphalt concrete surface course when atmospheric temperature is above 40° F (4° C), and when base is dry. Base course may be placed when air temperature is above 30° F (-1° C) and rising.

**Grade Control:** Establish and maintain required lines and elevations.

## **PART 2 - PRODUCTS**

### **MATERIALS:**

General: Use locally available materials and gradations, which exhibit a satisfactory record of previous installations.

Coarse Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.

Sand prepared from stone, blast-furnace slag, or gravel, or combinations thereof may be used if required to suit local material availability.

Mineral Filler: As per sections 917-1 and 917-2 of the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

Asphalt Cement: Superpave PG asphalt binders as per section 916-1, FDOT Standard Specifications for Road and Bridge Construction, latest edition.

Prime Coat: Cut-back asphalt type; AASHTO M 82 (ASTM D 2027) MC-30, MC-70 or MC-250.

Tack Coat: Emulsified asphalt; AASHTO M 140 (ASTM D 977) or M 208 (D 2397); SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

Reclaimed Asphalt Pavement (RAP): Only in strict accordance with FDOT specifications. Submit certified information to demonstrate compliance with FDOT specifications.

Lane Marking Paint: Paint shall meet or exceed Federal Specification TT-P-1952B and conform to the reflective requirements of FDOT Specifications.

### **ASPHALT-AGGREGATE MIXTURE:**

Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with ASTM D 3515 and as recommended by the FDOT to suit project conditions.

## **PART 3 - EXECUTION**

### **SURFACE PREPARATION:**

Remove loose material from compacted base surface immediately before applying prime coat.

Proof roll prepared base surface to check for unstable areas and areas requiring additional compaction.

Notify Engineer of unsatisfactory conditions. Do not begin paving work until deficient base

## ASPHALT CONCRETE PAVING

areas have been corrected and are ready to receive paving.

Prime Coat: Apply at rate of 0.15 to 0.20 gal. per 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.

Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

Allow to dry until at proper condition to receive paving.

Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

### PLANT MIX ASPHALTIC SURFACE COURSE:

General: This item shall consist of a wearing surface constructed of asphaltic concrete on a prepared base, in accordance with the plans and specifications.

Materials: The materials and construction methods shall comply with those set forth for Asphaltic Concrete wearing course in the latest edition of the Standard Specifications, Section 330 and 334.

The asphaltic cement shall meet the requirements of section 916-1, FDOT Standard Specifications for Road and Bridge Construction, latest edition. Performance grade 64-22, 67-22, or 76-22.

Job Mix Formula: Job mix to conform with the latest edition of the FDOT Standard Specifications for Road and Bridge Construction, Section 334, for traffic level "A".

Thickness: The thickness of the surface shall be as shown on the construction plans. This requirement shall be checked by cores and where a deficiency of more than 1/4" exists, the Contractor shall be required to correct the deficiency either by replacing the full thickness or overlaying the area to the satisfaction of the Engineer.

### PLACING MIX:

General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at temperature complying with Section 330-9.1.2 of the FDOT Standard Specifications for Road and Bridge Construction, latest edition. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

## ASPHALT CONCRETE PAVING

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.

### ROLLING:

General: Begin rolling when mixture will bear roller weight without excessive displacement or undesirable effects on the mixture and to achieve the specified density. As per Section 330-10, FDOT Standard Specifications for Road and Bridge Construction, latest edition.

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

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.

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

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.

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.

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.

### TRAFFIC AND LANE MARKINGS:

Cleaning: Sweep and clean surface to eliminate loose material and dust.

Striping: All striping shall be thermoplastic as per FDOT Specification 711.

Color: White Yellow, and Blue (Whichever is required)

Apply paint with mechanical equipment to produce uniform straight edges.

## ASPHALT CONCRETE PAVING

### FIELD QUALITY CONTROL:

General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer. Contractor to replace asphalt removed for testing purposes.

Testing and Inspection Service: Contractor to engage a geotechnical testing laboratory (engineer registered in Florida) to perform all testing and sampling and inspection service for quality control. Contractor to replace all materials used for testing.

A minimum of one core and density test per 500 square yards of asphalt shall be made to determine pavement thickness and density. Location and intervals shall be determined by the Engineer. Acceptance of in-place field density tests shall be based on the laboratory compacted density of the approved design mix, as per FDOT FM1-T166. In-place field densities shall not be less than 93% of the design mix laboratory compacted density. Engineer shall determine location of cores and test.

Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

Base Course: 1/2", plus or minus.

Surface Course: 1/4", plus or minus.

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

Base Course Surface: 1/4".

Wearing Course Surface: 3/16".

Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4".

Check surface areas at intervals as directed by Engineer.

END OF SECTION 02513

## **SECTION 02519 – GRADED AGGREGATE BASE**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification Sections in this project manual, apply to work of this section.

#### **DESCRIPTION OF WORK:**

This item shall consist of a base course composed of graded aggregate constructed on a subgrade prepared in accordance with the specifications and in conformity with the line, grades and typical cross-section as shown on the drawings. The construction methods shall conform to the requirements of Section 204 of the Florida Department of Transportation (FDOT) Standards Specifications, latest edition.

### **PART 2 - PRODUCTS**

#### **MATERIALS:**

All material shall be secured from sources approved by the Engineer and shall be furnished by the Contractor. Graded Aggregate material shall conform to Sections 901 and 902 of the FDOT Standard Specifications, latest edition.

#### **EQUIPMENT:**

The aggregate shall be spread by mechanical aggregate spreaders, equipped with a device which strikes off the aggregate uniformly to laying thickness and capable of producing an even distribution of the aggregate. For crossovers, intersections and ramp areas; for roadway widths of 20 feet or less; for the main roadway area when forms are used and for any other areas where the use of a mechanical spreader is not practicable; spreading may be done by bulldozers or blade graders. All equipment for proper construction of this project shall be in first-class working condition.

### **PART 3 – EXECUTION**

#### **TRANSPORTING GRADED AGGREGATE:**

The graded aggregate shall be transported to the point where it is to be used, over aggregate previously placed if practicable, and dumped on the end of the preceding spread. Hauling over the subgrade and dumping on the subgrade will be permitted when, in the Engineer's opinion, these operations will not be detrimental to the base.

SPREADING GRADED AGGREGATE:

Method of Spreading: The graded aggregate shall be spread uniformly. All segregated areas of fine or coarse aggregate shall be removed and replaced with properly graded aggregate.

Number of Courses: When the specified compacted thickness of the base is greater than six inches, the base shall be constructed in two courses. The thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without disturbing the subgrade. When compacted thickness is less than six inches, graded aggregate shall be placed in one lift.

COMPACTING AND FINISHING BASE:

Single-Course Base: For single-course base, after the spreading is completed, the entire surface shall be scarified and than shaped so as to produce the required grade and cross section after compaction.

Double-Course Base: For double-course base, the first course shall be cleaned of foreign material and bladed and brought to a surface cross section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, the density tests for the lower course shall be made and the Engineer shall have determined that the required compaction has been obtained. After the spreading of the material for the second course is completed, its surface shall be finished and shaped so as to produce the required grade and cross section after compaction, and free of scabs and lamination.

Moisture Content: When the material does not have the proper moisture content to insure the required density, wetting or drying will be required. 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 involve manipulation, as a unit, of the entire width and depth of the course which is being compacted.

DENSITY REQUIREMENTS:

As soon as proper conditions of moisture are attained, the material shall be compacted to a minimum soil density of 98% of the Modified Proctor Test (ASTM D1557).

TESTING SURFACE, PROTECTION, AND MAINTENANCE:

Testing shall be performed by a geotechnical laboratory with Engineer registered in Florida. Contractor to pay for testing. The Contractor is to replace all material used for testing. Contractor shall cooperate and coordinate with testing laboratory.

Density Tests:

At least at least one density determinations per 500 square yards shall be made at locations determined by the Engineer. Additional determinations may be made if deemed necessary by the Engineer.

During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density tests on the finished base.

Correction of Defects:

Contamination of Base Material: If, at anytime, the subgrade material should become mixed with the base course materials, the Contractor shall, without additional compensation, dig out and remover the mixture, reshape and compact the subgrade and replace the materials removed with clean base material, which shall be shaped and compacted as specified above.

Cracks and Checks: If cracks or checks appear in the base, either before or after priming, which, in the opinion of the Engineer, would impair the structural efficiency of the base, the Contractor shall remove the cracks or checks by rescarifying, reshaping, adding base material where necessary, and recompacting.

Compaction of Widening Strips:

Where base construction consists of widening strips and the trench width is not sufficient to permit use of standard blade compaction equipment, compaction shall be accomplished by use of vibratory compactors, trench rollers or other special equipment which will achieve the density requirements specified herein.

When multiple-course base construction is required by the plans or specifications, the required compaction shall be achieved in each course prior to spreading material for the overlaying course.

Testing Surface:

The finished surface of the base course shall be checked with a template cut to the required crown and with a 15-foot straight-edge laid parallel to the centerline of the road. All irregularities greater than ¼ inch shall be corrected by scarifying and removing or adding aggregate as required, after which the entire area shall be recompacted as specified herein before. In the testing of the surface, the measurements will not be taken in small holes caused by individual pieces of aggregate having been pulled out by the grader.

Priming and Maintaining:

Priming: The prime coat shall be applied only when the base meets the specified density requirements and the moisture content in the top half of the base does not exceed 90 percent of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding and in such condition that no undue distortion will occur.

Maintaining:

The Contractor will be responsible for assuring that the true crown and template are maintained, with no rutting or other distortion, and that the base meets all the requirements, at the time the surface course is applied.

Thickness Requirements:

Measurements: Thickness of the base shall be measured at intervals in such a manner that each test represents 500 square yards, or as otherwise directed by the Engineer. Measurements shall be taken at various points on the cross section, through holes not less than three inches in diameter.

Areas Requiring Correction: Where the compacted base is deficient by more than ½ inch from the thickness called for in the plans, the Contractor shall correct such areas by scarifying and adding aggregate. The base shall be scarified and aggregate added for a distance of 100 feet in each direction from the edge of the deficient area. The affected areas shall then be brought to the required state of compaction and to the required thickness and cross section.

