

Village of Palmetto Bay
TECHNICAL SPECIFICATIONS
For
Thalatta Park Site Improvements



November 2019

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VILLAGE OF PALMETTO BAY, FLORIDA

THALATTA PARK SITE IMPROVEMENTS

TECHNICAL SPECIFICATIONS

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SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 RESPONSIBILITY

A. Subsurface investigation and underground utility location shall be exclusively the Contractor's responsibility. Utility companies were contacted during the design. The information shown on the plans is based on those contacts. However, the contractor must do his own investigation. No responsibility is assumed by the Owner nor Engineer as to the location of underground utilities or underground features. No claim for additional compensation or time shall be allowed due to any circumstance related to subsurface conditions.

B. Copies of geotechnical investigation performed for the Village are available.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION OF WORK

Not Used

END OF SECTION

**SECTION 02050
DEMOLITION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the site demolition work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS."

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. All applicable Sections under Divisions 1, 2, and 3.

1.04 QUALITY ASSURANCE

- A. Demolition contractor qualifications: Minimum of five (5) years experience in demolition of comparable nature.
- B. Requirements of All Applicable Regulatory Agencies:
 - 1. All applicable Building Codes and other Public Agencies having jurisdiction upon the work.

1.05 SUBMITTALS

- A. Certificates of severance of utility services.
- B. Permit for transport and disposal of debris.
- C. Demolition procedures and operational sequence for review and acceptance by ENGINEER.

1.06 JOB CONDITIONS

- A. Existing Conditions
 - 1. The demolition work shall be done as indicated on the construction plans. This includes, but is not limited to, removal of the existing boat ramp.
 - 2. Remove all demolition debris from the site the same day the work is performed. Leave no deposits of demolished material on site over night.

3. Structural demolition, excavation, backfill and compaction as indicated in drawings.
- B. Protection:
1. Erect barriers, fences, guard rails, enclosures, and shoring to protect personnel, structures, and utilities remaining intact.
 2. Protect designated trees and plants from damages.
 3. Use all means necessary to protect existing objects and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary, to the approval of the ENGINEER at no additional cost to the OWNER.
- C. Maintaining Traffic:
1. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
 2. Do not close or obstruct streets and sidewalks without written approval from the ENGINEER.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.
- D. Dust Control:
1. Use all means necessary for preventing dust from demolition operations from being a nuisance to adjacent property owners. Methods used for dust control are subject to approval by the ENGINEER prior to use.
- E. Burning:
1. Burning will not be permitted.
- F. No explosives will be permitted.

1.07 GENERAL ITEMS

- A. Scope of work shall comprise the following: Provide all labor, materials, necessary equipment and services to complete the demolition and clearing work, as indicated on the contract plans, and as specified herein.
- B. The CONTRACTOR shall provide references to the OWNER to demonstrate a minimum of five years experience in demolition of a comparable nature. Current occupational licenses held by CONTRACTOR shall be submitted to OWNER.
- C. The CONTRACTOR shall be responsible for adherence to all applicable codes of all

regulatory agencies having jurisdiction upon the works.

1.08 PRE-DEMOLITION MEETING

- A. A meeting shall be held with the OWNER or his representative at the jobsite to describe intended demolition and cleaning procedures and schedules. This shall include identifying access routes for bringing necessary equipment in, removing debris from site, and designation of any trees, drives or other items to remain.

1.09 EXISTING CONDITIONS

- A. The CONTRACTOR shall become thoroughly familiar with the site, and of existing utilities and their connections, and note all conditions which may influence the work.
- B. By submitting a bid, the CONTRACTOR affirms that CONTRACTOR has carefully examined the site and all conditions affecting work. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.
- C. The OWNER shall be notified immediately by the CONTRACTOR should any hazardous materials be discovered during demolition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that structures to be demolished are discontinued in use and ready for removal.
- B. Do not commence work until all conditions and requirements of all applicable public agencies are complied with.

3.02 PREPARATION

- A. Arrange for, and verify, termination of utility and drainage services to include removing meters and/or capping lines.
- B. Notification:
 - 1. Notify the OWNER at least three (3) full working days prior to commencing the work of this Section.

3.03 CLARIFICATION

- A. The drawings do not purport to show all objects existing on the site.
- B. Before commencing the work of this Section, verify with the OWNER all objects to be removed and all objects to be preserved.

3.04 SCHEDULING

- A. Schedule all work in a careful manner with all necessary consideration for the public and the OWNER.
- B. Avoid interference with the use of, and passage to and from, adjacent facilities.

3.05 DISCONNECTION OF UTILITIES

- A. Before starting site operations, disconnect or arrange for the disconnection of all effected utility service.
 - 1. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify affected utility company in advance and obtain approval before starting this work.
 - 2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
 - 3. Place markers to indicate location of disconnected services.
 - 4. On-site drainage structures and drain fields shall be removed in their entirety by methods approved by the OWNER's representative.

3.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Utility Services: Maintain existing off-site utilities, keep in service, and protect against damage during demolition operations.
- B. Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.
- C. Cease operations and notify OWNER immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.
- D. Prevent movement, settlement, damage, or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the OWNER.
- E. Ensure safe passage of persons around areas of demolition.

3.07 MAINTAINING TRAFFIC

- A. Do not interfere with use of adjacent buildings and facilities. Maintain free and safe passage to and from. Conduct demolition operations and removal of debris 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. Provide alternate routes around closed or obstructed travel ways if required by governing authorities.

3.08 POLLUTION CONTROLS

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations as directed by the OWNER or his representative or governing authorities. Return adjacent areas to condition existing prior to start of work.

3.09 INSPECTION AND PREPARATION

- A. Verify that structures to be demolished are discontinued in use and ready for removal.
- B. Do not commence work until all conditions and requirements of all applicable public agencies are complied with.
- C. Arrange for, and verify, termination of utility services to include removing meters and capping lines.
- D. The drawings do not purport to show all objects existing on the site; at the pre-demolition meeting before commencement of the work, verify with the OWNER all objects to be removed and all objects to be preserved.

3.10 DEMOLITION

- A. Pull out any existing utility lines designated for abandonment, irrigation, electrical lines, pull boxes and splice boxes, manholes and catch basins to be removed and all other objects designated to be removed or interfering with the work. Contact the utility company or agency involved for their requirements for performing this work. No equipment and materials shall be allowed to remain in the work area after the day it was removed.
- B. Remove all debris from the site and leave the site in a neat, orderly condition to the full acceptance of the ENGINEER, or the OWNER. No debris shall be left on the site over night.
- C. Clear and Grub and dispose of all trees, shrubs and other organic matter not otherwise addressed on tree removal and relocation plans and specifications.

3.11 DEMOLITION OF SITE STRUCTURES

- A. Demolish all site structure items designated to be removed or which are required to be removed to perform the work. This item does not include buildings.

3.12 REMOVAL OF DEBRIS AND DISPOSAL OF MATERIAL

- A. Material resulting from demolition and not scheduled for salvaging shall become the property of the CONTRACTOR and shall be removed from site and legally disposed of off-site. Disposal shall be timely, performed as promptly as possible and not left until the final cleanup. Material shall not be left on the job site for more than 60 days.

- B. Remove from site contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.
- C. Burning of removed materials from demolished structures will not be permitted.

3.13 COMPLETION OF WORK

- A. Leave the site in a neat, orderly condition to the full acceptance of the OWNER.
- B. Dirt remaining after demolition shall be graded level and compacted, in preparation for filling operations to follow demolition. Trenches shall be filled in layers of 12" maximum thickness and compacted in accordance with the technical specifications applicable to backfilling of trenches.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Section covers cleaning, grubbing, and stripping of the construction site, complete as specified herein.
- B. Clear and demuck the areas within the limits of construction as required, including drainage easements. The width of the area to be cleared shall be established by the Engineer prior to the beginning of any work.

1.02 RELATED WORK

- A. Section 02050: Demolition
- B. Section 02220: Structural Excavation, Backfill & Compaction

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 CLEARING

- A. The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, those trees which are designated by the Engineer shall be preserved as hereinafter specified. Clearing operations shall be conducted so as to prevent damage to existing structures and installations, and to those under construction, so as to provide for the safety of employees and others. Clearing for structures shall consist of topsoil and vegetation removal.

3.02 GRUBBING

- A. Grubbing shall consist of the complete removal of all stumps, roots larger than 1 ½ inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

3.03 STRIPPING

- A. In areas so designated, topsoil, not muck shall be stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be disposed of by the Contractor.

3.04 DEMUCKING

- A. When encountered, organic material (muck) shall be excavated and removed. This material may be stockpiled temporarily but must be disposed of as directed by the Engineer or the Owner.

3.05 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

- A. The Contractor shall dispose of all material and debris from the clearing and grubbing operation by shipping such material and debris and disposing such material to a suitable location as required by the Engineer or the governmental agencies. Disposal by deep burial will not be permitted. The cost of disposal of material (including hauling) shall be considered a subsidiary obligation of the Contractor, the cost of which shall be included in the contract prices.

3.06 PRESERVATION OF TREES

- A. All existing trees within the vicinity of the work shall be carefully protected from damage. The Contractor shall erect such barricades, guards, and enclosures as may be considered necessary by him for the protection of the trees during all construction operations.

3.07 PRESERVATION OF DEVELOPED PRIVATE PROPERTY

- A. The Contractor shall exercise extreme care to avoid necessary disturbance of developed private property as applicable. Trees, shrubbery, gardens, lawn and other landscaping, which in the opinion of the Engineer must be removed, shall be replaced and replanted to restore the construction easement to the condition existing prior to construction.
- B. All soil preparation procedures and replanting operations shall be under the supervision of nurseryman experienced in such operations.
- C. Improvements to the land such as fences, walls, outbuildings, etc., which of necessity must be removed shall be replaced with equal quality materials and workmanship.
- D. The Contractor shall clean up the construction site across developed private property directly after construction is complete upon approval of the Engineer.

3.08 PRESERVATION OF PUBLIC PROPERTY

- A. The appropriate paragraphs of the Contract Documents shall apply to the preservation and restoration of all damaged areas of public lands, rights-of-way, easements, etc.

END OF SECTION

SECTION 02151

SHORING AND BRACING OF EXCAVATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work included: Provide shoring at excavations and elsewhere as required to protect workmen, materials, other properties, and the public.

1.02 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
- B. As established in the General Conditions of the Contract, the Contractor is solely responsible for means and methods of construction and for the sequences and procedures to be used.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods required for proper performance of the work of this Section.
- B. Employ a Professional Engineer registered in the State of Florida, who is qualified to design the shoring system and to inspect and report on the quality of its construction. All drawings must bear the signature and seal of this engineer.
- C. Comply with pertinent requirements of governmental agencies having jurisdiction, specifically the Florida Trench Safety Act.
- D. The shoring design and construction shall take into consideration all the information regarding the following:
 - 1. The plans and specifications prepared for this Work.
 - 2. Existing Utilities.
 - 3. The general geological conditions in the area.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of the "Submittals and Substitutions" portion of the Contract Documents.
- B. Submit shoring design for approval by Owner.
 - 1. Should changes in the shoring design be required coordinate all such changes with the Engineer and secure the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Provide list of materials as required for the shoring system.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 DESIGN

- A. Design a shoring system which will safely and adequately prevent collapse of adjacent materials and which will permit construction of the Work to the arrangement shown on the Drawings.
- B. Secure approval from Owner.

