

Project Special Provisions

Section 01010 - Summary of Work

A. Work Covered By Contract Documents:

The work covered by these documents shall include but not be limited to:

1. Contact utilities location service to mark underground services.
2. Remove existing perimeter chain link fencing to allow access to pickleball courts.
3. Remove existing pickleball net support poles.
4. Remove existing asphalt playing surface.
5. Install new pickleball net support system.
6. Place 2 1/2" thickness asphalt playing surface, ensuring drainage as per work description.
7. Apply color and striping to playing surface, including four courts with USAPA layout format.
8. Install pickleball nets.
9. Replace perimeter chain link fencing.
10. Grade around courts and seed and mulch all disturbed areas around pickleball courts.

B. Related requirements specified elsewhere:

1. Construction Schedule: Section 01310.
2. Schedule of Values: Section 01370.

C. Contractor's Duties:

1. Except as specifically noted, provide and pay for:
 - a. Labor, materials and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Other facilities and services necessary for proper execution and completion of Work.
2. Pay legally required sales, consumer, and use taxes.
3. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids.
 - a. Permits
 - b. Government fees.
 - c. Licenses.
4. Give required notices.
5. Comply with codes, ordinances, rules, regulations, order and other legal requirements of public authorities which bear on performance of work.

6. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements. It is not Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.
 - a. Appropriate modifications to Contract Documents will adjust necessary changes.
 - b. Assume responsibility for Work known to be contrary to such requirements, without notice.
7. Enforce strict discipline and good order among employees. Do not employ on Work:
 - a. Unfit persons.
 - b. Persons not skilled in assigned task.

Contractor's Use of Premises:

- A. Confine operations at site to areas permitted by:
 1. Law.
 2. Ordinances.
 3. Permits.
 4. Contract Documents.
- B. Do not unreasonably encumber site with materials or equipment.
- C. Assume full responsibility for protection and safekeeping of products stored on premises.
- D. Move any stored products which interfere with operations of Owner or other Contractor.
- E. Obtain and pay for use of additional storage or work areas needed for operations.

END OF SECTION 01010

Section 010101- Description of Work

The work covered by these documents shall provide for a complete project at the Hickory Optimist Park replacing the playing surface of four existing pickleball courts. The items listed are the major construction components and do not cover all of the activities necessary to provide a complete project. Costs for items not listed but required for a complete project shall be included in the overall bid. Contractor shall not begin demolition of the court until he is prepared to complete grading and paving operations in a continuous operation. No additional payments will be made for work required to provide a complete project but not listed among the various pay items.

1. **Removal of Existing Asphalt:** The approximate dimensions of the asphalt to be removed on the existing courts are 123' x 72'. The Contractor shall pulverize with a milling machine to a depth of no less than 8" (eight inches) below top of original surface and mixed with the existing stone subgrade. The pulverized asphalt and stone base mixture shall be shaped and compacted for use as subgrade. The slope of the courts shall provide positive drainage according to United States Pickleball Association (USAPA) guidelines and toward the drainage catch basin on the north side of the court
2. **Fence Repair and Relocation:** The contractor shall be responsible for removal and replacement of the fencing mesh, though the fence posts are to remain in place. The pickleball court contractor shall take all necessary precautions to protect the fence posts. No payment will be made to the pickleball court contractor for any repairs required to return the fence posts to a condition equal to or better than prior to beginning of court construction due to damage incurred during the court construction.
3. **Aggregate Base Course:** Aggregate base course shall be placed and compacted 1 ½" deep on top of the compacted, pulverized asphalt base. Base course shall be compacted to NCDOT requirements for roadway construction. Proof rolling with a loaded dump truck may be required at the discretion of the Owner. No additional payment will be made for proof rolling.
4. **Asphalt Overlay** shall be placed to provide 2 ½" of compacted depth S-9.5B surface course. Asphalt materials and installation shall be according to NCDOT standards. Court shall be constructed to provide drainage from the court according to USAPA guidelines with runoff directed to the catch basin on the north side of the court. Asphalt at the edges of the court shall be tamped to provide consolidation and a smooth surface for painting.
5. **Replace Net System:** Contractor shall include complete installation of four (4) new pickleball net systems. The existing net system on court is to be removed and properly disposed. Replacement net posts shall be 3" round tubular steel with integral lacing bars. The posts shall be polyester powder coated in green color and include a brass winder. Net posts shall be Edwards Classic Round posts by the Collins Company or approved equal installed per manufacturer's recommendations. Replacement nets shall have heavy-duty 3.5 mm braided polyethylene. The vinyl-coated polyester headband shall have a double-layer UV and mildew resistant vinyl-coating. Headband shall be lock-stitched with white polyester thread. Dowels to be included. Nets to be Collins Pickleball Net by Collins Company or approved equal. Net posts ground sleeves shall be galvanized steel or PVC for 3" round posts and include center anchor. All pickleball court equipment shall be by the same manufacturer.