END OF SECTION 02519

## **SECTION 02520 - PORTLAND CEMENT CONCRETE PAVING**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specification Sections in this project manual, apply to this section.

#### **SUMMARY**

Extent of Portland cement concrete paving is shown on drawings.

Prepared sub-grade is specified in "Earthwork" section.

#### **SUBMITTALS**

Provide samples, manufacturer's product data, test reports, and materials' certifications as required by Engineer and specifications for concrete and joint fillers and sealers.

#### **QUALITY ASSURANCE**

Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

#### **JOB CONDITIONS**

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

Utilize flagmen, barricades, warning signs and warning lights as required.

### **PART 2 - PRODUCTS**

#### **MATERIALS**

##### **Materials and Mix:**

All materials used for concrete, and the design of all concrete mixes, shall conform with the recommendations of the American Concrete Institute (ACI 318). All concrete shall develop a 28-day compressive strength of 3000 psi. If any concrete should fail to meet the strength requirement the structure shall be removed as necessary to remove the defective concrete and shall then be rebuilt. Use Type I cement for all concrete.

Forms: Steel, wood, or other suitable material of size and strength to resist movement

## PORTLAND CEMENT CONCRETE PAVING

during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

Use flexible spring steel forms or laminated boards to form radius bends as required.

Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

Furnish in flat sheets, not rolls, unless otherwise acceptable to Engineer.

Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 60 steel bars, unless otherwise indicated.

Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with the ends square and free of burrs.

Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

Concrete Materials: Portland Cement - ASTM C 150, Type I, unless otherwise acceptable to Engineer.

Use one brand of cement throughout project, unless otherwise acceptable to Engineer.

Expansion Joint Materials: Submit specifications to Engineer for approval.

Liquid-membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Moisture loss can be no more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

Products: Subject to compliance with requirements, provide one of the following:

"Masterseal"; Master Builders.

"A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.

## PORTLAND CEMENT CONCRETE PAVING

"Ecocure"; Euclid Chemical Co.  
"Clear Seal"; A. C. Horn.  
"J-20 Acrylic Cure"; Dayton Superior.  
"Sure Cure"; Kaufman Products Inc.  
"AR -3011 W.R. Meadows. "Spartan-Cote"; The Burke Co.  
"Sealkure"; Toch Div. - Carboline.  
"Kure-N-Seal"; Sonneborn-Contech.  
"Polyclear"; Upco Chemical/USM Corp.  
"L&M Cure"; L & M Construction Chemicals.  
"Klearseal"; Setcon Industries.  
"ILR-152"; Protex Industries.  
"Hardtop"; Gifford - Hill.

Bonding Compound.: Polyvinyl acetate or acrylic base, rewettable type.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following;

Products: Subject to compliance with requirements, provide one of the following:

"J-40 Bonding Agent"; Dayton Superior Corp.  
"Weldcretell; Larsen Products.  
"Intralok"; W.R. Meadows.  
"Everbond"; L & M Construction Chemicals.  
"EucoWeld"; Euclid Chemical Co.  
"Hornweld"; A. C. Horn.  
"Sonocrete"; Sonneborn-Contech.  
"Acrylic Bondcrete"; The Burke Co.

Epoxy Adhesive: ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

Available Products: Subject to compliance with requirements, products that may be incorporated in the work include but are not limited to the following;

Products: Subject to compliance with requirements, provide one of the following:

"Epoxtite"; A. C. Horn.  
"Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.  
"Sikadur Hi-Mod"; Sika Chemical Corp.  
"Euco Epoxy 463 or 615"; Euclid Chemical Co.  
"Patch and Bond Epoxy"; The Burke Co.  
"Sure-Poxy"; Kaufman Products Inc.

## PORTLAND CEMENT CONCRETE PAVING

### CONCRETE MIX, DESIGN, AND TESTING

Comply with requirements of ASTM C 94, sections for ready mix and as herein specified.

Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

Compressive Strength: 3000 psi, minimum at 28 days, unless otherwise indicated. W/C ratio 0.58 maximum (non air-entrained), 0.46 maximum (air-entrained).

Slump Range: Not more than 8" after addition of HRWR admixture (superplasticizer) to verified 2"-3" slump; not more than 3" for ramps, slabs, and sloping surfaces; not more than 4" for other concrete.

Air Content: 5 to 8 percent.

All sampling and testing shall be conducted by a Geotechnical Testing laboratory (Engineer registered in the state of Florida). Contractor to pay for testing. Submit test results directly to the Engineer. The following test shall be taken:

28 day compressive test of concrete, minimum of 3 test cylinders per 50 cubic yards of concrete poured. If less than 50 cubic yards is poured, then a minimum of three test cylinders per day.

Air content, minimum one test for each day's pour.

Slump test, minimum three tests per 50 cubic yards of concrete poured. If less than 50 cubic yards is poured, then a minimum of three tests per day.

Contractor shall replace materials removed for testing purposes.

Should any work or materials fail to meet the requirements set forth in the plans and specification, Contractor shall pay for retesting of same.

Contractor shall notify the testing laboratory 24 hours prior to work being ready for testing. Contractor shall coordinate with and assist testing laboratory.

### **PART 3 - EXECUTION**

#### SURFACE PREPARATION

## PORTLAND CEMENT CONCRETE PAVING

Remove all loose material from compacted sub-grade surface immediately before placing concrete.

The sub-grade shall be uniformly graded, compacted, and thoroughly dampened. There shall not be any soft or muddy spots, or free standing water on the sub-grade.

Proof-roll prepared sub-base surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

### FORM CONSTRUCTION

Set forms to the required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

Check completed formwork for grade and alignment to following tolerances:

Top of forms not more than 1/8 inch in 10 feet.

Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.

Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

### REINFORCEMENT

Comply with concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and support, and as herein specified.

Clean reinforcement of loose rust and mill, scale, earth, ice, and other materials that reduce or destroy bond with concrete.

Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

## PORTLAND CEMENT CONCRETE PAVING

### CONCRETE PLACEMENT

General: Comply with requirements of ACI 304 sections for mixing, transporting and placing concrete, and as herein specified.

Do not place concrete until subgrade and forms have been checked for line and grade. Moisten sub-grade if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Deposit and spread concrete in a continuous operation between transverse joints or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If interrupted for more than 1/2-hour, place a construction joint. Deposit concrete as nearly as practical to its final location to avoid segregation.

When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without injury.

Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

Place concrete in 2 operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike off and screed.

Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Engineer.

Curbs and Gutters: Automatic machines may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and

## PORTLAND CEMENT CONCRETE PAVING

laboratory test results that meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross sections, lines, grades, finish and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

### JOINTS

Expansion Joints: Provide pre-molded joint filler for expansion joints abutting concrete curbs, valve boxes, manholes, structures, walks and other fixed objects, unless otherwise indicated. Extend joint fillers full width and depth of joint, not less than ½ inch or more than 1 inch below finished surface where joints sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint. Locate expansion joints at 10' on center or as otherwise required or noted on plans.

Filler and Sealants: Sonolastic SL2 sealant, Submit specifications to Engineer for approval.

Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than ½ hour, except where such placements terminate at expansion joints. Locate and install construction joints so as not to impair strength and appearance of the structure, as acceptable to Engineer.

Isolation Joints in Slabs-on-Ground Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces.

Control Joints: at intervals not greater than half the width of the walk/slab (see plans). The concrete shall be scored (not saw-cut) to a depth equal to one-third (1/3) the total depth of the concrete.

### CONCRETE FINISHING

After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide a continuous smooth finish.

## PORTLAND CEMENT CONCRETE PAVING

Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Engineer. Wash broom clean of excess and dried concrete as necessary during finishing operations.

On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

Burlap finish by dragging a seamless strip of damp burlap across concrete, perpendicular to line of traffic. Repeat operation to provide a gritty texture acceptable to Engineer.

Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

### CURING

General: Protect freshly poured concrete from premature drying and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from the surface after placing and finishing. Weather permitting keep continuously moist for not less than 7 days.

Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

Provide moisture curing by the following methods.

Keep concrete surface continuously wet by covering with water.

## PORTLAND CEMENT CONCRETE PAVING

Continuous water-fog spray.

Covering concrete surface with a specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provided coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

Provide moisture-cover curing as follows:

Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using materials and waterproof tape.

Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks and curbs, as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with the manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during period.

Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp proofing, ceramic or quarry tile, painting and other coatings and finish materials, unless otherwise acceptable to Engineer.

Curing Formed Surfaces: Cure formed concrete surfaces, including slabs, walks and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, walks and other flat surfaces by application of appropriate curing method.

Protect and cure finished concrete paving complying with applicable requirements of ACI 301. Use curing and sealing compound or approved moist-curing methods.

Seal per manufacturer's recommendations.

### REPAIRS AND PROTECTIONS

## PORTLAND CEMENT CONCRETE PAVING

Repair or replace broken or defective concrete, as directed by Engineer.

Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage they occur.

Sweep concrete pavement and wash free of stains, dirt, and other foreign material just before final inspection.

END OF SECTION 02520

## **SECTION 02556 - WATER DISTRIBUTION AND SERVICE LINES**

### **PART 1: GENERAL**

#### **1.1 GENERAL DESCRIPTION OF WORK COVERED**

The contractor shall furnish and install all pipes, fittings, structures and accessories required for water distribution and/or service lines in accordance with the requirements of the Construction Plans and related Contract Documents.

Drawings and general provisions of contract, including General and Supplementary Conditions and other specifications sections in this project manual apply to the work of this section.