3.03 INSTALLATION

- A. Construct and install the shoring system in accordance with the design as approved by the Owner.

END OF SECTION

SECTION 02200

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification sections, apply to the work specified in this Section.

1.02 REQUIREMENTS INCLUDED

- A. All necessary cutting, coring, drilling, grouting, and patching to fit together the several parts of the work will be done by the Contractor, except as may be specifically noted otherwise under any particular section of the specifications.
- B. Definition: Cutting and Patching includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition. Cutting and Patching is performed to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

1.03 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural work in a way that would result in a reduction of load-carrying capacity or of a load-deflection ratio.
- B. Visual Requirements: Do not cut and patch work, in a way that would result in reducing the strength of structures. Do not cut and patch work in a manner that would result in substantial visual evidence. Remove and replace work judged by the Owner to be cut and patched in a visually unsatisfactory manner.

1.04 SUBMITTALS

- A. Procedure for Cutting and Patching: Where prior approval of cutting and patching is required, submit procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
 - 1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work operation and visual changes as well as other significant elements.
 - 2. List products to be used and firms that will perform work.
 - 3. Give dates when work is expected to be performed.
- B. Approval by Owner to proceed with cutting and patching work does not waive the Owner's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Except as otherwise indicated, or as directed by the Owner, use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible. Use material for cutting and patching that will result in equal-or-better performance characteristics.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.
- B. Before the start of cutting work, meet at the work site with all parties involved in cutting the patching. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work.

3.02 PREPARATION

- A. Temporary Support: To prevent failure, provide temporary support of work to be cut.
- B. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
 - 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 PERFORMANCE

- A. Employ skilled workman to perform cutting and patching work. Except as otherwise indicated or as approved by the Owner, proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cut the work using methods that are least likely to damage work to be retained or adjoining work.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
- C. Patching: Patch with seams which are durable and as invisible as possible. Comply with

specified tolerances for the work.

1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
2. Restore exposed finishes of patched areas and where adjoining work in a manner which will eliminate evidence of patching and refinishing.

D. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish entire unit.

E. Damaged Surfaces: Patch or replace any portion of an existing finished surface which is found to be damaged, lifted, discolored, or shows other imperfections, with matching material.

3.04 TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or finishes flush with existing work, make a smooth and workmanlike transition. Patched work shall match existing adjacent work in texture and appearance unless otherwise noted so that the patch or transition is invisible at a distance of five feet.

B. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.05 CLEANING

A. Thoroughly clean area and spaces where work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature.

END OF SECTION

SECTION 02220

STRUCTURAL EXCAVATION, BACKFILL & COMPACTION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Section includes, except as elsewhere provided, excavation, filling and grading under and around structures to the subgrades and grades indicated on the Drawings.
- B. Supplemental Foundation and Site Preparation Notes may be indicated on the Structural Drawings.

1.02 RELATED WORK

- A. Bid Documents: General Conditions
- B. Section 02100: Site Preparation

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: The Contractor will engage soil testing and inspection service for quality control testing during earthwork operations.

1.04 JOB CONDITIONS

- A. The Contractor shall examine the site and review the available test borings or undertake his own soil borings prior to submitting his bid, taking into consideration all conditions that may affect his work. The Owner and Engineer will not assume responsibility for variations of subsoil quality or conditions at locations other than places shown and at the time the investigation was made.
- B. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Engineer and the Owner of such piping or utility immediately for directions.
 - 2. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 3. Demolish and completely remove from site existing above ground structures and underground utilities indicated on the Drawings to be removed.

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

1.05 PROTECTION

A. Sheeting and Bracing in Excavations:

1. In connection with the construction of below grade structures, the Contractor shall construct, brace, and maintain cofferdams consisting of sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing piping and foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
2. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities, existing piping, or property. Unless otherwise approved or indicated on the Drawings or in the Specifications, all sheeting and bracing shall be removed after completion of substructure, care being taken not to disturb or otherwise injure the finished structures. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as may be directed.
3. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
4. The Contractor shall construct the cofferdams and sheeting outside the neat lines of the foundations unless indicated otherwise to the extent, he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing and cofferdams shall be adequate to withstand all pressures to which the structure will be subjected. Pumping, bracing, and other work within the cofferdams shall be done in a manner to avoid disturbing any construction of the masonry enclosed. Any movement or bulging which may expense so as to provide the necessary clearances and dimensions.
5. Drawings of the cofferdams and design computations shall be submitted to the Engineer for approval, and construction shall not be started until such drawings are approved. However, approval of these drawings shall not relieve the Contractor of the responsibility for the cofferdam. The drawings and computations shall be prepared and stamped by a Registered Professional Engineer in the State of Florida and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the substructures.

B. Dewatering, Drainage and Floatation:

1. The Contractor shall construct and place all concrete work, structural fill, bedding rock, and limerock base course, in-the-dry unless authorized by the Engineer or Owner to place in the wet. When dewatering, the Contractor shall make the final 24-inches of excavation for this work in-the-dry and not until the water level is a minimum of 12-inches below proposed bottom of excavation.
2. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of property all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill and structure to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
3. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
4. Wellpoints may be required for predrainage of the soils prior to final excavation for some of the deeper in-ground structures, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure or fill will not be floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
5. The Contractor shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems he proposes for handling groundwater and surface water encountered during construction of structures and compacted fills.
6. If requested by the Engineer, the Contractor's proposed method of dewatering shall include a groundwater observation well at each structure to be used to determine the water level during construction of the structure. Locations of the observation wells shall be at structures as approved by the Engineer prior to their installation. The observation wells shall be extended to 6-inches above finished grade, capped with screw-on caps protected by 24" x 24" wide concrete base, and left in place at the completion of this Project.
7. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the Engineer for approval. However, such approval shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The contractor shall be responsible for correcting any disturbance or natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
8. As part of his request for approval of a dewatering system, the Contractor may be requested to demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one-quart sample.
9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the Engineer.
10. Continuous pumping will be required as long as water levels are required to be below natural levels.

1.06 SUBMITTALS

- A. The Contractor shall furnish the Engineer, for approval, a representative sample of fill material obtained from on-site sources at least 10-calendar days prior to the date of anticipated use of such material. For each material obtained from other than on-site sources, the Contractor shall notify the Engineer of the source of the material and shall furnish the Engineer, for approval, a representative sample at least 10-calendar days prior to the date of anticipated use of such material.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General:
 1. Materials for use as base, fill and backfill shall be as described below.
 - a. Satisfactory soil materials are defined as those complying with American Association of State Highway and Transportation Officials (AASHTO) M-145, soil classification Groups A-1, A-2-4, A-2-5 and A-3.
 - b. Unsatisfactory soil materials are those defined in AASHTO M-145 soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6 and A-7 along with peat and other highly organic soils.
 2. Materials shall be furnished as required from off site sources and hauled to the site.
- B. Structural Fill:
 1. Structural fill material shall be satisfactory soil material consisting of a minimum of 60 percent clean medium to fine grain sized quartz sand, free of organic, deleterious and compressible material. Rock in excess of 2-1/2-inches in diameter shall not be used in the fill material. Structural fill shall not contain hardpan, stones, rocks, cobbles or other similar materials.
- C. Crusher-Run Gravel:
 1. The impervious aggregate base, crusher-on gravel, subbase or shoulder course material shall be uniform quality throughout. The material retained on the No. 10 sieve shall be composed of aggregate meeting the requirements for Class A or B coarse aggregate, except the percent of soft fragments allowed shall be as shown in the requirements below. To be used only if requested by Contractor and approved by Engineer.
 2. The impervious aggregate may be produced from an approved quarry source, or bank or pit deposit, which will yield a satisfactory mixture conforming to all requirements of these specifications after it has been crushed or processed as a part of the mining operations, or the material may be furnished in two sizes of such gradation that when combined in the central mix plant the resultant mixture shall conform to the required specifications. Impervious aggregate base, subbase or shoulder material shall conform to the following requirements:

a. Gradation, Percent by Weight Passing Each Sieve.

12-Inch Sieve	100
3/4-Inch Sieve	60-100
No. 10 Sieve	30-55
No. 60 Sieve	8-35
No. 200 Sieve	5-20

Test on Material Passing No. 10 Sieve Volume Change, Percent 0-18.

Test on Material Retained on 3/8 Sieve Soft Fragments, Percent 0-30.

3. Method of tests shall be in accordance with the following:

Gradation	AASH O: T27
Volume Change	GHD: 6
Soft Fragments	AASHTO: T-189

D. Base Course:

1. Limerock shall not contain cherty or other extremely hard pieces, or lumps, or balls or pockets of sand material in sufficient quantity as to be detrimental to the proper bonding, finish or strength of the limerock base.
2. Gradation and Size Limits:
At least 97-percent (by weight of the material shall pass a 3-1/2-inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist of dust of fracture. All crushing or breaking up which might be necessary in order to meet such size requirements shall be done before the material is in place.
3. Limerock shall originate from a Florida Dept. of Transportation (FDOT) certified pit.
4. Crushed or recycled concrete free from deleterious materials may be used as base material conforming to the gradation requirements of limerock, and as approved by the Engineer.

E. Common Fill:

1. Common fill material shall be satisfactory soil material containing no more than 5-percent by weight finer than No. 200-mesh sieve. It shall be free from organic matter, muck, marl, and rock exceeding 2-1/2-inches in diameter. Common fill shall not contain broken concrete, masonry, rubble or other similar material.
2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the Engineer, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials.

F. Bedding Rock Aggregate:

1. Bedding rock aggregate shall be 3/8" to 3/4-inch washed and graded limerock. This Rock shall be graded so that 99-percent will pass a 3/4-inch screen and 80-percent will be retained on a No. 8 screen.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which excavating, filling, and grading are to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Examine and accept existing grade of walks, pavements and steps prior to commencement of work and report to Engineer if elevations of existing subgrade substantially vary from elevations shown on the Drawings.

3.02 EXCAVATION

- A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations.
- B. Excavation Classifications: The following classifications of excavation will be made when unanticipated rock excavation or unclassified excavation is encountered in the work. Do not perform such work until material to be excavated has been cross-sectioned and classified by Engineer or specialized geotechnical consultant.
 1. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in soil boring data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
 2. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer shall be at the Contractor's expense.
 - a. Under footings and foundation bases, fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. Lean (unreinforced) concrete fill may be used to bring bottom elevations to proper position, when acceptable to Engineer. Reinforcement shall be placed as needed or directed by the Engineer.
 - b. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classifications, unless otherwise directed by Engineer.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer who will reserve the right to contact a specialized geotechnical consultant and make an inspection of conditions.

1. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Engineer.
 2. Removal of unsuitable material and its replacement as directed beyond the authorized limits will be paid on the basis of contract conditions relative to changes in work.
- D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction or as shown on the Drawings. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
1. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- E. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
 2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- F. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area. Maintain groundwater table level a minimum of one-foot below excavation level.
1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, wellpoints, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 2. Convey water removed from excavations and rainwater to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
 3. While dewatering for new Construction in the vicinity of existing structures, depletion of the groundwater level underneath these existing structures may cause settlement. To avoid this settlement, the groundwater level under these structures shall be maintained by appropriate methods of construction as approved by the Engineer.
- G. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
1. Locate and retain soil materials away from edge of excavations.
 2. Dispose of excess soil material and waste materials as herein specified.
- H. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection, or as shown on the Drawings.
1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavated by hand to final grade just before concrete

- reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.
2. Do not excavate to the bearing levels designated on the drawings until surface compaction is completed.

3.03 BACKFILL AND FILL

- A. General: Place material in layers to required subgrade elevations, for each area classification listed below.
 1. Structural fill shall be used below spread footing foundations, slab-on grade floors, and other structures and as backfill within three feet of the below grade portion of structures.
 2. Crusher-run gravel shall be used under and around drainage sumps. It can be used at the request of the Contractor and if approved by the Engineer as base material for areas approved by the Engineer.
 3. Limerock base course shall be used under roadways, parking areas, and walks and for riprap. Limerock base course may be used by the Contractor at other similar locations if approved by the Engineer or indicated on the Drawings.
 4. Common fill shall be used at all other locations.
 5. Bedding rock shall be used for pipe bedding, under and around manhole base and at other locations indicated on the Drawings or approved by the Engineer.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
 1. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Inspection, testing, approval, and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 5. Removal of trash and debris.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls. Layout and location of bracing shall consider loads of the structure as well as the effects of the soil and groundwater.
- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
 1. When existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.
- D. Fill Placement:
 1. Material placed in fill areas under and around structures shall be deposited within the lines and to the grades shown on the Drawings or as directed by the Engineer, making due allowance for settlement of the material. Backfill shall be carried up evenly on all walls of an individual structure simultaneously with no more than a two-foot elevation variation allowed. Fill with no more than a two-foot elevation variation allowed.

- Fill shall be placed only on properly prepared surfaces which have been inspected and approved by the Engineer.
2. Fill material can be obtained from cut areas within the construction project site. If sufficient satisfactory soil material is not available from excavation on site, the Contractor shall provide fill material as may be required from off-site sources at no additional cost to the Owner.
 3. Fill shall be brought up in substantially level lifts throughout the site, starting in the deepest portion of the fill. The entire surface of the work shall be maintained free from ruts, and in such condition that construction equipment can readily travel over any section. Fill shall not be placed on surfaces that are muddy or against concrete structures until they have attained sufficient strength.
 4. Fill shall be dumped and spread in layers by a bulldozer or other approved method. During the process of dumping and spreading, all roots, debris, and stones greater in size than specified under Materials, shall be removed from the fill areas, and the Contractor shall assign a sufficient number of men to this work to insure satisfactory compliance with these requirements.
 5. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.
 6. All fill materials shall be placed and compacted "in-the-dry." The Contractor shall dewater excavated areas as required to perform the work and in such manner as to preserve the undisturbed state of the natural inorganic soils.

3.04 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified on the structural drawings for each area classification. It shall be the Contractor's responsibility to notify the Engineer in writing that penetration tests can be performed. Written notice from the Contractor shall precede completion of compaction operations by at least 2-working days.
- B. Percentage of Maximum Density Requirements:
 1. Compact soil to not less than the following percentages of maximum dry density in accordance with AASHTO T-180.
 - a. Underneath structures and 5-feet 0-inches around perimeter of foundation: Compact top 12-inches of subgrade and each layer of backfill or fill material to 98-percent maximum dry density.
 - b. Building Slabs and Footings: Compact top 12-inches of subgrade and each layer of backfill or fill material at 95-percent maximum dry density.
 - c. Lawn or Unpaved Areas: Compact top 6-inches of subgrade 90-percent maximum dry density.
 - d. Walkways: Compact top 6-inches of subgrade 95-percent maximum dry density.
 - e. Pavements and Steps: Compact top 6-inches of subgrade to 98-percent maximum dry density.

2. Moisture content of soil shall be within 2-percent of the optimum.
- C. Moisture Control: Where subgrade or layer of soil material that is too wet to permit compaction to specified density.
 1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 2. Soil material that has been removed because it is too wet to permit compaction, but is otherwise satisfactory may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to satisfactory value.
 - D. Structural fill shall be placed in layers not more than 6-inches compacted depth for material compacted by heavy compaction equipment. Each layer shall be compacted with proper heavy equipment, to the minimum percent of maximum dry density prescribed herein. Incidental compaction due to traffic by construction equipment will not be credited toward the required minimum coverages.
 - E. Common fill consisting of other than structural fill shall be placed and compacted in a manner similar to that described above for structural fill, with the following exception: layer thickness prior to compaction may be increased the 12-inches in open area; and common fill except dike fill, required below water level in peat excavation areas may be placed as one lift, in-the-wet, to an elevation one foot above the water level at the time of filling.
 - F. Compaction of the fill by such means shall be to the same degree of compaction as obtained by rubber-tired or vibratory roller equipment, and the Engineer may make the necessary tests to determine the amount compactive effort necessary to obtain equal compaction. Large compaction equipment shall not be used within-5 feet of structures. Compaction equipment is subject to approval by the Engineer.
 - G. Place fill material in layers not more than 8-inches loose depth for material compacted by hand-operated tampers. Use manually operated sled-type vibratory compactors next to structures and confined areas not accessible to heavy mechanical compaction equipment.
 - H. If the Engineer shall determine that added moisture is required, water shall be applied by sprinkler tanks or other sprinkler systems, which will insure uniform distribution of the water over the area to be treated, distribution of the water over the area to be treated, and give complete and accurate control of the amount of water to be used. If too much water is added, the area shall be permitted to dry before compaction is continued.
 - I. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment, and all other materials and equipment necessary to place the water in the fill in the manner specified.

3.05 GRADING

- A. General: Uniformly grade-fill areas within limits of project including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such point and existing grades. No soft spots or uncompacted areas will be allowed in the work.
- B. Grading Outside Building Lines: Grade areas adjacent to Buildings as shown on the Drawings, to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:
- C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.
- D. Stones or rock fragments larger than 2-1/2-inches in their greatest dimension will not be permitted in the top 6-inches of the subgrade line of all dike, fills or embankments.
- E. All cut and fill slopes shall be uniformly dressed to the slope, cross section and alignment shown on the Drawings, or as directed by the Engineer to prevent ponding water on driveways, walkways or against structures.
- F. During grading, protect all buried valved extensions and covers, sprinklers and any other mechanical or structural object protruding from below grade.

3.06 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.
- B. If in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills, which have been placed, are below specified density, provide additional compaction and testing at no additional expense.

3.07 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - 1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. 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.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIAL

- A. All surplus and unsuitable excavated material shall be disposed of by the Contractor in the following ways.
 - 1. Transport to an appropriate soil storage area and stockpile or spread as needed.
 - 2. Transport and legally dispose of. Any permit required for the hauling and disposing of this material shall be obtained prior to commencing hauling operations.
- B. Suitable excavated material may be used for fill if it meets that specifications for satisfactory material and is approved by the Engineer. Excavated material so approved may be neatly stockpiled at the site where designated by the Engineer provided there is an area available where it will not interfere with the operator of the facility nor inconvenience traffic or adjoining property owners.
- C. Excavated rock may be used in open fill areas only with the approval of the Engineer.

END OF SECTION

SECTION 02223

EXCAVATION BELOW NORMAL GRADE AND GRAVEL REFILL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. If in the opinion of the Engineer, the material at or below the normal grade of the bottom of the trench (9 inches below the invert of the pipe) is unsuitable for foundation, it shall be removed to the depth directed by the Engineer and replaced by drain rock.

1.02 RELATED WORK

- A. Documents affecting work of this section include, but are not necessarily limited to General Conditions, and Sections in Division 1 of these Specifications.
- B. Section 02221: "Trenching, Bedding and Backfill for Pipe"

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Drain rock shall be 3/8-inch to 3/4-inch washed and graded limerock. The rock shall be graded so that 99 percent will pass a 3/4-inch screen and 80-percent will be retained on a No. 8-screen.

PART 3 - EXECUTION

3.01 EXCAVATION AND DRAINAGE:

- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.
- B. If the Contractor excavates below grade through error or for his own convenience, or fails to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the preceding paragraph, in which case the work of excavating below grade and finishing and placing the refill shall be performed at the Contractors own expense.

3.02 REFILL

- A. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may penetrate into the drain rock matrix, the subgrade material shall be removed to the extent directed and the excavation refilled with coarse sand, or a mixture graded from coarse sand to fine peastone, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Engineer prior to placement. Refill shall be placed in 6-inch layers thoroughly compacted. If directed by the Engineer, drain rock shall be used for refill of excavation below grade.

END OF SECTION

SECTION 02276

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls may include, but are not limited to, mulching, netting, and watering, on site surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner.
- C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, silt barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Owner. In construction in and around water, floating turbidity barriers shall also be employed.
- D. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.02 SUBMITTALS

- A. Submit schedule for temporary erosion and sedimentation control.

PART 2 – PRODUCTS

2.01 TURBIDITY BARRIERS

- A. Floating turbidity barriers shall comply with the latest FDOT Standard Index #103 of the Florida Department of Transportation Roadway and Traffic Design Standards, latest edition and as indicated in the Storm Water Pollution Prevention Plan (SWPPP).
- B. Temporary erosion control measures shall conform to the latest FDOT Standard Indexes #102 and #103 of the Florida Department of Transportation Roadway and Traffic Design Standards, latest edition.

2.02 EROSION CONTROL

- A. Mulch: FDOT type per Section 981-3.2, Green Mulch
- B. Netting: fabricated of material acceptable to the Owner.

2.03 SEDIMENTATION CONTROL

- A. Bales: clean, seed free cereal hay type
- B. Netting: fabricated of material acceptable to the Owner
- C. Filter stone: crushed stone conforming to Florida Department of Transportation specifications.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Contractor shall install floating turbidity barrier in the locations detailed in the plans to a depth not less than the canal bottom. The barrier shall be installed in accordance with FDOT Standard Index #103. Other temporary erosion control measures shall conform to FDOT Standard Index #102.