6. Surfacing, Coloring, and Striping: The entire court area shall receive two coats of DECO 920-29 acrylic resurfacer as a filler coat. The resurfacer shall be applied according to the manufacturer's directions and application rates. Two coats of DECO 920-27 sand-filled acrylic color concentrate shall be applied to the entire court area. One coat shall be a texture coat and the second coat as a finish coat following the manufacturer's directions and application rates. The court areas shall be green in color and the out-of-bounds areas red in color. Colors are to be approved by the Owner prior to ordering. Layout, tape, and hand-paint 2" wide playing lines using DECO 920-22 textured acrylic white line paint. Dimensions of the playing lines are to conform to USPA specifications. DECO brand materials are the basis of design, but may be substituted with approved equals, such as Laykold brand materials. Resurfacer, color coats, and line paint shall be provided by the same manufacturer.

7. Seeding and mulching shall include all fill, fine grading, seed, and mulch required to bring the work area vegetation to a condition equal to or better than prior to beginning of the project. Seeding and mulching is to include any damages to the grassed areas adjacent to the tennis court. All exposed areas are to be seeded and mulched according to specifications.

END OF SECTION 01011

Section 01051- Description of Work

Description:

A. Work included:

Work included in this section shall be that of coordinating the various aspects and contracts and setting forth the areas of responsibility for coordination for the various Contractors.

B. The Contractor shall be responsible for the following:

1. Observe work to monitor compliance with schedule.
 - a. Verify that labor and equipment are adequate to keep the work on schedule.
 - b. Verify that product deliveries are adequate to maintain schedule.
 - c. Report non-compliance to the owner or Engineer with recommendations for remedy.
2. Maintain cost accounting records for authorized work performed under:
 - a. Unit cost.
 - b. Actual cost for labor and materials.
 - c. Any other bases requiring accounting records.
3. Permits and fees:

The Contractor shall obtain the necessary permits and pay the fees required for his work.

4. Maintain reports and records at job site.
 - a. Daily log of progress of work available to the Engineer and to the Owner.
 - b. Records:
 1. Contracts.
 2. Purchases.
 3. Materials and equipment records.
 4. Applicable handbooks, codes and standards.
 - c. Obtain information from subcontractors and maintain record documents.
 - d. Upon completion of project deliver all records to the Engineer.
 - e. Assemble documentation for handling disputes.

END OF SECTION 01051

Section 01300- Submittals and Substitution

PART 1 – GENERAL

Description:

A. Work included:

1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
2. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the Engineer.

B. Related work described elsewhere:

1. Contract requirements for submittals: General Conditions and Supplementary Conditions
2. Individual submittals required: Pertinent Sections of these Specifications
3. Construction Schedules: Section 01310
4. Shop Drawing, Project Data and Samples: Section 01340
5. Schedule of Values: Section 01370

Product Handling:

Make all submittals of Shop Drawings, Samples, request for substitutions, and other items, in strict accordance with the appropriate provisions of these Specifications.

PART 2 – PRODUCTS

Shop Drawings:

A. Scale required:

Unless otherwise specifically directed by the Engineer, make all Shop Drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the Work.

B. Type of prints required:

Unless otherwise specifically directed by the Engineer, make all Shop Drawing prints in blue or black line on white background.

C. Number of prints required:

Submit all Shop Drawings in the quantity which is required to be returned plus two copies which will be retained by the Engineer.

Samples:

A. Accuracy of Sample:

Unless otherwise specifically directed by the Engineer, all Samples shall be of the precise article proposed to be furnished.

B. Number of Samples required:

Submit all Samples in the quantity which is required to be returned plus one which will be retained by the Engineer.

Substitutions:

A. Engineer's approval required:

1. The Contract is based on the materials, equipment, and methods described in the Contract Documents.
2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution.
3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the Engineer. Such approval shall be in writing.

B. "Or equal":

1. Where the phrase "or equal" or "or equal as approved by the Engineer" occurs in the Contract Documents, do not assume the material, equipment, or methods will be approved as equal by the Engineer unless the item has been specifically approved in writing for this Work by the Engineer.
2. The decision of the Engineer shall be final.