#### **1.2 QUALITY ASSURANCE**

##### **AWWA Standards**

Construction materials and methods shall comply with the requirements of the latest published edition of American Water Works Association (AWWA) Standards. Applicable standards include, but may not be limited to, the following:

1	<b>AWWA C104</b>	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
2	<b>AWWA C105</b>	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
3	<b>AWWA C110, C110a</b>	Gray Iron and Ductile Iron Fittings, 2-inch through 48-inch for Water and Other Liquids
4	<b>AWWA C111</b>	Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings
5	<b>AWWA C151</b>	Ductile Iron Pipe, Centrifugally Cast in Metal Mold or Sand Lined Molds, for Water or Other Liquids
6	<b>AWWA C153</b>	Ductile Iron Compact Fittings, 3-inch through 12-inch for Water and Other Liquids
7	<b>AWWA C213</b>	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
8	<b>AWWA C301</b>	Prestressed Concrete Cylinder Pipe (PCCP), 16-inch and Larger
9	<b>AWWA C502</b>	Fire Hydrants
10	<b>AWWA C504</b>	Butterfly Valves
11	<b>AWWA C509</b>	Gate Valves

12	<b>AWWA C550</b>	Protective Epoxy Interior Coatings for Valves and Hydrants
13	<b>AWWA C600</b>	Installation of Ductile Iron Water Main and Appurtenances
14	<b>AWWA C605</b>	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
15	<b>AWWA C651</b>	Disinfection Water Mains
16	<b>AWWA C800</b>	Underground Service Line Valves and Fittings
17	<b>AWWA C900</b>	Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 12-inch for Water
18	<b>AWWA C901</b>	Polyethylene Pressure Pipe and Tubing 1/2-inch through 3-inch
19	<b>AWWA C905</b>	Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch and Larger

### **ASTM Standards**

In addition, construction materials and methods shall also comply with the requirements of the latest published editions of the American Society for Testing and Materials (ASTM) Standards.

## **PART 2: MATERIALS AND EQUIPMENT**

### **2.1 GENERAL**

All pipe, fittings and accessories shall be new, and shall be suitable and rated for potable water use, and carry NSF seal.

### **2.2 DELIVERY, STORAGE, AND HANDLING**

Certificates of Compliance with the Specifications shall be required for all materials used on the Project. All materials shall be protected during transportation, storage, handling, and installation to avoid physical damage. All materials shall be stored to prevent physical deterioration due to sun and weather. The City of Milton reserves the right to reject material which in any way does not meet the requirements of these Specifications.

### **2.3 WATER MAINS**

#### **2.3.1 Polyvinyl Chloride Pipe (PVC)**

PVC pipe shall meet AWWA Standard C900 or C905, or ASTM Standard D2241, with minimum designations per Table 2.3.1 below. PVC pipe shall be provided

with push-on joints with the bell integrally cast into the pipe. PVC pipe shall be installed with elastomeric gaskets meeting ASTM Standard F477.

<b>TABLE 2.3.1 - PVC PIPE STANDARDS</b>					
<b>Standard</b>	<b>Nominal Size</b>	<b>Dimension Ratio</b>	<b>OD</b>	<b>Pressure Class (psi)</b>	<b>Pressure Rating (psi)</b>
AWWA C900	4-inch thru 12-inch	DR25	CI	100	(165)*
AWWA C905	14-inch thru 36-inch	DR25	CI	(100)*	165
ASTM D224I	2-inch thru 3-inch	SDR26	IP	(95)*	160

\*Pressure class and rating designations shown in parentheses are nominal designations.

### 2.3.1.1 **Markings**

PVC pipe shall be marked to indicate the following:

1. Nominal Pipe Size and OD Base
2. Material Code Designation
3. Dimension Ratio
4. Pressure Class or Pressure Rating
5. Manufacturer's Name or Trademark
6. National Sanitation Foundation Approved Marking
7. Appropriate AWWA or ASTM Standard Number

### 2.3.1.2 **Color-Coding**

PVC water pipe shall be color-coded blue in accordance with AWWA Standards. If blue pigmented pipe is not available, white pipe may be substituted subject to the approval of the City Of Milton. White pipe used for potable water shall be marked with 3 blue stripes (1/2 inch wide) in permanent ink along the entire length and evenly spaced around the pipe circumference with the word *WATER* in 3/4-inch letters every 21 inches along each stripe.

### 2.3.2 **Ductile Iron Pipe (DIP)**

Ductile iron pipe shall meet AWWA Standard C151 and pressure class based on Table 2.3.2 below for design operating pressures of up to 150 psig, installed in Class 2 Trenching conditions. Increase pressure class or bedding class as required by AWWA C151 for surface loads greater than indicated above or operating pressures greater than 150 psi. DIP shall be constructed with push-on

joints using rubber gaskets in accordance with AWWA Standard C111. Other methods of joint construction, such as mechanical, flanged, or ball-and-socket, may be required in special applications as appropriate. DIP shall be lined in accordance with AWWA Standard C104, unless otherwise specified and approved.

**TABLE 2.3.2 - DI PRESSURE CLASSES**

<b>Diameter</b>	<b>Class</b>	<b>Max. Depth of Bury</b>
3-inch & 4-inch	350	32 feet
6-inch & 8-inch	350	28 feet
10-inch & 12-inch	350	14 feet
14-inch thru 20-inch	250	10 feet
24-inch thru 64-inch	200	8 feet

**2.3.2.1 Markings**

Each ductile iron pipe section shall be marked to indicate the weight class or nominal thickness, and casting period. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters *DI* or *DUCTILE* shall be cast or stamped on the pipe. All required markings shall be clear and legible, and all cast marks shall be on or near the bell. All letters and numerals on pipe sizes 14-inch and larger shall be not less than 0.5-inch in height.

**2.3.2.2 Encasement**

When required, DIP shall be encased in polyethylene material in accordance with AWWA Standard C105.

**2.3.3 Polyethylene Pipe (PE)**

The pipe supplied under this specification shall be high performance, high molecular weight, high density polyethylene pipe and shall conform to ASTM D 1248 (Type III C, Class C, Category 5, p34). Minimum cell classification values shall be 345434C as referenced in ASTM D 3350 - latest edition. All pipe resin shall be manufactured by the same company that manufactures the pipe itself in accordance with these specifications to insure complete resin compatibility and total product accountability. The fittings shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe. To insure compatibility of polyethylene resins, all fittings supplied under this specification shall be of the same manufacture as the pipe being supplied.

<b>TABLE 2.3.3 - TYPICAL PHYSICAL PROPERTIES OF PE PIPE</b>			
<b>Property</b>	<b>Test Method</b>	<b>Unit</b>	<b>Value</b>
Density	ASTM D1505	gms/cc	0.957
Melt Flow	ASTM D 1238 (190/21.60)	gms/ 10 min.	1.5
Environmental Stress Cracking Resistance Condition A, B & C, F_ Compressed Ring, F_	ASTM D1693 Proposed ASTM	hrs. hrs.	>5000 >5000
Tensile Strength, Ultimate Type IV Specimen	ASTM D 638 (2"/min.)	psi	5000
Tensile Strength, Yield Type IV Specimen	ASTM D 638 (2"/min.)	psi	3500
Elongation at Break Type IV Specimen	ASTM D 638 (2"/min.)	%	>600
Impact Strength Specimen Thickness 0.125 inch	ASTM D 256 Method A	ft.lbs./inch notch	>12
Vicat Softening Temperature	ASTM D 1525	_F	257
Brittleness Temperature	ASTM D 746	_F	<-180
Flexural Modulus	ASTM D 3350	psi	125,000
Hardness	ASTM D 2240	Shore D	65
Coefficient of Linear Thermal Expansion Molded Specimen Extruded Pipe	ASTM D 696	in./in./_F	8.3x10 <sup>-5</sup> 1.2x10 <sup>-4</sup>
Thermal Conductivity	Dynatech-Colora Thermoconductor	TRU, in./ ft. <sup>2</sup> /hrs./_F	2.7
Long Term Strength 73_F 140_F	ASTM D 2837	psi psi	1600 800
Material Cell Classification	ASTM D 3350		355434C
Material Designation	PPI		PE 3408

### 2.3.3.1 Quality Control

The resin used for manufacture of the pipe shall be manufactured by the pipe manufacturer, thus maintaining complete control of the pipe quality. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties.

The polyethylene resin used shall have all ingredients pre-compound prior to extrusion of pipe; in plant blending is not acceptable.

The Engineer may request, as part of the quality control records submittal, certification that the pipe produced is represented by the quality assurance testing. Additionally, test results from manufacturer's testing or random manufacturer's representation, may be cause for rejection of pipe represented by the testing. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM D 3350, 10.1.9.

#### Verification

The Owner or the specifying Engineer may request certified lab data to verify the physical properties of the materials supplied under this specification or may taken random samples and have them tested by an independent laboratory.

#### Rejection

Polyethylene pipe and fittings may be rejected for failure to meet any of the requirements of this specification.

#### Pipe Dimensions

Pipe supplied under this specification shall have a nominal IPS (Iron Pipe Size) O.D. unless otherwise specified. Pipe shall have a SDR (Standard Dimension Ratio) of 11.

### 2.3.4 **Alternate Pipe Material**

The City of Milton may consider other pipe materials as appropriate for the needs of the Project. Alternate pipe materials identified during design and approved for use on the Project shall be noted on the Construction Plans, and a detailed Technical Specification shall be prepared and included in the Contract Documents.

## 2.4 **WATER MAIN APPURTENANCES**

### 2.4.1 **Water Main Fittings**

Water main fittings shall include Tees, Wyes, Bends, Reducers, and other appurtenances commonly used in pipe construction. Fittings shall meet AWWA Standard C110 or C153 with pressure ratings of not less than that specified for adjacent pipe. Fittings shall be constructed with mechanical joints, unless otherwise specified, and shall be supplied complete with low alloy bolts and nuts, EPR gaskets and other necessary parts required for field assembly. Fittings shall be cement-mortar lined in accordance with AWWA Standard C104/A21.4.

#### 2.4.1.1 **Pipe Couplings**

Pipe couplings shall be solid sleeve type with mechanical joints at each end containing and compressing a gasket. Couplings shall be ductile iron, 12 inches minimum in length, with low alloy bolts and nuts, and EPR gaskets. Rings and gaskets shall be sized to conform exactly to the requirements of the pipe manufacturer.

**2.4.1.2 Pipe Cut-in Sleeves**

Cut-in sleeves shall be solid ductile iron, one end plain for insertion to female fitting, the other end flanged mechanical joint, furnished with loose attaching flange and fastener, nominal length of 20-21 inches. Specify pipe main size and type of pipe fabrication.