3.02 EROSION CONTROL

- A. Minimum procedures for mulching and netting are:
 - 1. Apply mulch loosely and to a thickness of between 3/4-inch and 1 1/2-inches.
 - 2. Apply netting over mulched areas on sloped surfaces.

3.03 SEDIMENTATION CONTROL

- A. Install and maintain silt dams, traps and barriers as shown on the approved schedule. Hay bales which deteriorate and filter stone which is dislodged shall be replaced as required.
- B. Turbidity testing shall be required when visible evidence suggests that siltation of the adjacent waterway is occurring and as directed by the engineer. Lack of siltation does not preclude the Contractor from installing floating turbidity barriers.

3.04 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the Owner, Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense. All earthwork operations shall cease until the problem is rectified and acceptable conditions are met.

END OF SECTION

**SECTION 02520
CONCRETE CURBS AND HEADERS**

PART 1 - GENERAL

1.01 SCOPE

The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the construction of concrete curbs and headers, complete and in place, in strict accordance with these specifications and the applicable drawings and subject to the terms and conditions of this contract.

1.02 REFERENCES

Florida Department of Transportation Standard Specifications for Road and Bridge Construction, (latest edition)

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The concrete mix shall produce standard weight concrete with the following properties to be verified by the use of the appropriate listed test methods.
- *Compressive strength:* 3,000 psi at 28 days - tested according to ASTM designation C31 (AASHTO T23)
 - *Slump Range:* 2-4 inches - tested according to ASTM designation C143 (AASHTO T119)
- B. Joint materials shall be in accordance with FDOT Specification Section 932

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

Concrete curbs and headers shall be constructed of the type and in the locations as shown on the plans.

- A. **FORMS:** Forms for this work shall be made of either wood or metal. They shall be straight, free from warp or bends, and of sufficient strength, when staked, to resist the pressure of the concrete without springing. If made of wood, they shall be of two (2) inch surfaced plank; if made of metal, they shall be of approved section and shall have a flat surface on top.
- B. **CONSTRUCTION:** Excavation shall be made to the required depth; and the sub-grade or base upon which the curb or header is placed shall be compacted to 98% AASHTO T-180.

The concrete shall be placed in the forms to the depth specified, and tamped and vibrated to prevent honeycomb and until the top of the structure can be floated smooth and the edges rounded to the radius shown on the plans.

Contraction joints shall be placed at intervals of ten feet except where a lesser interval is required for closure, but no section shall be less than four feet in length.

Contraction joints shall be created while the concrete is still plastic by using a grooving tool or by inserting a pre-molded filler strip, or a groove may be saw cut into the concrete soon after it has hardened, but in no case shall it be sawcut later than 24 hours after placement of fresh concrete. Curb with irregular cracks due to late contraction joint construction will not be accepted.

Expansion joints shall be constructed at all radius points and at other locations indicated on the plans. They shall be located at intervals of 500 feet between other expansion joints or ends of a run. The joint shall be 1/2 inch in width.

The forms shall be removed within twenty-four (24) hours after the concrete has been placed, and minor defects then filled with mortar composed of one (1) part Portland Cement and two (2) parts fine aggregate. Plastering shall not be permitted on the face of the curb; and all rejected curb, or header shall be removed and replaced without additional compensation. The curb top, face and/or header top shall be given a surface finish while the concrete is still green. A brush finish will be required unless noted otherwise; however, additional finishing may be required in areas considered too rough or with minor defects.

On headers, after the concrete has been rubbed smooth, it shall be rubbed again until a uniform color is produced, using a thin grout composed of one (1) part Portland Cement and one (1) part fine aggregate.

After concrete has set sufficiently, the spaces in front and back of the curb shall be refilled to the required elevation with suitable material, which shall be placed and thoroughly compacted in layers of not more than six (6) inches in thickness.

END OF SECTION

**SECTION 02817
CLEARING AND GRUBBING**

PART 1 - GENERAL

1.01 SCOPE

- A. Work specified in this section consists of clearing and grubbing within areas specified in the Contract Documents or as directed by the OWNER's representative. Work under this section includes removal and disposal of all trees, brush, stumps, grass, roots, and other such protruding objects. Also included is the removal and disposal of buildings, structures, existing pavement, other existing facilities, and debris not required to remain or to be salvaged that is necessary to prepare the area for the proposed construction. CONTRACTOR shall notify all utility companies or utility owners (both public or private) of their intent to perform such work and shall coordinate field location of utility lines prior to commencement of construction.

- B. Other miscellaneous work considered necessary for the complete preparation of the overall project site is also included under this section. Work includes, but is not limited to, the following:
 - 1. Leveling and restoration of terrain outside the limits of construction for purposes of facilitating maintenance and other post-construction operations.
 - 2. Trimming of certain trees and shrubs within project limits for utilization in subsequent landscaping of the project.

1.02 SPECIFICATION AND STANDARDS REFERENCE

- A. Where supplementary specifications or standards such as ASTM, AWWA, AASHTO, etc. are referenced, such references shall be latest edition.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

- A. Clearing and Grubbing shall consist of complete removal and disposal of all items stated in Article 1.01 which are not specified for removal under other items of the contract such as in demolition. The CONTRACTOR shall obtain all permits/approvals necessary for disposal at their own expense. The CONTRACTOR shall obtain tree removal permits.

- B. Unless otherwise shown in the plans or Contract Documents, Standard Clearing and Grubbing shall be done within the following areas:

1. All areas where any type of excavation is to be done.
2. All areas where any type of embankment will be constructed.
3. All areas where any type of structure, including pipe culverts or pipe lines, will be installed or constructed.
4. All areas where any type of pavement will be constructed.
5. Other areas designated in the plans or by the specifications.

C. Depths of Removal

1. In areas listed below, all roots and other debris shall be removed to a depth of at least one foot below ground surface. The surface shall then be plowed to a depth of at least six inches and all roots exposed shall be removed to a depth of at least one foot. All stumps including subsurface roots shall be completely removed to the satisfaction of the ENGINEER. Trees shall be removed so roots are pulled out rather than broken or sawed off. Areas requiring the removal methods stated in this paragraph are as follows:
 - a. Excavation areas where the excavated material is to be used in embankment construction under permanent structures such as but not limited to pavement and buildings.
 - b. Embankment areas under permanent structures such as but not limited to pavement, buildings, sewage treatment facilities, bridges, etc.
 - c. Excavation areas where roots or similar vegetation in the top one foot would interfere with disking, harrowing, or finish grading operations prior to seeding or landscaping.
 - d. Lots and building areas.
2. In all other excavation areas not listed above where clearing and grubbing is to be done, all roots, stumps, and debris protruding through or appearing on the surface of the completed excavation shall be removed or cut off below the excavated surface.
3. In all other embankment areas not listed above where clearing and grubbing is to be done, all roots, stumps, and debris protruding through or appearing on the surface shall be removed to a depth of at least one foot below the surface but no plowing or harrowing will be required in these areas.

- D. Trees to Remain: As an exception to the above provisions, where so directed by the OWNER's representative, desirable trees within the clearing limits shall be protected, left standing, and trimmed to prevent damage to limbs during

construction. No equipment shall stand, stop, or travel across or inside the drip line of any trees or vegetation designated to be saved or protected.

- E. Boulders: Any boulders laying on the top of the existing surface or otherwise encountered during the clearing and grubbing shall be removed and disposed of by the CONTRACTOR in areas provided by the CONTRACTOR. As an alternate to off-site disposal and at the CONTRACTOR's expense, he may elect to utilize these boulders in embankments provided the conditions of Article 3.04 in Section 02820 are satisfied. Any breaking or splitting of boulders that may be necessary to comply with size requirements for embankment shall be incidental to the cost of clearing and grubbing. No boulders or rock shall be left or placed in building pads, lots, or building embankment areas.

3.02 SELECTIVE CLEARING AND GRUBBING

- A. Selective clearing and grubbing shall consist of removing and disposing of all vegetation, obstructions, etc, as provided above except that in non-structural areas where the CONTRACTOR so elects, roots may be cut off flush with the ground surface. Stumps shall be completely removed. Undergrowth shall be completely removed except in areas designated by the OWNER's representative for aesthetic purposes.
- B. Desirable trees, that are designated by the OWNER's representative to remain, shall be protected and trimmed in such a way to avoid damage to limbs during construction.

3.03 SPECIAL CLEARING AND GRUBBING

- A. In certain areas that are inaccessible by machines or are considered environmentally sensitive, ENGINEER may specify Special Clearing and Grubbing. Where listed as a separate pay item, Special Clearing and Grubbing shall consist of removal and disposal of all trees, brush stumps, roots, debris or other objects protruding through the surface by cutting off flush with the ground surface. The use of any machinery that would disturb the original ground surface condition will not be permitted.

3.04 ERADICATION OF EXOTIC VEGETATION

- A. Where listed as a separate pay item, Eradication of Exotic Vegetation shall consist of removal and disposal of Australian Pine, Melaleuca, Brazilian Pepper, and other species specifically stated on the plans or specified herein. Also included shall be the removal of the subsurface root system for each exotic species.
- B. In areas where removal is modified to permit cutting off flush within the ground surface, stump and root system shall be treated with an agency approved chemical herbicide that will ensure the eradication of the root system.
- C. Within the limits established for the Eradication of Exotic Vegetation, all other trees, brush, etc. not classified as exotic shall be removed, unless designated in the field

by the OWNER's representative to remain. The removal and disposal of non-exotic vegetation shall conform to the provisions of Article 3.01.

3.05 REMOVAL OF EXISTING PAVEMENT

- A. Work specified in this article consists of the removing and disposing of existing pavement surfaces such as, but not limited to, pavement, sidewalk, curb, and gutter where shown in the plans, or required to be removed during construction operations, or as required by the ENGINEER.

3.06 REMOVAL OF EXISTING STRUCTURES

- A. Work specified in this article shall include removal and disposal of existing buildings, bridges, pipes, and structures of whatever type as specifically shown in the plans to be removed or as otherwise specified for removal in the Contract Documents. Also included are structures of whatever type or portions thereof which are encountered during construction operations. Where partial removal of a structure is approved by the ENGINEER, the portion of the existing structure shall be backfilled, plugged, or filled in such a way that will prevent the settlement, movement, erosion or collapse of the adjacent soils.

3.07 BURNING ON-SITE

- A. Not Applicable.

3.08 DISPOSAL OF MATERIALS

- A. Timber, stumps, roots, brush, boulders, rubbish, and other objectionable material resulting from work specified in this section shall be disposed of off-site in locations provided by the CONTRACTOR.

3.09 OWNERSHIP OF MATERIALS

- A. Except as may be otherwise stated in the Contract Documents, all buildings, structures, appurtenances and other materials removed by the CONTRACTOR shall become the property of the CONTRACTOR, to be disposed of in areas provided by him.