C. Availability of specified items:

1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the Work.
2. In the event specified item or items will not be so available, so notify the Engineer prior to receipt of bids.
3. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be backcharged as necessary and shall not be borne by the Owner.

D. Separate substitute bids:

No Substitute Bids will be permitted.

Manuals:

A. General:

Where manuals are required to be submitted covering items included in this Work, prepare all such manuals in durable plastic binders approximately 8 ½" by 11 inches in size and with at least the following:

1. Identification on, or readable through, the front cover stating general nature of the manual.
2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.
3. Complete instructions regarding operation and maintenance of all equipment involved.
4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.
6. Copy of the approved Shop Drawings with all data concerning changes made during construction.

B. Extraneous data:

Where contents of manuals include manufacturers' catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

C. Number of copies required:

As a condition of Final Payment submit 3 copies of the manual to the Engineer who will submit 2 copies to the Owner.

PART 3 – EXECUTION

Identification of Submittals:

Completely identify each submittal and resubmittal by showing at least the following information:

- A. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- B. Name of project as it appears on each page of these Specifications.
- C. Drawing number and Specifications Section number to which the submittal applies.
- D. Whether this is an original submittal or resubmittal.

Coordination of Submittals:

A. General:

Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
2. Coordinate as required with all trades and with all public agencies involved.
3. Secure all necessary approvals from the Contract Documents. Any deviation not so marked shall not be permitted.
4. Clearly indicate all deviations from the Contract Documents. Any deviation not so marked shall not be permitted.

B. Grouping of submittals:

Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with this provision of the Contract Documents.

C. Review by Contractor:

The Engineer will not review any Drawings that are not properly identified or that do not contain complete data on the work or that have not been checked by the Contractor for compliance with Contract Documents.

Such Drawings will be returned to the Contractor for his review and/or correction prior to any review by the Engineer. Should the Contractor request specific review of such Drawings this must be done in writing and it is mutually understood that the Contractor would pay for such review at the then prevailing rate as determined by the Engineer's "Rate Schedule". Such payment shall be due upon submission of an invoice from the Engineer.

Timing of Submittals:

A. General:

1. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
2. In scheduling, allow at least five full working days for the Engineer's review following his receipt of the submittal. This does not necessarily constitute adequate time for review but shall be a minimum.

B. Delays:

Cost of delays occasioned by tardiness of submittals may be backcharged to the Contractor as necessary and shall not be borne by the Owner.

END OF SECTION 01300

Section 01640 - Substitutions

Description:

Related requirements specified elsewhere:

- A. Substitutions During Bidding: Instructions to Bidders.
- B. Schedule of Values: Section 01370.
- C. Testing Laboratory: Section 01400.

Products List:

- A. Within 15 days after date of Contract, submit to Engineer five copies of complete list of all products which are proposed for installation.
- B. Tabulate list by each Specification Section.
- C. For products specified under reference standards, include with listing of each product:
 - 1. Name and address of Manufacturer.
 - 2. Trade name.
 - 3. Model or catalog designation.
 - 4. Manufacturer's data.
 - a. Performance and test data.
 - b. Reference standards.

Contractor's Options:

- A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.
- B. For products specified by naming several products or manufacturers, select any product of a manufacturer named.
- C. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or equal" after specified product, Contractor must submit request, as required for substitution, for any product not specifically named.
- D. For products specified by naming only one product and manufacturer, there is no option, and no substitution will be allowed.

Substitutions:

- A. During Bidding Engineer will consider written requests from prime Bidders for substitutions, received at least 10 days prior to bid date; requests received after that time will not be considered.
- B. Within 30 days after date of Contract, Engineer will consider formal requests from Contractor for substitution of products in place of those specified.

- C. Submit five copies of request for substitution. Include in request:
1. Complete data substantiating compliance of proposed substitution with Contract Documents.
 2. For products:
 - a. Product identification, including Manufacturer's name and address.
 - b. Manufacturer's literature:
 - (1) Product description.
 - (2) Performance and test data.
 - (3) Reference standards.
 - c. Samples.
 - d. Name and address of similar projects on which product was used, and date of installation.
 3. For construction methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 4. Itemized comparison of proposed substitution with product or method specified.
 5. Data relating to changes in construction schedule.
 6. Relation to separate contracts.
 7. Accurate cost data on proposed substitution in comparison with product or method specified.
- D. In making request for substitution, Bidder/Contractor represents;
1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
 2. He will provide the same guarantee for substitution as for product or method specified.
 3. He will coordinate installation of accepted substitution into Work, making such changes as may be required for work to be complete in all respects.
 4. He waives all claims for additional costs related to substitution which consequently becomes apparent.
 5. Cost data is complete and includes all related costs under his Contract, but excludes:
 - a. Costs under separate contracts.
 - b. Engineer's redesign.
- E. Substitutions will not be considered if:
1. They are indicated or implied on shop drawings or project data submittals without formal request submitted in accord with Paragraph 1.04.
 2. Acceptance will require substantial revision of Contract Documents.