**Approved Manufacturers**

<b>Manufacturer</b>	<b>Model</b>	<b>Application</b>
Clow	F-1220	for centrifugally cast or sand cast pipe (special)
Clow	F-3459	for all classes of centrifugally cast pipe
Union Foundry	21-4520 21-4610 24-4800	MJ X PE FLG X PE MJ X FLG
Clow	F-3459	for all classes of centrifugally cast pipe
Others as approved by the City of Milton in writing.		

**2.4.1.3 Repair Clamps**

Repair clamps shall not be used in the installation of new pipe except with the written permission of the Engineer. Repair clamps shall be full circle and selected based on Table 2.4.1.3 below.

<b>TABLE 2.4.1.3 - REPAIR CLAMP SIZES</b>	
<b>Pipe Diameter</b>	<b>Maximum Sections</b>
Up to 12-inch	Single Section
14-inch to 24-inch	Double Section
26-inch and above	Triple Section

Repair clamps shall be composed of stainless steel bands and bolts, DI lugs and full gridded virgin EPR compounded gasket.

Repair clamps shall be sized so that the OD of the existing pipe being repaired falls within the designated range for the clamp size. Repair clamps shall have ample length to give full gasketing at both ends.

**Approved Manufacturers**

<b>Manufacturer</b>	<b>Model</b>
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Ford	FS1 (all SS), Fordflex (SS-DI Lugs)
Rockwell	2XX*
JCM	101,102,103,104,131,132,133,134
Mueller	520, 530
'Others as approved by the City of Milton in writing.	

\*XX: See Mfr.'s catalog to complete model numbers by size.

#### 2.4.1.4 Pipe Restraints

Retainer glands shall be used on all water line fittings and appurtenances, unless otherwise approved. Stainless steel all-thread tie rods may otherwise be used, with the expressed written permission of the Engineer. In cases of tees, tapping sleeves, and flushing hydrants, the fitting shall be restrained with retainer glands and thrust blocks. See Detail Sheets.

##### Approved Manufacturers

Manufacturer	Model
Ebaa Iron Works	MegaLug
Others as approved by the City of Milton in writing.	

#### 2.4.1.5 Expansion Joints

Expansion joint fittings shall be used where specified on the Construction Plans. They shall be of the rigid or flexible type as specified, and manufactured of ductile iron in accordance with 2.4.1 above. They shall be capable of expanding or contracting to the extent shown on the plans, but in no case less than 4-inch axially, and designed to prevent separation beyond the maximum extension without the use of external tie rods.

Fittings shall be provided with restrained mechanical joints, individually pressure tested to a minimum of 350 psi against their own restraints, and internally coated on all exposed surfaces with a minimum of 15 mils. of fusion bonded epoxy conforming to AWWA C213. They shall be capable of deflecting not less than 15° by means of an integral ball at each joint in the case of flexible types.

##### Approved Manufacturers

Type	Manufacturer	Model
Rigid	EBAA Iron, Inc.	EX-TEND 200
Flexible	EBAA Iron, Inc.	Flex-Tend
Others as approved by the City of Milton in writing.		

### 2.4.1.6 Tapping Sleeves

Tapping sleeves shall be mechanical joint or fabricated-type designed for a working pressure of 200 psig without leakage. The outlet branch connection shall have a recessed flanged face for connection of tapping valve with standard dimensions in accordance with MSS SP-60. A complete set of neoprene or other elastomer gaskets shall be furnished. Sleeves shall be furnished to fit cast iron, cement-asbestos, or Class 160 or C900/905 PVC pipe with side connection as shown on plans or specifications in standard pipe sizes of 4-inch X 4-inch through 16-inch X 12-inch. Sleeves shall be furnished with all necessary installation parts such as mechanical joint loose flange ends, bolts, fasteners, seals and gaskets.

#### Approved Manufacturers

Manufacturer	Main Material	Model
Clow	CI & C900 PVC Class 50, 100, 150, 200 10-inch & 12-inch Class 50, 100	F-5205 F-5207 4 F-5205
American Darling	CI & C900 PVC CI & CA	2800C 2800A
Mueller	CI, DI - 4-inch - 12-inch CA - 4-inch - 8-inch CI Class C & D - 10-inch - 14-inch CA - 4-inch-12-inch	H615 H615 H616 H619
M & H	MJ Class A-B Pipe MJ Class C-D Pipe	1174 1274
Others as approved by the City of Milton in writing		

*Note: To specify exact fitting when ordering, state line diameter and line material.*

#### Mechanical Joint Tapping Sleeves

Mechanical joint tapping sleeves shall be cast iron with mechanical joint main ends and a standard special dimension tapping machine attaching flange on the branch connection. The sleeve shall be of split sleeve configuration and fabricated in accordance with AWWA Specification C-110 with joints to AWWA Specification C-111.

#### Fabricated Tapping Sleeves

Fabricated tapping sleeves shall be the high-strength type having a wide body, made of 285 Grade C steel, which conforms to and reinforces the pipe to be tapped. Body length must be at least twice that of the tap size. The sleeve shall have, as a minimum, a 7/8-inch wide recessed Buna-N gasket around the outlet, and 3/4-inch high-strength corrosion resistant alloy bolts. Sleeve to be furnished with manufacturer's standard corrosion resistant coating.

### Approved Manufacturers

Manufacturer	Model
JCM Industries	Model 412
Smith & Blair	622
Ford	FTS
Others as approved by Pensacola Christian College in writing.	

### 2.4.1.7 Pipe Hangers and Supports

Hangers and supports shall be in compliance with Federal Specification WW-H-171E, or Manufacturer's Standardization Society SP-69, or UL listed. Materials of construction shall be in accordance with the requirements outlined in Table 2.4.1.7 below.

<b>TABLE 2.4.1.7 - PIPE HANGERS AND SUPPORTS MATERIALS OF CONSTRUCTION</b>	
Part I.D.	Material
Clamps	Steel - Epoxy Coated or Galvanized Cast Iron - Galvanized Malleable Iron
Hanger Rods	Steel - Electro Galvanized Steel - Stainless 304
Rollers/Bases/Roller Stands	Cast Iron
Fasteners/Fittings	Galvanized Steel Stainless
Hanger Rod Inserts	Steel: Cadmium Plated Steel: Galvanized Universal Concrete Insert - Cast Iron - Galvanized
Rod Attachments	Clevis - Forged Steel Turnbuckle: 1) Forged Steel, 2) Malleable Iron Sockets, Eye Nuts, Extension - Malleable Iron
Rollers	Steel or Iron Core, Insulated from Structure

### Approved Manufacturers

Manufacturer	Part I.D.	Model No.
<i>ITT Grinnell</i>	Clevis Hanger	590
	Socket Clamp	224
		246
	<u>Concrete Inserts:</u> CB-Universal	282
	Screen Insert	152
	<u>Rod Attachments:</u>	

Eye Nut	290
Forged Clevis	299
Forged Turnbuckle	230
Carbon Steel	233
Couplings	136
Socket Eye	110R
Extension	157
<u>Pipe Rolls:</u>	
Adjustable Swivel	174
Adjustable Steel Yoke	181
Pipe Roll with Base	274
Pipe Roll and Plate	277
Others as approved by the City of Milton in writing.	

## 2.4.2 **Valves**

All valves shall be manufactured in accordance with the current appropriate AWWA Standard and shall be NSF approved for use in potable water.

### 2.4.2.1 **Resilient Seated Gate Valves**

Resilient seated gate valves shall be designed and fabricated in accordance with the current AWWA Standard C-509. The basic design of the gate valves shall have a cast iron body, elastomer encapsulated cast iron disc, bronze stem and operating nuts with non-rising stem design. The valve working pressure shall be 200 psig with a test pressure of 400 psig.

#### Materials and Construction

Valves shall open counterclockwise with a 2-inch square cast iron operating nut secured to the valve stem by a corrosion resistant nut to threads on the valve stem. The valve stem shall be made of high tensile strength bronze and shall be of one piece construction sealed by O-Rings. The thrust collar shall be secured in place by a stuffing box or bonnet cover with a thrust washer located above the thrust collar. Valve construction shall be so that upper O-Rings can be replaced with the valve in service. The disc shall be cast iron encapsulated with an elastomer material bonded in accordance with ASTM D429 and shall be secured to the threaded stem by a bronze nut. The disc shall effect a seal that is bubble-tight at 200 psig.

#### Corrosion Resistant Coatings

All interior and exterior cast iron surfaces shall be coated with fusion bonded epoxy in accordance with AWWA Standard C-550.

#### Body Sizing

Valve body length shall be per ANSI Standard B16.2 for the type of end  
Hamilton Bridge Rd Water Main Upgrade 2018-17 WATER DISTRIBUTION AND SERVICE LINE  
02556 - 11

connections specified. In the full open position, the valve internal bore shall be smooth and obstruction-free without cavities or projections that could accumulate solids. The internal cross-sectional area of the valve shall be approximately equal to the nominal cross-sectional area for Schedule 40 PVC pipe of the same nominal internal diameter.

End Connections

Valves shall be furnished with mechanical joint end connections, complete with flange kits, unless otherwise specified on the plans or purchase order.

When flanged ends are specified they shall be flat face nominal 125# ANSI B16.1 Standard with bolt holes straddling the vertical center line.

**Approved Manufacturers**

VALVE BODY CONNECTIONS				TAPPING VALVE
Manufacturer	MJ x MJ	MJ x FLG	FLG x FLG	MJ x SF
American Darling	4-inch - 12-inch CSR-80X	4-inch - 12-inch CSR-80X	CSR-80X Specify Ends	4-inch - 12-inch No. 862  16-inch - 24-inch*
Clow	2-inch - 12-inch F6100	4-inch - 12-inch F-6106	4-inch - 12-inch F-6102	4-inch - 12-inch F-6114  14-inch - 24-inch F-5093*
Kennedy	3-inch - 12-inch F-1571-XNRS	3-inch - 12-inch F-1572-XNRS	3-inch - 12-inch F-1561-XNRS	3-inch - 12-inch F-950X
M & H	4-inch - 12-inch S-4067-01		4-inch - 12-inch S-4067	2-inch - 12-inch H-667 200 PSI  14-inch - 24-inch H-667 150 PSI

Others as approved by the City of Milton in writing.