PART 4 - MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

- A. General: For the various items of work specified in this section when listed as a separate pay item, payment shall be made by the unit price or the lump sum amount as established in the Contract Documents. Where no separate pay item is established, the cost of all such work shall be included in the various scheduled items of work specified in the Contract Documents, except as provided below.
- B. Clearing and Grubbing: Measurement of Clearing and Grubbing shall include only the areas specified in the Contract Documents that are required to be cleared to permit the construction of the various items of work. Areas that are cleared for convenience, access, or other purposes that are not a requirement of construction will not be measured for payment.
- C. Selective Clearing and Grubbing: Measurement of Selective Clearing and Grubbing shall include all areas shown in the plans or designated in the field by the OWNER's representative. This measurement shall include the total area within the limits of Selective Clearing and Grubbing and no deduction shall be made for areas in which desirable trees and brush are designated to remain. Where the limits of Selective Clearing and Grubbing are shown on the plans or otherwise established in the Contract Documents but no separate pay item established, the measurement of such work shall be included in the quantity or lump sum amount of "Clearing and Grubbing".
- D. Special Clearing and Grubbing: Measurement of Special Clearing and Grubbing shall include all areas shown in the plans or designated in the field by the OWNER's representative. This measurement shall include only actual areas cleared by the hand method and shall not include areas cleared by other methods or areas that remain in their original condition. Where the limits of Special Clearing and Grubbing are shown on the plans or otherwise established in the Contract Documents but no separate pay item established, the measurement of such work shall be included in the quantity or lump sum amount of "Clearing and Grubbing".
- E. Eradication of Exotic Vegetation: Measurement of Eradication of Exotic Vegetation shall include areas shown on the plans or designated in the field by the OWNER's representative. This measurement shall include the total area within the limits established for Eradication of Exotic Vegetation and include the areas within these limits where non-exotic vegetation is removed. Where the OWNER's representative has designated desirable vegetation to remain within these limits, no deduction of area shall be made for the "saved" areas.

Where limits of Eradication of Exotic Vegetation are shown on the plans or otherwise established in the Contract Documents but no separate pay item established, the measurement of such work shall be included in the quantity or lump sum amount of "Clearing and Grubbing."

- F. Removal of Existing Pavement: When a separate pay item is established for the Removal of Existing Pavement, the quantity to be paid shall be by the square yard

for the actual quantity removed and disposed of off-site. For curb and gutter, slope pavement, and other irregular areas, the measurement shall be generally taken as an approximate horizontal surface. Where lump sum payment is provided, such payment shall be compensation for the removal of areas shown on the plans or otherwise specified in the Contract Documents.

Where a separate pay item is established for curb, gutter, or curb and gutter removal, the measurement shall be measured by the lineal foot at the flow line of the gutter or at the top of curb where there is no gutter. Where separate pay has not been provided for curb or curb and gutter removal, the measurement shall be included in the area for pavement removal as stated above.

When no separate payment is provided for the Removal of Existing Pavement and no applicable item of excavation or embankment covering such work is listed, the costs of this work shall be included in the contract price for the item of Clearing and Grubbing or for the pipe or other structure of which the pavement removal is required.

- G. Removal of Existing Structures: When separate payment for Removal of Existing Structures or Removal of Existing Buildings is provided, the work shall be paid for at the contract lump sum price. When direct payment is not provided, the cost of such removal and disposal shall be included in the contract price for Clearing and Grubbing or if no clearing and grubbing is included, in the compensation for the other items covering the new structure to be constructed.
- H. Burning: Unless otherwise specified in the Contract Documents, and where permitted, burning shall be considered as being part of the process of disposing of materials and the cost of such work shall be included in the item which requires the disposal of materials.

4.02 BASIS FOR PAYMENT

- A. General: Prices and payments for the various work items included in this section shall constitute full compensation for all work described herein and shall include all removal, disposal, protecting, trimming, breaking, plugging, eradication, or any other items specified in this section.
- B. Pay Items: For all work specified in this section, payment shall be made in accordance with the list of pay items established or as otherwise defined in the Contract Documents. The description of a pay item in the proposal section may vary from the descriptions stated in this section.

END OF SECTION

SECTION 02931

SODDING

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor, materials, equipment and incidentals required to prepare lawn bed and install sodding as shown on contract drawings and as specified herein.
- B. Area to receive sodded grass lawns within the landscape limits shown on the Drawings except as noted herein shall be as designated on the Drawings.

1.02 SUBMITTALS

- A. Provide technical data as specified on all materials or installation procedures required under this Section.
- B. Submit representative topsoil samples for analysis by a private laboratory to determine nutrient deficiencies and outline a proper fertilization program.
- C. Submit certifications required for all sodding supplied.

PART 2 – PRODUCTS

2.01 SOD

- A. Sod type shall match existing, where Sodding is specified.
- B. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type, and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.
- C. Before being cut and lifted, the sod shall have been mowed 3 times with the final mowing not more than 1-week before cutting into uniform dimensions.

2.02 SOIL CONDITIONERS

- A. Fertilizer:
 - 1. Fertilizer shall be a complete fertilizer, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with State and Federal fertilizer laws.
 - 2. Percentages of nitrogen, phosphorus and potash shall be based on laboratory tests on soils outlined in Paragraph 1.02B and approved by the Engineer. For purpose of bidding, assume 6% nitrogen, 6% phosphorus and 6% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen.

3. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. Store fertilizer in a weather-proof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.
- B. Super phosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 20% available phosphoric acid.

PART 3 – EXECUTION

3.01 LAWN BED PREPARATION

- A. Areas to be sodded shall be cleared of all rough grass, weeds and debris, and the ground brought to an even grade as approved.
- B. The soil shall be then thoroughly tilled to a minimum 8-inch depth.
- C. Super phosphate at a rate for bidding purposes of 5-pounds per 1000-square foot and complete fertilizer at a rate for bidding purposes of 16-pounds per 1000-square foot shall be evenly distributed over entire area and cross-disced in to a depth of 4-6-inches.
- D. The areas shall be brought to a proper grade, free of sticks, stones, or other foreign matter over 1 inch diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and uniformly firm texture.

3.02 SOD HANDLING AND INSTALLATION

- A. During delivery, prior to planting, and during the planting of the lawn areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and planting so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.
- C. Bring the sod edge in a neat, clean matter to the edge of all paving and shrub areas. Top dressing with approved, clean, weed free, sand may be required at no additional cost to the Owner if deemed necessary by the Engineer.

3.03 MAINTENANCE

- A. The Contractor shall produce a dense, well-established lawn. The Contractor shall be responsible for the repair and re-sodding of all eroded or bare spots until project acceptance. Repair sodding shall be accomplished as in the original work except that fertilizing may be omitted.
- B. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Sodded areas shall receive no less than 1.5-inches of water per week.

3.04 REPAIRS TO LAWN AREAS DISTRIBUTED BY CONTRACTOR'S OPERATIONS

- A. Lawn areas planted under this Contract and lawn areas outside the designated areas damages by Contractor's operations shall be repaired at once by proper sod bed preparation, fertilizing and re-sodding, in accordance with these specifications.

END OF SECTION

SECTION 03100

PAVERS

PART 1 - GENERAL

- 1.1 CONFORMITY: Conform to the requirements of the conditions of the contract.
- 1.2 Related work in Other Sections of These Specifications
- a.) Preparation of sub-base.
 - b.) Supply and place base coarse materials.
 - d.) Curbing and or edge restraints.
 - e.) Cleaning and sealing of Pavers.
- 1.3 Work Included:
- a.) Supply and place sand-laying course.
 - b.) Supply and Install interlocking concrete paving stones in quality, shape, thickness and color as specified.
 - c.) Supply and place all accessory items as required by the Contract.
- 1.4 Product Handling: Paving stones shall be delivered and unloaded at job site with or without pallets and bound in such manner that no damage occurs to the product during handling, shipping and unloading.

PART 2 - PRODUCTS

- 2.1 Solid Concrete Interlocking Paving Stones: ASTM Designation C936-82
- A.) Holland Stone or Approved equal
- | <u>Shape</u> | <u>Thickness</u> |
|---------------------------------|------------------|
| 4"x8" Rectangular and 5-1/2"x9" | 2-3/8" |
- B.) Colors shall match the existing pavers at the site.
 - C.) Cementitious Materials: Portland Cements shall conform to ASTM Specification C-150.
 - D.) Aggregates: Shall conform to ASTM Specification C-33 for Normal Weight Concrete Aggregate (no expanded shale or lightweight aggregates) except that grading requirements shall not necessarily apply.
 - E.) Other Constituents: Coloring pigments, air entraining agents, integral water Repellents, finely ground silica, etc., shall conform to ASTM standards where applicable, or shall be previously established as suitable for use in concrete.
 - F.) Physical Requirements:
 - 1. Size of Units shall be as noted above.
 - 2. Compressive Strength: At the time of delivery to the work site, the

average comprehensive strength shall not be less than 8,000 I with No individual unit strength loss than 7,200 PSI with testing procedures in accordance with ASTM – Standard C-140.

3. Absorption: The average absorption shall not be greater than 5 percent (5%) with no individual unit absorption greater than seven percent (7%).
4. Abrasion Resistance: When tested in accordance with method C418, specimens shall not have a greater volume loss than 0.915 in. 3 per 7.75 in.2. The average thickness loss shall not exceed 0.118 in (3mm).

I.) Visual Inspection: All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or performance of the construction. Minor Cracks incidental to the usual methods of manufacture, or minor chipping resulting from customary methods of handling in shipment and delivery shall not be deemed grounds for rejections.

J.) Sampling and testing:

1. The Engineer shall be accorded facilities to inspect and sample the units at the place of manufacture from lots ready for delivery.

K.) Rejection: In case the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new test units should/shall be selected at random by the Purchaser from the retained lot and tested at the expenses of the manufacturer. In case the Second set of test units fails to conform to the specified requirements; the entire lot shall be rejected.

L.) Expense of Tests: The expense of Inspection and testing shall be borne by the purchaser unless otherwise agreed.

2.2 Edge Restraint:

A.) All edges: Of the installed paving stones shall be restrained. The type of edge restraint shall be approved at locations as noted on plans.

B.) The Edge Restraint can be:

1. Concrete Curbing or Sidewalk

PART 3 - EXECUTION:

3.1 The Contractor: Must have a minimum of 2 years experience in the Installation of Interlocking concrete paving stones.

3.2 Preparation of Sub base: Material as specified should be compacted to at least 98% of the modified Proctor Dry Density, which is determined in accordance with ASTM T-180.

3.3 Preparation of the Base Course:

A.) A suitable Base: Must be prepared as detailed in other sections of the project specifications.

B.) The Base Course: The final elevation should be within +3/4 in. (19mm) or -1/2 in. (13mm) of the specified elevations. Deviations in the base

elevation should not exceed ½ in. (13mm) when tested with a 10-foot (3m) straight edge.

C. Base Course:

1. 6" limerock base compacted to 98%.