Section 01740 - Guarantees, Warranties, and Bonds

Description:

A. Guarantees, warranties and bonds shall be as required under various sections of these Specifications. Where no specifies warranties, guarantee or bond is called for in a given section or where one or more are not specifically mentioned the following shall apply:

1. Bond shall be sufficient to cover all guarantees and warranties as required by this section or any other section of these Specifications.
2. All materials, products and workmanship shall be guaranteed unconditionally against defects in material or workmanship for a minimum period of **1 year from date of final acceptance**. The Contractor responsible for the work into which any item is incorporated shall be liable for this guarantee from the date of final acceptance.

B. Warranties:

All warranties shall be as required by the individual portions of these Contract Documents or shall be warranted in accordance with this section. In no case shall a warranty be less than signifying that all materials labor and workmanship comply with the Contract Documents in each and every regard. Each Contractor shall be required to supply a written certification warranting that all material and labor are in compliance with these Contract Documents.

C. Bonds:

All bonds required by the Owner for work shall be paid for by the Contractor and shall be included in his bid.

D. Final Payment:

Final payment shall not be made until conditions as herein set forth are met. Without the required guarantee in writing, the required bond and the required warranty, the Contractor shall not receive final payment.

END OF SECTION 01740

Section 02070 - Selective Demolition

PART 1 – GENERAL

RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to work specified in this Section.

DESCRIPTION OF WORK:

Provide selective demolition as required.

1. Remove existing asphalt courts and associated nets.
2. Remove and protect fencing and posts.
3. Remove and legally dispose of demolished materials off-site unless otherwise stated.

SUBMITTALS:

Submit for approval selective demolition schedule.

QUALITY ASSURANCE:

Comply with governing codes and regulations. Use experienced workmen.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

DEMOLITION

Do not damage fence posts and elements and improvements indicated to remain. Items of salvage value shall remain on site. Storage or sale of items at project site is prohibited.

Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the owner and the authorities having jurisdiction. If necessary, provide temporary utilities.

Cease operations if public safety or remaining structures are endangered.

Performed temporary corrective measures until operations can be continued properly.

END OF SECTION 02070

Section 02930 – Seeding and Landscaping

1.1 INTRODUCTION

This section covers the furnishing of all labor, equipment, material and any other items necessary for landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding, and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for successful establishment and growth of grasses or legumes.

1.2 CATALOG CUT SUBMITTALS

Contractor shall submit 4 copies of catalog cuts to Engineer for review for all materials that are required to complete the work as described in the associated plans. Engineer will retain two sets of original submittals and return two sets to the Contractor with the appropriate response annotated.

1.3 STORAGE AND HANDLING

Contractor shall take all prudent and customary measures to ensure that all materials stay moisture free and are not degraded by storage or handling. All lime and fertilizer shall be kept free from hardening or caking and if this occurs they shall be pulverized to their original state. All seed shall be further protected such that it is not subjected to heat or rodents. If degradation occurs and the materials no longer hold the mineral values advertised then they shall be removed from the site and new materials applied.

1.4 MATERIALS

A. Lime

The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the NC Board of Agriculture.

Lime shall be agriculture grade ground dolomite limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

B. Fertilizer

The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the NC Board of Agriculture.

Fertilizer shall be 10-10-10 grade. Upon written approval of the Engineer, a different grade of fertilizer may be used provided the rate of application is adjusted to provide the same amounts of plant food.

C. Seed

The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the NC Department of Agriculture.

The NC Department of Agriculture shall have approved seed or any agency approved by the Engineer before being sown, and no seed will be accepted with the date of test more than 9 months prior to the date of sowing. Such testing does not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of

germination causes the quality of seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

Seed shall be entirely free from bulbets or seed of Johnson grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic and Bermuda grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockel, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound.

D. Mulch

Straw shall be free of weed seed or any other species that would be detrimental or deterring to specified grass maturation. Straw shall be from oat, rye, or wheat species and threshed to limit seed content.