\*Metal seated only, specify bypass if required  
14-inch and larger valves specify special appurtenances.

**2.4.2.2 Resilient Seated Tapping Valves**

Resilient seated gate valves shall be designed and fabricated in accordance with the current AWWA Standard C-509. The basic design of the gate valves shall have a cast iron body, elastomer encapsulated cast iron disc, bronze stem and operating nuts with non-rising stem design. The valve working pressure shall be 200 psig with a test pressure of 400 psig.

### Materials and Construction

Valves shall open counterclockwise with a 2-inch square cast iron operating nut secured to the valve stem by a corrosion resistant nut to threads on the valve stem. The valve stem shall be made of high tensile strength bronze and shall be one piece construction sealed by O-Rings. The thrust collar shall be secured in place by a stuffing box or bonnet cover with a thrust washer located above the thrust collar. Valve construction shall be so that upper O-Rings can be replaced with the valve in service. The disc shall be cast iron encapsulated with an elastomer material bonded in accordance with ASTM D429 and shall be secured to the threaded stem by a bronze nut. The disk shall effect a seal that is bubble-tight at 200 psig.

### Corrosion Resistant Coatings

All interior and exterior cast iron surfaces shall be coated with fusion bonded epoxy in accordance with AWWA Standard C-550

### Body Sizing

Valve body length shall be per ANSI Standard B16.1 for tapping valves. Tapping valves shall conform to Specification AWWA C509, latest revision, covering gate valves except as modified for passage and clearance of tapping machine cutters. The opening through the valve shall be at least 1/4-inch larger than nominal valve diameter. Tapping valves shall allow full size shell cutters to be used.

### End Connections

Valves shall be furnished with one end of the body with projecting face flange in accordance with specification MSS SP-60 for tapping valve/saddle connections to bolt to a standard tapping sleeve and the other end for mechanical joint.

### **Approved Manufacturers**

*See Section 2.4.2.1 above.*

#### **2.4.2.3 Butterfly Valves**

All butterfly valves shall be of the rubber-seated, tight-closing type. They shall meet or exceed AWWA Standard C504. All valves must use full AWWA C504 Class 150B valve shaft diameter, and full Class 150B underground service operator torque rating throughout entire travel, to provide capability for operation in emergency service.

### Valve Construction

Valve body shall be high-strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high-strength cast iron ASTM A48 Class 40, having rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel self locked screws. Shaft shall be one piece ANSI 304 stainless steel. Bearings shall be sleeve-type, self lubricated with O-Ring seals.

Operators

Operator shall be of the traveling-nut type, sealed, gasketed, and lubricated for underground service. It shall be capable of withstanding an overload input torque of 450 ft. lbs. at full-open or closed position without damage to the valve or valve operator. Operator shall have operating nut or post indicator as specified.

End Connection

End connections shall be mechanical joint, wafer-type with flange meeting ANSI B16.1-125#, and furnished as specified.

**Approved Manufacturers**

<b>Manufacturer</b>	<b>Model</b>
Dresser	450
American Darling	Class 150
Clow	F-53XX*
M & H	450, 1450, 4500
Others as approved by the City of Milton in writing.	

\*XX: See Mfr.'s catalog to complete model numbers by size.

**2.4.2.4 Valve Boxes**

Valve boxes shall be provided for all direct buried valves. Use nominal 6-inch cast-iron sliding-type pipe shaft with cover and base casting. The box top shall be set at finished grade and encased with a concrete ring in unpaved area. Each valve box shall be furnished with a drop-in cover marked "WATER". See Detail Sheets.

**2.4.3 Line Stops**

Line stops are to be used where specified to temporarily stop water line water flow without depressurizing the entire line. The line stop parts and installation equipment are to be rated at a minimum of 200 psig working pressure unless otherwise specified.

**Materials and Construction**

Tapping saddles shall have 360° clamping on the main. Main sizes 4-inch - 8-inch to be fabricated of 304 Stainless Steel; 10-inch and greater to be fabricated Carbon Steel.

All bolts and fasteners are to be 304 Stainless Steel, and the saddle shall be installed with Buna-N or neoprene rubber full facing gasket.

The stopping device attaching nozzle to be vendor's standard with connecting threads or flange face, and the nozzle I.D. to be machine with a shelf to provide a position stop for the closure plug.

The closure plug is to be fabricated carbon steel, ductile iron, or malleable iron with at least one Buna-N or neoprene O-Ring seal on the outside diameter.

**Corrosion Resistant Coatings**

Non-stainless steel permanently installed parts to have manufacturer's standard red or black water base epoxy coating.

**Connection**

Tapping saddle shall be fabricated with dimensions to fit on concrete, steel, CA, PVC, CI, DI main as specified.

**Installation**

Temporary line stops shall only be installed by vendor personnel or contractor personnel trained and certified for stop by the vendor.

**Approved Manufacturers (Main Sizes 3/4-inch - 42-inch)**

Manufacturer	Contact
Hydra-Stop, Inc.	Phone: 800-538-7867 FAX: 708-389-5125
International Piping Services Co. (IPSCO)	Phone: 708-343-1333 FAX: 708-343-1435
Others as approved by the City of Milton in writing.	

**2.4.4 Location Aids**

All new water main and service line installations shall include an approved method for locating lines from the ground surface after completion.

**2.4.4.1 Tracer Wire**

Tracer wire for water lines shall be minimum 12 gauge copper with blue PVC

insulation. Tracer wire systems shall be electrically continuous covering all mains and services within the project. Wire-to-wire connectors shall be made with silicone-filled wire nuts. Wire-to-appurtenance attachments shall be made with lug-type terminals.

**Approved Manufacturers (Tracer Wire Silicone-filled Wire Nut Connectors)**

<b>Manufacturer</b>	<b>Model</b>
Ideal Industries	Twister® DB Plus
King Technology, Inc.	Failsafe™
Others as approved by the City of Milton in writing.	

**2.4.4.2 Pipeline Markers**

Markers shall be of a passive electronic type that reflects a signal back to an electronic hand-held transmitter/detector. Electronic components shall be enclosed in a waterproof polyethylene housing. Markers shall have a different response frequency for each service line type.

Markers shall be ScotchMark® products manufactured by 3M Telecom Systems Group, Austin, Texas. Alternate manufacturers are not acceptable.

<b>Application</b>	<b>Usable Depth</b>	<b>Dimension/ Configuration</b>	<b>Service</b>	<b>Color Code</b>	<b>Model</b>
Near Surface	2 feet	3½" L X 5/8" Ø Cylinder	Water	Blue	1434
			Wastewater	Green	1435
Medium Depth	4 feet	4" Ø Ball	Water	Blue	1403
			Wastewater	Green	1435
Deep	6 feet	8" Ø X 1" Thick Disc	Water	Blue	1257
			Wastewater	Green	1258

**2.5 HYDRANTS AND FLUSHING EQUIPMENT**

**2.5.1 Fire Hydrants (As Applicable Per Plans)**

Fire Hydrants shall be current design in compliance with the AWWA Standard C-502, with rated working pressure of 200 psig. The basic design of the fire hydrant shall be of the dry barrel type of breakaway traffic design.

**Hydrant Construction**

The hydrant inlet connection shall be 6-inch mechanical joint type complete with flange kit.

The hydrant shall be designed with a traffic breakaway feature incorporating a flanged design using breakable bolts and breakaway shaft coupling. Split ring retainer-type breakaway design with pinch bolts is not acceptable. The hydrant design shall allow the upper barrel to be rotated 360 degrees in order to assure proper nozzle orientation.

The drain valve shall assure quick and complete drainage of the hydrant and the drain hole shall be bushed with bronze if passing through cast iron. The drain valve sealing facing shall be made of Buna N, nylon or urethane. If the valve top plate comes in contact with the bronze seat ring to facilitate draining of the hydrant, the valve top plate shall be made of bronze.

### **Main Hydrant Valve**

The main hydrant valve shall be compression type, opening counterclockwise against system pressure and closing clockwise with system pressure. The main valve connection opening shall not be less than 5¼-inches. The main valve shall have a resilient seat.

The hydrant shall be designed such that the operating threads on the stem are prevented from coming in contact with potable water and shall be enclosed in an operating chamber and sealed by O-Rings at the top and bottom of the chamber. The chamber shall be constructed for grease or oil lubrication with an installed grease fitting for maintenance.

The operating nut shall be 1½-inches in size and pentagon in shape and of one-piece construction.

The hydrant shall have one 4½-inch pumper nozzle, and two 2½-inch pumper nozzles having national standard hose coupling threads. The nozzles shall be field replaceable utilizing either a threaded or quarter-turn fitting with an O-Ring seal.

### **Operation and Maintenance Features**

The hydrant shall not incorporate parts requiring field adjustment for proper operation.

The hydrant shall be designed to permit the removal of all working parts from the hydrant through the barrel without disturbing the earth around the hydrant.

Removal of the working parts of the hydrant shall be accomplished by using a seat wrench which can be used regardless of hydrant bury depth. Hydrants requiring other special tools to perform removal of interior parts will not be accepted.

## Materials

All operating parts including operating nut, hold-down nut, drain ring and seat ring shall be bronze. The valve seat ring shall thread into a bronze insert or drain ring to provide bronze-to-bronze seating.

## Markings

The fire hydrant shall have permanent markings identifying the manufacturer by name, initials or insignia, the size of the main valve opening, and the year of manufacture.

Paint hydrants with at least one coat of primer and two coats of yellow enamel paint, except use red paint for tops of hydrants in non-potable water systems.

## Approved Manufacturers

Manufacturer	Model No
Kennedy	81-A
Mueller	A423
American Darling	B-62B
Clow	Medallion
M & H	129T
Others as approved by the City of Milton in writing.	