3.4 Laying of Concrete Paving Stones:

- A.) The Paving Stones: Shall be laid in the approved pattern as noted or shown on drawings.
- B.) The Paving Stones: Shall be laid in such a manner that the desired pattern is maintained and the joints between the adjacent units are approximately 1 1/6 in. (1.5mm) to 1/8 in. (3mm wide).
- C.) String Lines: Should be used to hold pattern lines true.
- D.) The Gaps: At the edge of the paver surface shall be filled with standard edge stone or with stones cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic surface using a double-headed breaker or a masonry saw is recommended. Whenever possible, no cuts should result with a paver less than 1/3 of original dimension. Gaps less than 3/8 in. (10mm) should be filled with sand.
- E.) Paving Stones: Shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force with the surface clean and joints open.
- F.) After Vibration: Clean masonry type sand containing at least 30% of 1/8" (3mm) particles shall be spread over the paving stone surface. Allowed to dry and vibrated into joints with additional vibrator passes and brushing so as to completely fill joints.
- G.) Final Elevation: Unless otherwise specified, the final surface elevations should not deviate more than 3/8-in. (10mm) under a 10-foot (3m) straight edge. The surface elevation of pavers should be 1/8 in. (3mm) to ¼ in. (6mm) above adjacent drainage inlets, concrete collars or channels.
- H.) Surplus Material: Shall then be swept from the surface or left on surface during construction time to insure complete filling of joints during initial use. This sand also may provide surface protection from construction debris.
- I.) Upon completion: Of work in the Section, the Contractor shall clean up all work areas by removing all debris, surplus material and equipment from the site.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor, materials, equipment and incidentals required to install all steel bars, steel wire, and wire fabric required for the reinforcement of concrete, as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete is included in Section 03300.

1.03 SUBMITTALS

- A. Submit to the Engineer, as provided in the Drawings and the General Conditions, completely detailed working drawings and schedules of all reinforcement required.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Unless otherwise specified or required, the design, materials, workmanship, and erection shall conform to the requirements of the latest local Building Code and the latest ACI 318 Code. In case of conflict, the latest local Building Code shall govern.
- B. Concrete reinforcement in sizes No.3 (3/8-inch) and larger shall be deformed steel bars of the sizes and shapes indicated on the Drawings. The steel shall be newly rolled stock of domestic manufacture, substantially free from mill scale, rust, dirt, grease, or other foreign matter. Bars shall be of intermediate grade, deformed billet steel conforming to ASTM Specification A615, Grade 60.
- C. Rail-steel bars will not be allowed in the work.
- D. Reinforcement shall be accurately fabricated to the dimensions indicated on the Drawings. Particular care shall be exercised not to have stirrups oversize in order to maintain proper coverage of concrete. Stirrups and tie bars shall be bent around a revolving collar having a diameter not less than 2 times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than 6 times the minimum thickness of the bar except for bars 1 larger than 1-inch, in which case the bends shall be made around a pin of 8-bar diameters. All bars shall be bent cold. Bars reduced in section or with kinks or bends not shown on the Drawings will not be accepted.
- E. Wire fabric shall conform to ASTM Specification A185 for Welded Steel Wire Fabric for Concrete Reinforcement.

- F. Steel wire shall conform to ASTM Specification A82 for Cold-Drawn Steel 1 for Concrete Reinforcement. Wire ties shall be zinc coated annealed iron of not less than No. 18 gage.

2.02 HANDLING MATERIALS

- A. Reinforcement shall be shipped to the work with bars of the same size and shape fastened in bundles with metal identification tags giving size and mark securely wired on. The identification tags shall be labeled with the same designation as shown on submitted bar schedules and shop drawings.
- B. All bars shall be stored off the ground and shall be protected from moisture and be kept free from dirt, oil, or injurious contaminants.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. No reinforcing bars shall be welded either during fabrication or erection without prior written approval from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work.
- B. Unless otherwise shown, splices in reinforcement shall be lapped not less than 24 bar diameters. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.
- C. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.
- D. Reinforcement shall be accurately positioned as indicated on the Drawings and secured against displacement by using wire ties or suitable clips at intersections.
- E. All accessories such as chairs, chair bars, and the like are an integral part of the reinforcement and shall be furnished and installed in sufficient quantity to satisfactorily position all steel and in accordance with the latest (ACI 315) Manual of Standard Practice for Detailing Reinforced Concrete Structures.
- F. Except as otherwise indicated on the Drawings, bars in slabs, beams and girders shall be spliced as per requirements in ACI 315. Splices and laps in columns, piers and struts shall be sufficient to transfer full stress by bond. Splices in adjacent bars shall be staggered if required.
- G. Except as otherwise indicated on the Drawings, reinforcement shall be installed with clearance for concrete coverage as follows:

Footing bottom	3-inch
Formed surfaces in contact with soil or exposed to the weather	2-inch
Columns, beams and shear-walls.....	1-1/2-inch
Slabs on grade	1-1/2-inch
Bottom steel of interior slabs	1-inch
Top steel of interior slabs	3/4-inch
Bottom steel in grid slabs	1-1/2-inch
Interior face of walls	1-inch

- G. All slab reinforcing shall be supported on concrete cubes or wafers of the correct height. Wafers shall contain soft steel wires embedded therein for fastening to reinforcing. Wafers shall have a minimum compressive strength of 3,500 psi and shall have been cured as specified for concrete. Masonry units will not be permitted for supporting steel in bottom mats or elsewhere. For supporting the top steel in slabs, the Contractor shall furnish extra steel supports such as channel s if required and shall construct blocks of concrete having the same quality as specified for the structure for use in supporting both top and bottom mat steel. Wood blocks, stones, brick chips, etc., cinder blocks; or concrete building blocks will not be allowed. Alternate methods for supporting top steel in slabs, such as vertical reinforcing fastened to bottom and top mats, may be used if approved by the Engineer.
- I. Alternate methods of supporting bottom reinforcement for slabs and beams not exposed to the weather (such as plastic chairs, but not plastic-tipped bolsters) may be used only if specifically approved by the Engineer.
- J. Reinforcement for vertical surfaces (beams, columns, walls) shall be properly and firmly positioned from the forms at all points by means of stainless steel (tipped) bolsters or equal, subject to Engineer's approval.
- K. Reinforcement which is to be exposed for a considerable length of time after being placed shall be painted with a heavy coat of neat cement slurry.
- L. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcements has been checked by the Engineer and his permission given to proceed with the concreting. The Engineer shall be given ample prior notice of the availability of set reinforcement for checking.

END OF SECTION

SECTION 03251

JOINTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish all materials, labor, equipment and incidentals required to make all joints tight in the concrete as detailed on the Drawings and as specified herein.

1.02 SUBMITTALS

- A. Submit to the Engineer shop drawings showing placement of forms, form joints, major inserts and blockouts.

PART 2 - PRODUCTS

2.01 EXPANSION JOINTS – FLOOR – N/A

2.02 EXPANSION JOINTS - OTHER

- A. Pre-molded joint filler shall be 3/4-inch thick or as shown on the Drawings and shall be a self-expanding cork, Serviced Products, W.R. Grace and Company, Code No. 4324 equal by W.R. Meadows, Inc., or equal.
- B. Joint sealant shall be a two-component synthetic rubber compound based on Thiokol liquid polysulphide polymer by W.R. Grace and Company, Toch Bros., Tremco Co., or equal. Sealant shall develop a Shore Hardness of at least 30 after seven days curing. Back-up material where required shall be approved closed cell polyethylene foam rods of diameters to suit joint conditions.
- C. Primer shall be as recommended by sealant manufacturer.

2.03 WATERSTOPS – N/A

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Pre-molded joint fillers shall be installed at all locations shown on the Drawings.
- B. Joint sealant for all joints indicated on the Drawings shall be placed to the depths shown. Preparation of surfaces, priming, and the handling and preparation of materials shall be in complete compliance with the manufacturer's instructions as approved.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
 - 1. Shoring and Re-shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing re-shoring.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.

- F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
 - 4. Fiber reinforcement.
 - 5. Admixtures.
 - 6. Waterstops.
 - 7. Curing materials.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Epoxy joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- H. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and re-shoring installations that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

- F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better.
 - b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
 - c. Structural 1, B-B, or better, mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade-60 (Grade-420). Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
 - 1. Fly Ash: ASTM C 618, Class C or F.
 - 2. Fly Ash: ASTM C 618, Class F.
 - 3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.

- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Moderate weathering region, but not less than 3M.
 - 2. Nominal Maximum Aggregate Size: 1-inch (25 mm).
 - 3. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18-percent and not less than 8-percent retained on an individual sieve, except that less than 8-percent may be retained on coarsest sieve and on No. 50 (0.3-mm) sieve, and less than 8-percent may be retained on sieves finer than No. 50 (0.3 mm).
- D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1-percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Catexol 1000CL; Axim Concrete Technologies.
 - b. MCI 2000 or MCI 2005; Cortec Corporation.
 - c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
 - d. Rheocrete 222+; Master Builders, Inc.
 - e. FerroGard-901; Sika Corporation

2.6 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes.
 - 1. Profile: Flat, dumbbell with center bulb.
 - 2. Profile: Flat, dumbbell without center bulb.
 - 3. Profile: Ribbed with center bulb.
 - 4. Profile: Ribbed without center bulb.
 - 5. Profile: As indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Rubber Waterstops:
 - a. Greenstreak.
 - b. Progress Unlimited Inc.
 - c. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
 - d. Williams Products, Inc.

- D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Conseal CS-231; Concrete Sealants Inc.
 - c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - d. Hydrotite; Greenstreak.
 - e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
 - f. Adeka Ultra Seal; Mitsubishi International Corporation.
 - g. Superstop; Progress Unlimited Inc.

2.7 BOAT RAMP SLAB TREATMENTS

- A. Slip-Resistive Finishes as follows:

- B. Boat Ramps will have a heavy stamp or rake finish imparted into the surface with a minimum depth of ½” applied transverse to the direction of travel. The stamp or rake shall be applied at a slight angle (5 to 10 degrees max) to the perpendicular to allow water to drain to one side of the ramp. Contractor shall perform or submit a test sample of the finished texture to the Engineer prior to construction of the ramps for approval utilizing the same concrete as specified in the Drawings.

- C. Pier Ramps shall have a light to medium broom finish applied transverse to the direction of travel to provide sufficient traction for pedestrians under wet conditions. Vertical sides of the concrete pier ramps shall be rubbed smooth.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- D. Water: Potable.

- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 22-percent solids.
- H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- J. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- K. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Evaporation Retarder:
 - a. Cimfilm; Axim Concrete Technologies.
 - b. Finishing Aid Concentrate; Burke Group, LLC (The).
 - c. Spray-Film; ChemMasters.
 - d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
 - e. Sure Film; Dayton Superior Corporation.
 - f. Eucobar; Euclid Chemical Co.
 - g. Vapor Aid; Kaufman Products, Inc.
 - h. Lambco Skin; Lambert Corporation.
 - i. E-Con; L&M Construction Chemicals, Inc.
 - j. Confilm; Master Builders, Inc.
 - k. Waterhold; Metalcrete Industries.
 - l. Rich Film; Richmond Screw Anchor Co.
 - m. SikaFilm; Sika Corporation.
 - n. Finishing Aid; Symons Corporation.
 - o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
 - 2. Clear, Solvent-Borne, Membrane-Forming Curing Compound:
 - a. AH Clear Cure; Anti-Hydro International, Inc.
 - b. Spartan-Cote; Burke Group, LLC (The).
 - c. Spray-Cure & Seal 15; ChemMasters.
 - d. Conspec #1-15-percent solids; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day-Chem Cure and Seal; Dayton Superior Corporation.
 - f. Diamond Clear; Euclid Chemical Co.
 - g. Nitocure S; Fosroc.
 - h. Cure & Seal 309; Kaufman Products Inc.
 - i. Lambco 120; Lambert Corporation.
 - j. L&M Dress & Seal 18; L&M Construction Chemicals, Inc.
 - k. CS-309; W. R. Meadows, Inc.
 - l. Seal N Kure; Metalcrete Industries.
 - m. Rich Seal 14-percent UV; Richmond Screw Anchor Co.
 - n. Kure-N-Seal; Sonneborn, Div. of ChemRex, Inc.
 - o. Flortec 14; Sternson Group.
 - p. Cure & Seal 14-percent; Symons Corporation.
 - q. Clear Seal 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
 - r. Acrylic Cure; Unitex.
 - s. Certi-Vex AC 309; Vexcon Chemicals, Inc.

3. Clear, Waterborne, Membrane-Forming Curing Compound:
 - a. AH Clear Cure WB; Anti-Hydro International, Inc.
 - b. Klear Kote WB II Regular; Burke Chemicals.
 - c. Safe-Cure & Seal 20; ChemMasters.
 - d. High Seal; Conspec Marketing & Manufacturing Co., Inc.
 - e. Safe Cure and Seal; Dayton Superior Corporation.
 - f. Aqua Cure VOX; Euclid Chemical Co.
 - g. Cure & Seal 309 Emulsion; Kaufman Products Inc.
 - h. Glazecote Sealer-20; Lambert Corporation.
 - i. Dress & Seal WB; L&M Construction Chemicals, Inc.
 - j. Vocomp-20; W. R. Meadows, Inc.
 - k. Metcure; Metalcrete Industries.
 - l. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
 - m. Rich Seal 14-percent E; Richmond Screw Anchor Co.
 - n. Kure-N-Seal WB; Sonneborn, Div. of ChemRex, Inc.
 - o. Florseal W.B.; Sternson Group.
 - p. Cure & Seal 14-percent E; Symons Corporation.
 - q. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
 - r. Hydro Seal; Unitex.
 - s. Starseal 309; Vexcon Chemicals, Inc.
4. Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22-percent Solids:
 - a. Klear Kote WB II 20-percent; Burke Chemicals.
 - b. Safe-Cure & Seal 20; ChemMasters.
 - c. Conspec 21; Conspec Marketing & Manufacturing Co., Inc.
 - d. Diamond Clear VOX; Euclid Chemical Co.
 - e. SureCure Emulsion; Kaufman Products Inc.
 - f. Glazecote Sealer-20; Lambert Corporation.
 - g. Dress & Seal WB; L&M Construction Chemicals, Inc.
 - h. Vocomp-20; W. R. Meadows, Inc.
 - i. Metcure 0800; Metalcrete Industries.
 - j. Cure & Seal 200E; Nox-Crete Products Group, Kinsman Corporation.
 - k. Rich Seal 18-percent E; Richmond Screw Anchor Co.
 - l. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.
 - m. Florseal W.B.; Sternson Group.
 - n. Cure & Seal 18-percent E; Symons Corporation.
 - o. Seal Cure WB STD; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
 - p. Hydro Seal 800; Unitex.
 - q. Starseal 0800; Vexcon Chemicals, Inc.
5. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:
 - a. Spray-Cure & Seal Plus; ChemMasters.
 - b. UV Super Seal; Lambert Corporation.
 - c. Lumiseal Plus; L&M Construction Chemicals, Inc.
 - d. CS-309/30; W. R. Meadows, Inc.
 - e. Seal N Kure 30; Metalcrete Industries.
 - f. Rich Seal 31-percent UV; Richmond Screw Anchor Co.
 - g. Cure & Seal 31-percent UV; Symons Corporation.
 - h. Certi-Vex AC 1315; Vexcon Chemicals, Inc.
6. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
 - a. Klear-Kote Cure-Sealer-Hardener, 30-percent solids; Burke Group, LLC (The).
 - b. Polyseal WB; ChemMasters.

- c. UV Safe Seal; Lambert Corporation.
- d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
- e. Vocomp-30; W. R. Meadows, Inc.
- f. Metcure 30; Metalcrete Industries.
- g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

2.9 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- D. Epoxy Joint Filler: Two-component, semi-rigid, 100-percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- F. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- G. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- H. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336-inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repairs shall not be allowed. Concrete considered to be inadequate shall be removed and replaced in its entirety.

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Slab-on-Grade Ramps: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 5000 psi.
 - 2. Minimum Cementitious Materials Content: 520- lb/cu. yd.
 - 3. Maximum Slump: 5-inches.
- D. Pedestrian Pier Ramps: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28-Days): 5000 psi.
 - 2. Maximum Slump: 5-inches.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25-percent.
 - 2. Combined Fly Ash and Pozzolan: 25-percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50-percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50-percent Portland cement minimum, with fly ash or pozzolan not exceeding 25-percent.
 - 5. Silica Fume: 10-percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35-percent with fly ash or pozzolans not exceeding 25-percent and silica fume not exceeding 10-percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50-percent Portland cement minimum, with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10-percent.
- F. Maximum Water-Cementitious Materials Ratio: 0.40 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.
- G. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5-percent, unless otherwise indicated:
 - 1. Air Content: 5.5-percent for 1-1/2-inch- (38-mm-) nominal maximum aggregate size.
 - 2. Air Content: 6-percent for 1-inch- (25-mm-) nominal maximum aggregate size.
 - 3. Air Content: 6-percent for 3/4-inch- (19-mm-) nominal maximum aggregate size.
- H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15-percent by weight of cement.
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90-deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2-hours to 75-minutes; when air temperature is above 90-deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1- cu. yd. (0.76 cu. m) or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1- cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1- cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8-inch (3 mm).
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50-deg F (10 deg C) for 24-hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. 28-day design compressive strength.
 - 2. At least 70-percent of 28-day design compressive strength.
 - 3. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 4. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and re-shoring.
- B. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate re-shoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS – N/A

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2- inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8- inch (3 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.
- C. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

- D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- E. Deposit concrete in forms in horizontal layers no deeper than 24-inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6-inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90-deg F (32-deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8- inch (3 mm) in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- B. Rubbed Finish: Apply the following to smooth-formed finished concrete:

1. Smooth-Rubbed Finish: Not later than 1-day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36-hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, stamps or rakes as specified.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 2. Finish surfaces to the following tolerances, measured within 24-hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

- b. Specified overall values of flatness, F (F) 35; and levelness, F (L) 25; with minimum local values of flatness, F (F) 24; and levelness, F (L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F (F) 30; and levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and levelness, F (L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F (F) 45; and levelness, F (L) 35; with minimum local values of flatness, F (F) 30; and levelness, F (L) 24.
 - 3. Finish and measure surface so gap at any point between concrete surface and an unlevleed freestanding 10-foot- (3.05-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
 - a. 1/4- inch (6.4 mm).
 - b. 3/16- inch (4.8 mm).
 - c. 1/8- inch (3.2 mm).
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Aggregate Finish – N/A
- H. Mineral Dry-Shake Floor Hardener Finish – N/A:

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and

during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7-days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12- inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than 7-days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3-hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3-hours after initial application. Repeat process 24-hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS – N/A

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

- C. Install semi-rigid epoxy joint filler full depth in saw-cut joints and at least 2- inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Patching shall not be allowed.

3.17 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5- cu. yd., but less than 25- cu. yd., plus one set for each additional 50 - cu. yd. or fraction thereof.
 - 2. Testing Frequency: Obtain at least one composite sample for each 100- cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40-deg F and below and when 80-deg F and above, and one test for each composite sample.
 - 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 7. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 8. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7-days and two at 28-days.
 - a. Test two field-cured specimens at 7-days and two at 28-days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

- C. When strength of field-cured cylinders is less than 85-percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48-hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28-days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 03315

GROUT

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall furnish all materials for grout in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished grout, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK

- A. Section 03300 – “Cast-in-Place Concrete”

1.03 REFERENCES

- A. Specifications, codes, and standards shall be as specified in Section 03300 “Cast-in-Place Concrete,” and as referred to herein.
- B. Additional Commercial Standards: CRD-C 621 Corps of Engineers Specification for Non-Shrink Grout

1.04 SUBMITTALS

- A. The Contractor shall submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer’s literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

PART 2 - PRODUCTS

2.01 NON-SHRINK GROUT

- A. Non-shrink grout shall be a pre-packaged, non-organic, non-gas liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer’s instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for each particular application.
- B. Non-shrink grouts shall have a minimum 28-day compressive strength of 5000 psi, shall have no shrinkage (0.0-percent) and a maximum 4.0-percent expansion in the plastic state when tested in accordance with ASTM C 827, and shall have no shrinkage (0.0-percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

2.02 EPOXY GROUT

- A. Epoxy mortar (grout) shall be used to set items specified. Epoxy mortar (grout) shall be a pre-packaged mix containing aggregate and epoxy mortar adhesive; utilize "Permatop" as manufactured by Permagile Corp. of America, or approved equal.

2.03 CURING MATERIALS

- A. Curing materials shall be as recommended by the manufacturer.

2.04 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of the above described consistency.

2.05 MEASUREMENT OF INGREDIENTS

- A. Pre-packaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 – EXECUTION

3.01 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300 "Cast-in-Place Concrete". The finish of the grout surface shall match that of the adjacent concrete.
- B. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for pre-packaged grouts shall be done according to the instructions and recommendations of the manufacturer.

3.02 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

END OF SECTION

SECTION 03350

CONCRETE FINISHING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work included: Provide finishes on cast-in-place concrete as called for on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 RELATED DOCUMENTS

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.03 RELATED WORK

- A. Related Sections:
 - 1. Section 03300 – “Cast-in-Place Concrete”.
 - 2. Section 03480 – “Precast Concrete Specialties”.

1.04 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Except as may be modified herein or otherwise directed by the Engineer, comply with ACI 301 - "Specifications for Structural Concrete for Buildings."