E. Tack

Emulsified asphalt or organic tack shall be applied uniformly over straw so as to ensure proper hold and give uniform appearance over the entire area. Tack shall be applied by spraying onto surface immediately after applying straw. Application rates will vary dependent upon conditions. Organic tack shall be used when the ambient temperature is below freezing

1.5 PREPARATION

A. Protection of Existing Vegetation

The Contractor shall not remove or damage vegetation that is outside the Clearing Limits established by the Owner/Engineer or as displayed on the plans. All trees that are damaged and scheduled to remain shall be repaired promptly in an acceptable manner to prevent progressive deterioration. Vegetation which is scheduled to be replaced or is damaged beyond repair during construction operations shall be replaced with a similar size and species. Where this is not feasible, the property owner shall be compensated for the vegetation damaged. Damage incurred during construction operations and due to insufficient protection shall be paid at the Contractors expense.

Existing vegetation not indicated for removal shall be protected against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering by placing stockpiles of excavated material against the trunk or excessively over roots within the drip line. Vegetation shall also be protected against excessive vehicle or foot traffic within the drip line.

Roots cut during excavation shall be properly protected by either asphalt sealing or in some cases wrapping exposed roots in wet burlap to prevent drying.

B. Grading

Rough grading of the area shall be achieved as soon as the excavated area is backfilled and compacted. Rough grading shall be defined as all material restored which is required to bring the area to finish grade and acceptable surface drainage for storm water which provides for water to flow from the site in such a manner as that it does not place unusual risk to unsuspecting users of adjacent areas or inhabitants.

Fine grading of the area shall be achieved in a timely manner after completion of rough grading of the area. Fine grading shall consist of shaping final contours to ensure proper drainage and removing all

debris or construction waste materials to provide an acceptable appearance. Construction areas subject to finish grading shall have soil loosened to a depth of not less than 6 inches in a manner approved by the Engineer to promote seed growth. All finish landscaping shall be completed on a section-by-section basis where it is reasonable to expect completion of landscaping.

All grading, landscaping, and erosion control measures shall be properly pursued and maintained in order to maintain an acceptable appearance of the project. If such time occurs as this perception is degraded, then the Engineer may suspend progress on the project until the issues are appropriately addressed.

C. Surface and Bed Preparation

The Contractor shall smooth or shape surface contours outside the project site when such contours are detrimental to the seedbed preparation or will pose foreseeable problems with future maintenance of the area. The Engineer shall direct the Contractor to what extent outside areas shall be affected or the Contractor may elect to work with individual property owners with written verification delivered to the Engineer/Owner of the agreement with the property owner's signature.

1.c Level Areas and Slopes Less than 2:1

The construction area shall have soil loosened to a depth not less than 6 inches and shall be free from all debris, clods and all other irregularities which would prohibit a smooth, shaped finish grade. Top 3 inches of soil shall be worked to a clod free finish suitable for planting seed.

2.c Slopes Greater Than 2:1

The construction area shall have soil loosened and acceptable for vegetation growth, but the surface shall be free from all debris, clods and other irregularities. The surface may be track finished, scarified, grooved, or punctured so as to provide a place for seed and other planting material to lodge. In the case of such slopes the Engineer may allow partial completion of the slope sections at different times to promote stabilization. If the vegetation growth is acceptable, the Engineer may allow this to remain as the permanent ground cover.

The Contractor shall not pursue the finished preparation of surface areas to be landscaped if the soil is frozen, marginally wet, or when the Engineer deems it unsuitable for working conditions.

D. Rate of Application

Seed shall be applied by means of broadcast spreader, hydro-seeder, or other previously approved method. In no case shall seed, lime, or fertilizer be spread by hand. The rates of application for seed, lime and fertilizer shall be as follows, unless a variance is permitted by the Engineer in writing prior to performing work.

1.d Limestone

In the absence of a soil test performed at the Contractors expense and given to the Engineer on letterhead from the testing laboratory, limestone shall be applied at the rate of 2000 lb/ acre.

2.d Fertilizer

In the absence of a soil test performed at the Contractors expense and given to the Engineer on letterhead from the testing laboratory, fertilizer shall be applied at the rate of 1000 lb/ acre. Fertilizer shall be 10-10-10 grade, unless a variance is permitted by the Engineer in writing prior to performing work. A second application at 500-lb/ acre shall be applied to the area when the grass has reached a blade height of 3 inches or 45 days whichever comes first.