### 2.5.2 Fire Hydrant Appurtenances

#### 2.5.2.1 Extension Kits

When specified, hydrants shall be installed using original manufacturer hydrant extension kits as necessary to position the hydrant breakaway above finish grade per Detail Sheet.

Stand extension shall be in standard lengths of 12, 24, 36, 48, and 60 inches.

#### 2.5.2.2 Hydrant Connectors

Hydrant connector spools shall be ductile iron per AWWA C151 used for connection between the hydrant and lead valve, and shall incorporate joint restraints. See Detail Sheets.

Standard hydrant connector sizes shall be as follows:

- 1) 6-inch X 12-inch long
- 2) 6-inch X 24-inch long
- 3) 6-inch X 36-inch long
- 4) 6-inch X 48-inch long
- 5) 6-inch X 60-inch long

**Hydrant Offset Connectors**

When a connector between the hydrant and lead valve specified to adjust hydrant height or to offset the hydrant from the valve, an offset connector shall be used. Material to be ductile iron per AWWA C153/ANSIA2153. Sizes shall be as follows:

- 1) 6-inch X 18-inch long with 6-inch offset
- 2) 6-inch X 30-inch long with 12-inch offset

**Approved Manufacturers**

<b>Manufacturer</b>	<b>Straight Hydrant Connector</b>	<b>Offset Connector</b>
Assured Flow Sales, Inc.	N/A	GRADELOK
Clow	✓	N/A
Others as approved by the City of Milton in writing.		

**2.5.3 Flushing Hydrants**

Flushing hydrants shall be current design and in general compliance with AWWA Standard C-502, with rated working pressure of 200 psig.

**Hydrant Construction**

Flushing hydrants shall meet the requirements of Section 2.5.1, except breakaway feature is not required.

**Main Valve**

Generally the same as Section 2.5.1, except main valve opening shall be not less than 2-1/8 inches and the flushing hydrant shall have one (1) 2½-inch nozzle having national standard hose coupling threads.

**Operation and Maintenance Features**

Unless otherwise specified, the hydrant bury length shall be 36 inches. The breakaway traffic joint shall be located approximately 2 inches above the finished grade line. The bury length is the distance measured to the nearest ½ foot, from the bottom of the connecting pipe to the ground line of the hydrant.

**Materials**

All operating parts including operating nut, hold-down nut, drain ring and seat ring shall be bronze. The valve seat ring shall thread into a bronze insert or drain ring to provide bronze-to-bronze seating.

**Markings**

Flushing hydrant markings shall meet the requirements of Section 2.5.1 for fire hydrants.

**Approved Manufacturers**

Manufacturer	Model
Clow	F-4764
M & H	Style 33
Mueller	A-411
Others as approved by the City of Milton in writing.	

**2.6 WATER SERVICE LINES**

**2.6.1 Polyethylene (PE) - Tubing**

Polyethylene service tubing for water supply shall conform to AWWA C901. PE tubing dimensions shall conform to ASTM D2737 with Copper Tubing OD base. Refer to Section 2.3.3 for service lines greater than 2 inches in diameter.

**Materials**

PE tubing material shall conform to ASTM D3350, Standard Code PE 3408, and shall have minimum cell classification of PE 355434C.

**Pressure Rating**

PE tubing shall be Pressure Class 200 psi with a minimum working pressure of 150 psig, and comply with ASTM D1598, D1599, D1693, D3350 and AWWA 901.

**Dimensions and acceptable standard sizes**

NOM	OD	WALL	ID
1	1.125	.137	.851
1½	1.625	.200	1.225
2	2.125	.250	1.625

**Markings**

1. Nominal Size
2. Standard PE Code: 3408
3. Tubing: DR-9
4. Pressure Class: PC200
5. Manufacturer's Name or Trademark
6. NSF Seal or Marking
7. Blue Markings and Stripes

**Approved Manufacturers**

Manufacturer	Model
Phillips	Driscopipe 5100 Ultra-line
Others as approved by the City of Milton in writing.	

**2.6.2 Copper Water Service Tubing**

Copper water service tubing shall be Type K suitable for underground potable water services. Tracer wire is not required with copper tubing.

**Material**

Tubing is to be supplied in conformance with ASTM B88 for dimension and materials.

**Pressure Rating**

Test Pressure: 200 PSIG  
 Operating Pressure: 150 PSIG

Size (inches)	Nominal OD	Wall Thickness
---------------	------------	----------------

1	1.125	.065
1½	1.625	.072
2	2.125	.083

**Pipe Markings**

1. Nominal Size
2. Type K (color coded: green)
3. ASTM B88
4. Manufacturer's name or logo
5. NSF seal

**2.7 SERVICE LINE APPURTENANCES**

**2.7.1 Fittings and Valves**

Fittings and valves shall be manufactured in accordance with AWWA C-800 and be listed and approved by NSF for underground use in potable water service.

**Material**

Fitting and valve bodies, plugs, and compression nuts shall be bronze, copper alloy No. C83600 and meet chemical and mechanical requirements of ASTM B62 or ASTM B584.

Component parts such as fasteners, seals, and packings may be of other materials selected for adequate endurance, corrosion resistance and strength in accordance with AWWA C-800.

**Pressure**

Fittings and valves shall be high pressure type for maximum allowable pressure of 150 PSIG, nominal operating pressure 100 PSIG.

**Thread Specifications**

Fittings and valves shall be of materials and fabricated in accordance with appropriate specification:

<b>TABLE 2.7.1 - THREAD SPECIFICATIONS</b>	
<b>Thread Type</b>	<b>Standard</b>
Unified Inch	ANSI/ASME B1.1
General Purpose Pipe	ANSI/ASME B1.20.1
Dryseal	ANSI/ASME B1.20.3

Fittings and valves shall be marked as appropriate with the following information: manufacturer's name or logo; pressure rating; direction of flow; and size.

<b>Pack Joint Couplings - Acceptable Manufacturers</b>		
<b>Type</b>	<b>Manufacturer</b>	<b>Model</b>
<b>Joint Couplings</b> Copper or Plastic Tube X MPT	Ford Mueller	C84-XX H-15428-X
Copper or Plastic Tube X FPT	Ford Mueller	C14-XX H-15451-X
Copper or Plastic Tube to Tube	Ford Mueller	C44-XX H-15403-X
Female Copper Pipe (replaces flare nut) X Copper or Plastic Tubing	Ford Mueller	CO4-XX H-15071-X
Others as approved by the City of Milton in writing.		

[X, XX: See Mfr.'s catalog to complete model numbers by size]

### 2.7.1.1 Tapping Saddles

Tapping saddles shall be either bronze or cast or ductile iron with epoxy, nylon or PE coating with a minimum 10 mil thickness. Tapping saddles shall two (2) clamping straps, and be uniformly sized to accurately fit pipe being tapped with uniform sealing pressure. Nuts/washers and loose bolts, if used, shall be Type 304 or 316 stainless steel. Saddles used to tap Class 160 PVC pipe shall be designed with mechanical features or stops to prevent over-tightening.

#### Saddle Sizes

1. Main Pipe: 2-inch - 12-inch
2. Tapping valve connections: 1-inch, 1½-inch, 2-inch

#### **Acceptable Manufacturers**

<b>Manufacturer</b>	<b>Application</b>	<b>Model</b>
Ford	1-inch tap on PVC/steel OD pipe 1-inch tap on DI and CI Pipe	S-70 and S-90 F-101 and F-202
Mueller		H-105
Rockwell		313
Others as approved by the City of Milton in writing		

### 2.7.1.2 Water Tubing Couplings

Water tubing couplings in sizes 1-inch, 1½-inch, and 2-inch only shall be bronze

compression-type, inlet and outlet for PE or copper tubing. Coupling shall include stainless steel insert stiffeners for PE tubing. Crimp-type couplings are not acceptable.

**Acceptable Manufacturers**

Manufacturer	Model
Ford	C44-XX*
Mueller	H-15403-XX*
Others as approved by the City of Milton in writing	

\*XX: See Mfr.'s catalog to complete model numbers by size.

**2.7.1.3 Meter Couplings**

Meter couplings shall be bronze and sized as appropriate to accommodate the relevant meter. Inlet shall have male pipe thread.

**Acceptable Manufacturers**

Manufacturer	Model
Ford	C84-XX*
Mueller	H-15428-XX*
Others as approved by the City of Milton in writing	

\*XX: See Mfr.'s catalog to complete model numbers by size.

**2.7.2 Service Line Valves**

**2.7.2.1 Corporation Stops**

Corporation stops shall be high-pressure class, ball type, with inlet taper CC thread. Outlet shall be compression-type for PE or copper tubing. Stainless steel insert stiffeners shall be used for PE tubing. Corporation stops shall be sized for 1-inch, 1½-inch or 2-inch tubing as appropriate.

**Acceptable Manufacturers**

Manufacturer	Model
Ford	F-1000 and FB-1000
Mueller	300, Ball-type

Others as approved by the City of Milton in writing.

### 2.7.2.2 Curb Stops

Curb stops shall be bronze, high pressure, ball-type with locking wings. Inlet shall be compression-type for PE tubing. Outlet shall be female iron pipe threads. Stainless steel insert stiffeners shall be used for PE tubing. Curb stops shall be sized for 1-inch, 1½-inch or 2-inch tubing as appropriate.

#### Acceptable Manufacturers

Manufacturer	Size	Model
Ford	1-inch	B41 - 444W
	1½-inch	B41 - 666
	2-inch	B41 - 727
Others as approved by the City of Milton in writing.		

## 2.8 BACKFLOW PREVENTION DEVICES

Backflow prevention devices shall be manufactured in accordance with AWWA C-506, and shall also be approved by ASSE and/or approved by NSF for use in potable water systems with a maximum continuous operating pressure of 150 psig, and capable of sustaining a hydrostatic test pressure of 300 psig.