1.05 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340 – “Submittals and Substitutions”.
- B. Product Data: Within 35-calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used for this work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent provisions of Section 01640 – “Product Handling”.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
 - 2. As required for this work, provide the materials specified herein, or equals approved in advance by the Engineer.
- B. Concrete Materials: Comply with pertinent provisions of Section 03300 - "Cast-in-Place Concrete", except as may be modified herein.
- C. Liquid Bonding Agent: "Weld-Crete", manufactured by the Larsen Products Corporation.
- D. Curing and Protection Paper:
 - 1. Approved products:
 - a. "Sisalkraft, Orange Label", or;
 - b. Equal products complying with ASTM C171.
 - 2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896," or equal paper faced with polyethylene film.
- E. Liquid Curing Agents:
 - 1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
 - 2. For chemical curing, use "Hunt TLF" manufactured by Hunt Process Company, Inc.
- F. Floor Sealer: Acceptable products:
 - 1. "Superkote Special Clear Sealer" manufactured by Ven-Chem Company, Inc., P. O. Box 3186, Santa Barbara, California, 93105, (213)342-1195.
 - 2. "Supershield" manufactured by James Darcey Company, Inc., 19712 Merridy Street, Chatsworth, California, 91311, (213)349-3705.
- G. Slip-Resistant Abrasive Aggregate:
 - 1. Provide aluminum oxide, 14/36 grading.
 - 2. Acceptable manufacturers:
 - a. Carborundum Company.
 - b. Norton Company.
 - c. L. M. Scofield Company.

2.02 OTHER MATERIALS

- A. Contractor shall provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject for the approval of the Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISHING OF FORMED SURFACES

- A. General:
 - 1. After removal of forms, give the concrete surfaces one or more of the finishes specified below where so indicated on the Drawings.
 - 2. Revise the finishes as needed to secure the approval of the Engineer.

- B. As-cast finish:
 - 1. Rough form finish:
 - a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
 - b. Remove fins exceeding 1/4-inch in height.
 - 2. Smooth form finish:
 - a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
 - b. Patch tie-holes and defects.
 - c. Remove fins completely.

- C. Rubbed Finished:
 - 1. Provide these finishes only where specifically called for, and then only on a "smooth form finish" base as described above.
 - 2. Smooth rubbed finish:
 - a. Produce on newly hardened concrete no later than the day following form removal.
 - b. Wet the surfaces, and rub with carborundum brick or other abrasive until uniform color and texture are produced.
 - c. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.
 - 3. Grout cleaned finish:
 - a. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.
 - b. Do not permit cleaning while the work progresses.
 - c. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
 - d. Substitute white Portland cement for part of the gray Portland cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.
 - e. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.
 - f. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
 - g. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means.
 - h. After the surface whites from drying (about 30-minutes at normal temperatures), rub vigorously with clean burlap.
 - i. Keep the surface damp for at least 36-hours after final rubbing.

- D. Unspecified Finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.
 - 1. Rough form finish:
 - a. For all concrete surfaces not exposed to public view.
 - 2. Smooth form finish:

3.03 FINISHING SLABS

a. For all concrete surfaces exposed to public view.

A. Definition of Finishing Tolerances:

1. "Class A": True plane within 1/8-inch in 10-feet as determined by a 10-foot straightedge placed anywhere on the slab and in any direction.
2. "Class B": True plane within 1/4-inch in 10-feet as determined by a 10-foot straightedge placed anywhere on the slab and in any direction.
3. "Class C": True plane within 1/4-inch in two feet as determined by a 2-foot straightedge placed anywhere on the slab and in any direction.

B. Scratched Finish: After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.

C. Floated Finish:

1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
3. During or after the first floating, check the planeness of the surface with a ten foot straightedge applied at not less than two different angles.
4. Cut down high spots and fill low spots to produce a surface with a Class B tolerance throughout.
5. Re-float the slab immediately to a uniform sandy texture.

D. Troweled Finish:

1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.
 - a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
 - b. Provide hand troweling when a ringing sound is produced as the trowel is moved over the surface.
 - c. Thoroughly consolidate the surface by hand troweling.
2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
 - a. For concrete on metal deck, Class B plane tolerance is acceptable.
 - b. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.

E. Broom Finish:

1. Provide a floated finish as described above.
2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
3. Unless otherwise directed by the Engineer, provide the texturing in one direction only.
4. Provide "light", "medium" or "coarse" texturing as directed by the Engineer or otherwise called for on the Drawings.

F. Raked or Stamped Finish

1. Provide a floated finish as described above.
2. While the surface is still plastic, provide a textured finish by drawing a rough fiber bristle broom uniformly over the surface.
3. Immediately thereafter, provide a heavy rake or stamp to the concrete that has a depth for each tyne or rake of between 1/2" to 3/4" transverse to the direction of travel.

Spacing between tynes shall be a minimum of 1-1/2 inches and a maximum of 3 inches. The rakes shall be skewed slightly to produce an angle to the perpendicular of between 5 and 10 degrees.

3.04 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Preservation of Moisture:
 - 1. Unless otherwise directed by the Engineer, apply one of the following procedures to concrete not in contact with forms immediately after completion of placement and finishing:
 - a. Ponding or continuous sprinkling.
 - b. Application of absorptive mats or fabric kept continuously wet.
 - c. Application of sand kept continuously wet.
 - d. Continuous application of steam (not exceeding 150-degrees Fahrenheit) or mist spray.
 - e. Application of waterproof sheet materials specified in Part 2 of this Section.
 - f. Application of other moisture-retaining covering as approved by the Engineer.
 - g. Application of the curing agent specified in Part 2 of this Section or elsewhere in the Contract Documents.
 - 2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
 - 3. Cure concrete by preserving moisture as specified above for at least seven days.
- C. Temperature, Wind, and Humidity:
 - 1. Cold weather:
 - a. When the mean daily temperature outdoors is less than 40-degrees Fahrenheit, maintain the temperature of the concrete between 50-degrees Fahrenheit and 70-degrees Fahrenheit for the required curing period.
 - b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
 - c. Do not use combustion heaters during the first 24-hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
 - 2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
 - 3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5-degrees Fahrenheit in any one hour period, or 50-degrees Fahrenheit in any 24-hour period.
- D. Protection from Mechanical Injury:
 - 1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
 - 2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, from the application of curing procedures, and from rain and running water.
 - 3. Do not load self-supporting structures in such a way as to overstress the concrete.

END OF SECTION

SECTION 03480

PRECAST CONCRETE SPECIALTIES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. General: The Contractor shall furnish all materials, labor and equipment to precast manholes, wet-wells, valve pits, meter pits and other utility structures as shown on the Drawings.

1.02 RELATED DOCUMENTS

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Supplementary Conditions of these Specifications.
 - 1. Section 03200 – “Concrete Reinforcement”

1.03 REQUIREMENTS, GENERAL

- A. Precast Prestressed Concrete Piles shall be manufactured in accordance with the FDOT Standard Specifications
- B. The forms, dimensions, concrete, and construction methods shall be approved by the Engineer in advance of construction.

1.04 QUALITY ASSURANCE

- A. Quality Assurance: Use a pre-casting plant which has been certified by the precast concrete institute and has been engaged for more than five-years in the manufacturing of precast utility structures.

1.05 SUBMITTALS

- A. Product Data: Within 21-calendar days after award of the Contract, submit the following:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications, catalog cuts, and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturer's recommend installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedure used on the work. This will include all equipment such as cranes, pile driving hammers, cushion material, pile template, etc., in accordance with FDOT Specifications.
 - 4. Shop Drawings showing complete details and reinforcement schedules for fabrication, assembly and installation.

1.06 DELIVERY, STORAGE AND HANDLING

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representatives of the Owner. Such inspection may be made at the places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.
- B. At the time of inspection, the section will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimensions, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
- C. Surface Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7-days and 5,000 psi at the end of 28-days, when tested in 3-inch by 6-inch cylinder stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.
- D. Each section of the structure must be inspected and stamped at the casting yard by an accredited testing laboratory.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE MANHOLE SECTIONS – N/A

2.02 PRECAST PRESTRESSED CONCRETE PILES

- A. Piles shall be manufactured, cured, stored and transported as per FDOT Standard Specification Section 450

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Precast Prestressed Concrete Piles shall be installed as per FDOT Standard Specification Section 455 utilizing approved equipment and method as submitted to the Engineer. Pre-augering is allowed but the final 10 feet must be driven by a suitable hammer approved by the Engineer to meet the required loading conditions.
- B. Installation shall provide a pile that is within 3 inches horizontally of the design location and within 1" per 10 feet vertically.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Framing with engineered wood products.
 2. Wood blocking, cants, and nailers.
 3. Utility shelving.
 4. Wood furring and grounds.
 5. Sheathing.
 6. Plywood backing panels.

- B. Related Sections include the following:

1. Section 05535: N/A

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Exposed Framing: Dimension lumber not concealed by other construction.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NELMA - Northeastern Lumber Manufacturers Association.
 2. NLGA - National Lumber Grades Authority.
 3. RIS - Redwood Inspection Service.
 4. SPIB - Southern Pine Inspection Bureau.
 5. WCLIB - West Coast Lumber Inspection Bureau.
 6. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Engineered wood products.
 4. Foam-plastic sheathing.
 5. Power-driven fasteners.
 6. Powder-actuated fasteners.
 7. Expansion anchors.
 8. Metal framing anchors.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
6. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Chromated copper arsenate (CCA).
 - b. Ammoniacal copper zinc arsenate (ACZA).
 - c. Ammoniacal, or amine, copper quat (ACQ).
 - d. Copper bis (dimethyldithiocarbamate) (CDDC).
 - e. Ammoniacal copper citrate (CC).

- f. Copper azole, Type A (CBA-A).
- g. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

- 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
- 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- 3. Wood framing members less than 18 inches (460 mm) above grade.

E. Application: Treat items indicated on Drawings, and the following:

- 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
- 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- 3. Wood framing members less than 18 inches (460 mm) above grade.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

- 1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
- 2. Use treatment that does not promote corrosion of metal fasteners.
- 3. Use Exterior type for exterior locations and where indicated.
- 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

B.For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

2.5 DIMENSION LUMBER

A.General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

2.6 MISCELLANEOUS LUMBER

A.General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
3. Nailers.
4. Grounds.

B.For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; NELMA.
5. Northern species; NLGA.
6. Western woods; WCLIB or WWPA.

2.7 PLYWOOD BACKING PANELS

A.Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick. Back primed and finished per 09900.

2.8 FASTENERS

A.General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide stainless steel fasteners

B.Nails, Brads, and Staples: Stainless Steel 304

C. Power-Driven Fasteners: N/A

D. Wood Screws: Stainless Steel 304

E.Lag Bolts: Stainless Steel 304

F.Bolts: Steel bolts, nuts and washers: SS 304

2.9 METAL FRAMING ANCHORS

A.General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.10 MISCELLANEOUS MATERIALS

A.Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

B.Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. CABO NER-272 for power-driven fasteners.
 2. Published requirements of metal framing anchor manufacturer.

3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Where possible, secure anchor bolts to formwork before concrete placement.

END OF SECTION