3.d Seed

The type and rate of application shall vary at different times of the year and shall be applied at the rate and type appropriate for the time of year. All rates of application are measured in pounds per acre.

a. Fall and Winter (Sept. 1 to May 1)

85 pounds of Ky-31 tall fescue mixed with 15 pounds of rye grain.

b. Spring and Summer (May 1 to September 1)

100 pounds of Ky-31 tall fescue mixed with 10 pounds of rye grain.

c. Cut of Fill slopes greater than 2:1

The application rate on cut or fill slopes greater than 2:1 shall include the appropriate mix above for the time of year along with; 40 lb/acre of sericea lespedeza (hulled in spring or summer and unhulled in fall and winter) and either 15 pounds of Sudan grass in spring and summer or 25 pounds of rye cereal per acre in fall and winter.

4.d Mulch

Mulch shall be straw mulch applied at a rate of approximately 3000 pounds per acre. Straw shall be applied at such rate necessary to thoroughly cover and protect all finish grading, seed, lime and fertilizer but not smother the maturation of seed.

E. Application

Application of all limestone, fertilizer, seed and mulch shall be completed immediately following final preparation of the seed bed and shall not be pursued during a time when the Engineer deems weather to be non-conducive for seed growth, i.e. ground wet, frozen, etc. Lime, fertilizer and seed shall be distributed uniformly over the prepared seedbed at the specific rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed. Immediately following the covering operation, the seedbed shall be properly compacted as directed in the manner and degree approved by the Engineer.

When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 1 hour prior to application unless otherwise permitted by the Engineer.

The Engineer may permit modifications to the requirements for covering or compacting lime, fertilizer and seed in the prepared seedbed if the Contractor requests modification due to height, steepness of slope or non-conducive soil conditions. Modifications may be considered if the case of: slopes greater than 2:1 and slopes where surface is too rocky to successfully permit compaction or covering of the seedbed. Modifications may be permitted to include reduction of application rates and reduction or elimination of compaction requirements.

All equipment normal and prudent for the preparation of seedbed and uniform distribution of lime, fertilizer, and seed shall be approved by the Engineer prior to use on the project. In the event of malfunctioning or improperly maintained equipment, the Engineer reserves the right to suspend work on the project until such time as the equipment is restored to good repair and properly operational.

F. Mulching

Mulch shall be spread uniformly over all seeded areas at a rate of 1 ½ to 2 tons per acre in a continuous, uniform blanket. Mulch shall be spread by hand or by approved mechanical shredder or blower which will provide a uniform blanket. An acceptable application shall be one that completely covers the ground but still allows some sunlight to penetrate and air to circulate while providing

effective soil moisture conservation and reduced erosion. Mulching operation shall be pursued immediately following final seedbed preparation.

Tack or other approved binding material shall be applied over top of mulch in all necessary areas to ensure mulch will be held in place during adverse conditions. The rate and method of application shall be completed as directed by the Engineer.

The Contractor shall implement sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes. The Contractor shall remove completely any blockage to drainage structures that may occur.

G. Maintenance

Grassed areas shall be accepted when a 95% cover of permanent grasses is achieved and weeds are not the dominant foliage. The Contractor shall keep all grassed areas in good condition, reseeding and mowing if and when necessary, as directed by the Engineer. A good lawn shall be established over the entire project area and shall be maintained by the Contractor in an approved manner and kept in an approved condition until final acceptance.

The Contractor shall protect against washouts on slopes and ditch sections by a manner approved by the Engineer. Any damage or failure due to any cause shall be corrected by being either repaired or completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing construction operations or from not taking sufficient precautions to control erosion and silt as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

End of Section 02930

Section 02930 – Seeding and Landscaping

PART 1 – GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

SUMMARY:

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

Concrete paving and walks are specified in Division 2.

QUALITY ASSURANCE:

Codes and Standards: Comply with all applicable provisions of state and local building and safety codes, as well as other codes and standards referenced in this specification, except where more stringent requirements are shown or specified herein. These include:

1. ACI 301-89 “Specifications for Structural Concrete for Buildings”.
2. ACI 318-89 “Building Code Requirements for Reinforced Concrete”.
3. ACI SP-4 “Formwork for Concrete”.
4. ACI SP-15 “Field reference Manual”, provide copy in field office.
5. ACI SP-66 “Detailing Manual for Reinforced Concrete”.
6. CRSI “Manual of Standard Practice” latest edition.
7. AWS D1.4 “Structural Welding Code-Reinforcing Steel”.