### Materials and Construction

The body shall be cast iron with hot dip galvanized coating or fusion bonded epoxy on the interior and exterior, or cast bronze with a maximum lead content 5%. Working parts and springs shall be bronze or stainless steel; valve discs shall be silicone rubber; diaphragms shall be fabric reinforced neoprene, and O-rings shall be Buna-N, neoprene, or silicone rubber. Check valve enclosures shall be glass-filled nylon or Teflon, or bronze or stainless steel. Other working parts shall be bronze or stainless steel.

### 2.8.1 Double-check Device

Double-check backflow preventers shall have two independent check valve assemblies. The body may consist of one or more castings, and shall be equipped with ports and valves as necessary to allow testing in place.

**2.8.2 Reduced Pressure Principle Device**

Reduced pressure principle backflow preventers shall have two independent check valves with an intermediate relief valve incorporating a pressure diaphragm valve assembly that maintains a minimum 2 psig differential pressure across the assembly.

**2.8.3 End Connections**

Devices shall be manufactured with standard female pipe thread, size 3/4-inch, 1-inch, 1-1/2-inch, or standard ANSI B16.2 125# flanged, sizes 2-inch and greater.

**2.8.4 Appurtenances**

All back flow devices shall be provided and installed as a complete assembly with all necessary fittings to enable testing in place. Tapped test ports shall be fitted with test petcocks in each body cavity. Inlet and outlet gate or ball valve shall be of the same line size as that of the body.

**Acceptable Manufacturers**

Manufacturer	Type Device		
	Double Check	Double Check Detector	Reduced Pressure
Ames	2000 DCA OSY 2000 DCA NRS 2000 DCA OSY Epoxy 2000 DCA NRS Epoxy	3000 DCDA OSY 3000 DCDA NRS 3000 DCDA OSY Epoxy 3000 DCDA NRS Epoxy	4000 RP OSY 4000 RP NRS
Watts	709 OS&Y/BV	709 DDC	909 909 DDC (Detector)
Hersey	3/4" - 2" FDC 3" - 10" No. 2	3" - 10" DDC II	3/4" - 2" FRP II 2½" - 10" 6CM
Others as approved by the City of Milton in writing.			

**2.9 METER BOX ASSEMBLIES**

Meter box assemblies for 5/8-inch meters shall be cast iron open bottom per ASTM A-48 with cast iron lid . The box assembly shall include a ball valve with locking nuts, pack joint coupling for copper or PE tubing with expansion connection and gaskets as needed. Meter box and cover for meters 2-inch and larger shall be constructed in accordance with Detail Sheets.

## Acceptable Manufacturers

Manufacturer	Model	Meter Size
Ford	G148-133 (Modified) w/ 1" pack joint for copper or PE Tubing	5/8"
		1"
		1-1/2"
		2"
Others as approved by the City of Milton in writing.		

### **PART 3: EXECUTION**

#### **3.1 GENERAL**

The contractor shall provide all labor, equipment and materials as required to install all pipes, valves, fittings, and other appurtenances as indicated on the construction plans or as specified in the contract documents.

#### **3.2 POTABLE WATER LINE SEPARATION FROM SANITARY SEWER LINES**

- A. When a gravity sewer line must cross under a water line with less than 18-inch vertical clearance, one of the following methods may be used.
1. Fully encase sewer line with a minimum of 4 inches of concrete (2500 psi) for a minimum distance of 10 feet either side of the point of crossing, which must be at least 5 feet from a water line joint. If the crossing is other than at right angles, increase the length of encasement so that the end of the encasement will be at least 12 feet from a water line joint.
  2. Use equally rated pressure pipe for the sewer lines with no joints closer than 12 feet apart and at least 6-inch vertical clearance.
  3. Install sewer pipe into at least a 20-foot section of steel casing (casing I.D. slightly larger than sewer pipe bell O.D.) and center over crossing so that end of casing will be at least 12 feet from water line joint. Seal the ends of the casing with non-shrink grout.
- B. When a gravity sewer line must cross over a potable water line, regardless of clearance, because the water line cannot be relayed above sewer, use method 2 or 3 in subsection A. Concrete encasement will not be allowed.
- C. When a sanitary force main must cross under a potable water line with less than an 18-inch vertical clearance, or over the water line, use a higher rated

pressure pipe as in method 2 or 3 in subsection A.

- D. When the water line being crossed in A, B or C is a house or building service lateral, 2-inch or smaller and the service lateral is a continuous piece of PE DR9 tubing, then the above rules do not apply; but locate so that the distance to a sewer or force main joint is as great as possible.
- E. When a gravity sewer line must run parallel to and less than 18 inches below a potable water line and:
  - 1. 6 to 10 feet apart for less than 40 feet, use method 1, 2 or 3 in subsection A.
  - 2. 6 to 10 feet apart for over 40 feet, use method A2 and stagger joints.
  - 3. 3 to 6 feet apart for any distance, use a higher rated pressure pipe as in method A2.
- F. When a sanitary force main must run parallel to and less than 18 inches below a potable water line and:
  - 1. 6 to 10 feet apart for any distance, use a higher rated pressure pipe as in method A2.
  - 2. 3 to 6 feet apart, use a higher rated pressure pipe for both water and force main. Example: If force main is PC160 PVC DR26, and water line is C-900 DR25; then force main should be PVC DR21 and water line should be DR21, using extreme care to have both properly color-coded.

### 3.3 **PIPE INSTALLATION**

The contractor shall utilize equipment and methods in accordance with sound construction practices to insure pipe installation to line and grade as indicated.

#### 3.3.1 **Trench Excavation**

Refer to Section 2221: Trench Excavation Backfill and Compaction. Maintain minimum of 30 inches and maximum of 36 inches of cover below finished grade unless shown otherwise on the construction plans.

#### 3.3.2 **Alignment**

Pipe shall be installed along the alignment indicated by the construction plans. Accomplish horizontal and vertical changes in alignment of pipe with bends or other appropriate fittings. Limit joint deflection as recommended by the pipe manufacturer.

#### 3.3.3 **Pipe Preparation**

The contractor shall clean the interior of all pipes, fittings, and joints prior to installation. Pipes shall be inspected for defects prior to installation. Damaged pipe shall be rejected and removed from the project.

#### 3.3.4 **Pipe Installation**

Install pipe only when weather and trench conditions are suitable. Do not lay pipe in water. Join pipe in accordance with manufacturer's recommendations.

Provide initial backfill or anchoring as necessary to prevent displacement and preserve alignment after establishing final position.

Encase water pipe in steel casing or use ductile iron pipe when crossing under pipe, conduit, or structure when a 6-inch separation distance cannot be maintained. This protection shall extend a minimum of 5 feet beyond crossed structure. (See Section 2556.3.2.D for Sanitary Sewer Lines.)

#### 3.3.5 **Protection**

Prevent the introduction of foreign matter into the pipe at all times. Close open ends of pipe with water tight fitting closures or plugs. Do not let water fill trench, but include provisions to prevent flotation should water control measures prove inadequate. Remove water, sand, mud and other undesirable materials from trench before removal of pipe closure piece.

#### 3.3.6 **Cutting**

PVC or PE pipe shall be cut in a neat workmanlike manner, and the spigot end shall be beveled per manufacturer's recommendation. Ductile iron pipe shall be cut in accordance with manufacturer's recommendation. Do not allow excessive heat to develop. Smooth and bevel cut end by power grinding. Use of pipe with damaged lining is unacceptable.

#### 3.3.7 **Service Lines**

Service lines shall be constructed where shown on plans and in accordance with Detail Sheets.

#### 3.3.8 **Closure Pieces**

Closure pieces shall only be used where called for on plans, or with written permission of the City of Milton. Closure may be accomplished with sleeve coupling as long as its length is such that gaskets are not less than 3 inches from pipe ends.

#### 3.3.9 **Joint Restraints and Thrust Blocking**

Joint restraints and/or thrust blocking must be provided at all horizontal or vertical turns utilizing fittings, and at tees, 90's, and dead-ends.

### 3.4 **APPURTENANCE INSTALLATION**

#### 3.4.1 **Valves**

Valves shall be installed with operating stems vertical when installation is direct burial. Valves shall be installed on a suitable bearing surface so as to prevent vertical displacement.

#### 3.4.2 **Valve Boxes**

Valve boxes shall be centered on the valve. The earth shall be compacted around each valve box to a distance of 4 feet on all sides of box, or to undisturbed trench face if less than 4 feet. An 18-inch diameter by 4-inch thick collar shall be constructed and sloped to direct water away from the valve box.

#### 3.4.3 **Tracer Wire**

Tracer wire shall be installed on all new water mains and on water service lines installed in conjunction with new water mains. The tracer wire shall be placed directly above the pipe and electrically continuous throughout the project. The tracer wire shall be brought to the ground surface at each valve location in accordance with Detail Sheet. Splices and/or connections in the tracer wire shall be installed with silicone-filled wire nuts designed for direct burial.

### 3.5 **FIRE HYDRANT FLUSHING EQUIPMENT INSTALLATION**

#### 3.5.1 **Hydrants**

Restraints shall be installed in accordance with Detail Sheet.

#### 3.5.2 **Flush Stands and Valves**

Restraints shall be installed as shown on Detail Sheet, depending on line size.

### 3.6 **SERVICE LINE INSTALLATION**

#### 3.6.1 **General**

If called for in the plans, the contractor shall install individual services with tracer wire from the new main to a convenient point on the right-of-way or property line for each house, building or unit that is to be served through a water meter. This section will deal with service line tubing 2-inches in diameter and smaller, to serve 5/8-inch, 1-inch, 1-1/2-inch, and 2-inch meters. The installation of service lines for 3-inch meters and larger shall be in accordance with the requirements for water

main installation. (See Section 3.3)

### 3.6.2 **Service Line Connections**

Service lines shall be installed in accordance with Details as shown on construction plans. Tubing shall be installed in one continuous length from corporation stop to curb stop with no intermediate fittings. Service lines damaged after initial installation but before acceptance may be repaired by means of a single splice, except that no repair fittings will be permitted under any paving. The tap location shall be not less than 10 feet from any sanitary sewer joint with less than 18 inches vertical clearance.