Inspection and Testing: Owner will employ, at his expense, an Independent Testing Laboratory (ITL) to perform quality assurance program which will include, but not limited to the following testing and reports:

1. Verify that concrete operations are performed and concrete is placed and consolidated according to referenced standards.
2. Sampling Fresh Concrete: Secure random samples in accordance with ASTM C-172.

Slump – ASTM C-143; one (1) test for each concrete load at point of discharge; one (1) test for each set of compressive strength test specimens.

Air Content – ASTM C-173; volumetric method for air-entrained normal weight concrete; ASTM C-231; one (1) for each of compressive strength test specimens.

Concrete Temperature – For each load, at time of arrival, at point of discharge, test hourly when air temperature is 40 degrees F and below, and 80 degrees F and above; and each time a set of compression test specimens are made.

Accreditation of Owner's Testing Lab: ITL shall meet the requirements of ASTM E 329, "Standard Recommended Practice for Testing Agencies for Concrete as Used in Construction" by indication of accreditation as a Class I or II laboratory by the Board of Accreditation of Concrete Testing Laboratories, Inc. (BACTL).

Compression Test Specimens – ASTM C-31; one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are taken.

When cold weather conditions occur, as defined in this specification, two (2) additional standard cylinders are required for each complete set of test specimens. These two cylinders shall be field cured, at a location determined by the ITL.

Contractor shall be responsible for storage, temperature control, and protection of specimens while at site. ITL shall be responsible for handling and transportation of specimens.

Compressive Strength Tests – ASTM C-39; one (1) set of Compression Test Specimens for each 100 c.y. or fraction thereof, of each concrete class placed in any one (1) day or for each 10,000 s.f. surface area placed; one (1) specimen tested at seven (7) days, two (2) specimens tested at twenty-eight (28) days, and one (1) specimen retained in reserve for later testing if required.

When frequency of testing will provide less than three (3) strength tests for a given class of concrete, conduct testing from at least three (3) randomly selected batches or from each batch if fewer than three (3) are used.

When total quantity of a given class of concrete is less than 50 c.y. strength test may be waived by Structural Engineer.

When cold weather field cured specimens are required, transport and test one specimen with companion laboratory cured specimen and test remaining field cured specimen with companion laboratory cured specimens at 28 days.

When strength of field-cured cylinders is less than eighty-five percent (85%) of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.

Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

Concrete Test Reports: Record of test results of fresh concrete samples should contain the following:

- a. Name of concrete testing service
- b. Project identification name and number
- c. Date of concrete placement
- d. Concrete type and class
- e. Location of concrete batch in structure
- f. Design compressive strength in 28 days
- g. Concrete mix proportions and materials
- h. Compressive breaking strength of each cylinder
- i. Unit weight of concrete
- j. Type of break for both 7-day test and 28 day tests.

Concrete Batch Trip Tickets: Collected and retained by Contractor. Compressive and slump tests shall be identified by reference to particular trip ticket. Concrete batch trip ticket shall contain information specified in ASTM C-94, paragraph "Batch Ticket Information". Ticket shall clearly show amount of water for entire batch which may be added in field that will not exceed water/cement ratio specified by the design mix. Report site additions of water to all concrete.

SUBMITTALS:

Product Data: Manufacturer's product data with application and installation instructions for proprietary materials and items, including but not limited to forming accessories, admixtures, patching compounds, epoxies, grouts, waterstops, joint systems, curing compounds, dry-shake finish materials, and any others requested by Structural Engineer.

Substitutions: Any request for product substitution shall be submitted for review, with all necessary documentation, a minimum of ten (10) days prior to time of bid.

Concrete Mix Designs: Submit concrete mix designs for each class of concrete to be used including mixes for pumpable concrete, where used. The concrete mix designs shall conform to the requirements of this specification and ACI 318 and

ACI 301. Mix designs prepared more than twelve (12) months prior to the date submitted for review, are not acceptable. The concrete mix designs shall be submitted 15 days before starting concrete work. Materials and admixtures proposed in mix design shall be the same as those materials which will be used in the production mix. Do not proceed with concrete production until mixes have been accepted by the Structural Engineer.

Fly Ash Certification: Submit Materials Certification for each supplier furnishing fly ash showing the fly ash meets the specified restrictions. Certification shall be made by a testing laboratory which is regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) for fly ash testing. Testing laboratory shall authorize CCRL to submit copies of the inspection reports. Submit certifications and inspection reports to the Structural Engineer with copies to the State Construction Office.