### 3.7 **TAPS ON PRESSURIZED LINES**

The contractor shall perform taps on pressurized lines for the installation of pipes other than service lines of 2-inch and smaller PE tubing in accordance with these requirements. A City of Milton's representative shall be on-site during testing and cutting.

#### **Materials**

All materials used for taps on pressurized lines shall meet the requirements of these specifications. Tapping sleeves shall be properly sized for the pipe being tapped. (See Sec. 2.4.1.6) Resilient seated tapping valves shall be furnished with special end connections. (See Sec. 2.4.2.2) All other material used to accomplish the tap shall meet the standards set forth by the AWWA for potable water construction.

#### **Procedure**

The contractor shall:

1. Expose the existing pipe at the location shown on the plans, and clean the section of the pipe to receive the tapping sleeve.
2. Check the tapping sleeve and valve for defects and make sure the gate fully retracts in the valve to allow the shell cutter free passage.
3. Assemble the tapping sleeve on the pipe, then install the tapping valve.
4. Pressure test the tapping sleeve and valve after it has been assembled on the water main using the test plug on the sleeve. The test shall be 150 psi.
5. Pour a thrust block behind the tapping sleeve sufficient to withstand the pressure of the new line. Also, provide a suitable bearing surface sufficient to support the weight of the sleeve, valve, and tapping machine. Refer to Detail Sheet.

6. Assemble an approved tapping machine and proceed to make the necessary cut in accordance with the recommendation of the tapping machine manufacturer.

Approved tapping machines shall be:

- a. in good working condition.
- b. designed for and have a cutting bit for the pipe material to be cut.
- c. equipped with a depth of cut gauge.
- d. designed to capture the coupon.

#### **PART 4: ACCEPTANCE REQUIREMENTS**

##### **4.1 INSPECTION**

Upon completion of the installation, the system shall be inspected to ascertain that valves, fittings, fire hydrants, flush hydrants, etc. are located in conformance with the plans, and confirm that all 'as-built' measurements have been taken. The City of Milton's Inspector shall observe all appropriate activities related to properly placing the line in service including flushing, pressure and leakage testing, disinfection, and bacteriological sampling. Final connections and testing of fire hydrants shall be accomplished after final clearance of lines. Tracer wire shall be tested for continuity.

##### **4.2 FLUSHING**

All newly installed water lines shall be flushed with potable water to remove any sediment, solids and/or foreign matter prior to testing. The City of Milton will make water available to the contractor. Flushing shall be conducted at a sufficient velocity to clear the pipe. Discharge of flushing water must be through a 2-inch diameter pipe (or larger) and must be controlled so as not to cause any property damage.

##### **4.3 PRESSURE/LEAKAGE TEST**

###### **4.3.1 General**

All newly installed water lines and appurtenances shall be pressure/leak tested to assure the strength of materials and quality of workmanship of the installation. Testing shall be conducted in accordance with Details as shown on construction plans and the requirements of AWWA Manual 23 for PVC and other flexible pipe or AWWA C600 for Ductile Iron Pipe. Leakage testing may be conducted concurrently with the pressure test.

###### **4.3.2 Procedure**

Tests are to be conducted in segments not to exceed three thousand (3,000) feet of pipe. Water in the new line shall be pumped up to a pressure of 150 psi. This pressure shall be maintained for a minimum of one (1) hour by pumping a quantifiable amount of water into the line and record the amount of water added during the test period. This represents the leakage.

Pressure/leakage tests shall be deemed acceptable when leakage does not exceed that determined by the following formula:

$$L = S \cdot D \cdot \text{SQRT}(P) / 133200 \text{ (or 11.65 gpd/mi/inch/dia)}$$

or  $L = N \cdot D \cdot \text{SQRT}(P) / 7400$  for DI pipe 18' lengths

or  $L = N \cdot D \cdot \text{SQRT}(P) / 6600$  for PVC pipe 20' lengths

where: L = Maximum leakage, in gallons per hour.  
S = Length of pipe under test, in feet.  
N = Number of pipe joints in segment under test.  
D = Nominal internal diameter of pipe, in inches.  
P = Average actual leakage test pressure, psig.

Record all data for submission with as-built plans.

A City of Milton representative shall be present during test.

Refit and replace all pipe not meeting the leakage requirements. Repair clamps are not permitted.

Repair all visible leaks regardless of the amount of leakage.

When a satisfactory pressure/leakage test has been completed, reduce the pressure at or below normal line pressure, and continue on with line disinfection.

#### 4.4 **DISINFECTION**

##### 4.4.1 **General**

The contractor shall provide all equipment, materials and testing apparatus required to perform disinfection in accordance with AWWA 651, Detail Sheets, or as modified herein.

##### 4.4.2 **Procedure**

A. Prior to beginning disinfecting, the contractor shall submit information to the Engineer for approval of proposed materials and methods. The City of Milton will determine the number and location of all sampling points. Temporary sampling taps may be required consisting of a corporation cock with copper

tube.

- B. Add chlorine to attain an initial concentration of 25 mg/l chlorine with 10 mg/l remaining after 24 hours.
  - 1. Initial concentration is to be obtained by mixing proper amount of HTH granules (65% Cl) into auxiliary tank, then pump/meter into regulated flow into or through the pipe section.
  - 2. Alternate methods of disinfecting by use of granular or tablet forms of chlorine will not be allowed. The "SLUG" method as described in AWWA 651 will not be allowed.
  - 3. Check the chlorine concentration at all sampling points after the line has been filled and air expelled.
  - 4. Check residual chlorine concentration at the end of 24 hours to confirm that 10 ppm (minimum) is present.
- C. The City of Milton shall supply water for testing from the nearest available source. Coordinate all testing with the City of Milton. Flush main until chlorine concentration is 2 mg/l or less, prior to taking bacteriological samples.
  - 1. Check concentration at all sample point locations.
  - 2. Disposal of chlorinated water shall be the contractor's responsibility and shall be done without damage to public or private property. Chlorinated water disposal shall meet all State, Federal and local regulations.
- D. Contact the City of Milton for collection of samples. Two (2) satisfactory bacterial sample sets taken 24 hours apart must meet State requirements before placing the main into service.
- E. Should initial disinfecting fail to yield acceptable results, repeat flushing and disinfecting procedure at no additional costs to the Owner.

#### 4.5 **OTHER CONNECTIONS**

After new system piping has been satisfactorily tested and cleared for use, make any approved additional connections to the pre-existing distribution system. Exercise care in making connection and disinfect as needed. When total system is approved for use, a City of Milton representative shall verify that the contractor has opened all interior valves as required. Valves connecting new installations to existing distribution system shall then be opened by a City of Milton representative.

#### 4.9 TESTING FIRE HYDRANTS

All newly-installed fire hydrants shall be flow tested by the Contractor with representative of the City of Milton prior to final acceptance in accordance with established procedures. (Refer to AWWA-M17 and AWWA C502.) Static Leak Test of hydrant shall be done in conjunction with Section 4.3 with hydrant valve open.

Hydrant flow tests not meeting the minimum requirements of FDEP Standards shall be immediately reported to the Engineer-of-Record. The system shall not be placed into service until the system meets the minimum requirements.

### **PART 5: MEASUREMENT AND PAYMENT**

#### 5.1 GENERAL

Measurements shall be made to the nearest tenth of units and rounded to the nearest whole unit when totaled. Payments shall be for providing all labor, tools, equipment and materials as needed for: 1) furnishing, handling, and installing the required materials, fittings or fixtures; 2) excavation, backfill and compaction, including shoring, bracing and dewatering as required; 3) temporary removal and replacement of existing obstacles, including minor relocation and repair of other utilities; and 4) all required testing, disinfection and flushing. Payment for water main installations shall include the installation of tracer wire.

Unless noted otherwise in bid sheets, the following shall apply.

#### 5.2 WATER MAINS

Water mains shall be measured in lineal feet by the specified pipe size along the pipe centerline with no deduction for fittings. Payment shall be based on the contract unit price per lineal foot.

#### 5.3 APPURTENANCES

Water main appurtenances include fittings and valves as outlined in Section 2.4 of the specifications. Incidental appurtenances such as joint restraints, couplings, tracer wire, etc. are not considered separate pay items and their cost should be included in the unit price of the installed pipe, unless otherwise noted.

##### 5.3.1 Fittings

Water main fittings including bends, reducers, tees, wyes, tapping sleeves, expansion joints, pipe hangers/supports, and cut in sleeves shall be measured and paid for on a unit (per each) basis. Fittings shall be listed by size and type.

##### 5.3.2 Valves

Water main valves inclusive of any required valve boxes or other appropriate appurtenances shall be measured and paid for on a unit (per each) basis. Valves shall be listed by size and type.

#### 5.4 **HYDRANTS AND FLUSHING EQUIPMENT**

Hydrants and flushing equipment shall be measured and paid for on a unit (per each) basis to include a complete installed assembly.

##### 5.4.1 **Fire Hydrants**

Fire hydrant assemblies shall include the installed water main tee or tapping sleeve, lead valve and box, connectors (up to 10 feet of lateral distance), gravel pack, and hydrant.

##### 5.4.2 **Fire Hydrant Appurtenances**

Fire hydrant appurtenances including extensions and off-site connectors shall be measured and paid for on a unit (per each) basis.

#### 5.5 **WATER SERVICE LINES**

##### 5.5.1 **Service Lines (up to 2-inch diameter)**

Water service lines shall be measured and paid for on a unit (per each) basis. Each service line installation shall include the main tap, corporation stop, service tubing, and curb stop. Service lines shall be listed by tubing size and nominal length. Nominal length shall typically be categorized as "short" (for services on the same side of the street as the water main), and "long" (for services on the opposite side of the street from the water main).

##### 5.5.2 **Large Service Lines (3-inch diameter and larger)**

Large service lines, including fire lines, shall be measured and paid for in accordance with the requirements for water mains (see 5.2 and 5.3 above).

##### 5.6 **Taps on Pressurized Lines**

Taps on pressurized lines shall be measured and paid for on a unit price (per each) basis to include tapping sleeve, tapping valve, and valve box complete, in-place. Taps shall be listed by main and branch diameters.

**END OF SECTION 02556**