Reinforcement Shop Drawings: Submit drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI detailing manual (SP-66) showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of reinforcement. Include all accessories specified or required to support reinforcing and any special reinforcement required for openings through concrete structures.

Submit one (1) sepia and two (2) prints of each shop drawing. Shop drawings shall be reviewed by Contractor prior to submission. Drawings shall bear Contractor's approval stamp accepting quantities, coordination with other trades, and responsibility for coordination of dimensions shown in the Contract Documents.

PART 2 – PRODUCTS

FORM MATERIALS:

Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and conform to joint system where shown on drawings. Provide form

material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

Use overlaid plywood complying with U.S. Product Standards PS-1 “A-C or B-B High Density Overlaid (HDO) Concrete Form”, Class 1.

Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

Forms for Textured Finish Concrete: units of face design, size, arrangement, and configuration to match Engineer’s control sample or drawing details. Provide solid backing and form supports to ensure stability of textured form liners.

Forms for Cylindrical Columns and Supports: Steel, fiberglass-reinforced plastic, or fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide unites with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide ties that will leave no metal closer than one inch to exposed surface. Provide ties that, when removed, will leave holes no larger than one-inch diameter in concrete surface.

REINFORCING MATERIALS:

Reinforcing Steel: ASTM A 615 Grade 60 deformed, ASTM A 615 Grade 60S where field bending of reinforcement is required, and ASTM A 706 Grade 60 deformed for all conditions where welding of reinforcement is required.

Smooth Steel Wire: ASTM A 82, Grade 70 where indicated for use in columns or other elements as spiral reinforcing.

Deformed Steel Wire: ASTM A 496, Grade 70 deformed, where noted for use in masonry joints as column or pilaster reinforcing bar ties.

Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric or mat in place. Use wire bar type supports complying with CRSI specifications.

For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Supports of solid brick or masonry are not acceptable for use in slabs on grade.

For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel (CRSI, Class 2).

CONCRETE MATERIALS:

Portland Cement: ASTM C 150, Type 1, unless otherwise acceptable to the Structural Engineer. Type III may be used when approved by the Structural Engineer. Use one brand of cement throughout project, unless acceptable to the Structural Engineer.

Fly Ash: ASTM C 618, Type F, but not exceeding 4% loss on ignition. The amount of fly ash shall not exceed 25% of cement content by weight. Fly ash used shall be from one source throughout the project. Use of fly ash is prohibited where concrete will be architecturally exposed to view. Fly ash is subject to testing at the concrete plant by the Owner's testing agency at the request of the Structural Engineer.

Normal Weight Aggregates: ASTM C 33, and as herein specified; provide aggregates from a single source for exposed concrete. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

Aggregate shall be ASTM C 33, No. 57 or No. 67 stone for all concrete except No. 76 stone (or equivalent) shall be provided for grout fill in masonry bond beams, pockets and vertical cells.

Lightweight Aggregates: ASTM C 330; saturated "Solite", "Stalite" expanded shale aggregate produced by rotary kiln method.

Water: Drinkable.

Admixtures (General): Provide admixtures for concrete that contain not more than 0.1% chloride ions. Calcium chloride and thiocyanates are not permitted.

Water Reducing Admixture: ASTM C 494, Type A. Subject to compliance, one of the following:

Eucon WR-75 by Euclid Chemical	Plastiment-NS by Sika	Relcrete NW by Monex
WRDA-Hycol by W.R. Grace		Pozzolith
200N by Master Builders		

Water Reducing, Accelerating Admixture: ASTM C 494, Type E. Subject to compliance, one of the following:

Acceguard 80 by Euclid Chemical	Daraset by W.R. Grace
Pozzutec 20 by Master Builders	Relcrete can by Monex

Water Reducing, Retarding Admixture: ASTM C 494, Type D. Subject to compliance, one of the following:

Eucon Retarder 75 by Euclid Chemical	Relcrete NR by Monex
Daratard-17 by W.R. Grace	Pozzolith R by
Master Builders	
Plastiment by Sika	

Air Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures. Subject to compliance, one of the following:

Air-Mix or Perma-Air by Euclid Chemical	Relcrete Septair or Air 40 by
Monex	
MB-VR or Micro-Air by Master Builders	
Darex AEA or Daravair by W.R. Grace	
Sika AER by Sika	

Mid-Range Water Reducing Admixture (MRWR): ASTM C 494, Type A or F. Subject to compliance, one of the following:

Daracem 55 by W.R. Grace

Polyheed or Polyheed 997 by Master Builders

X15 by Monex

High Range Water Reducing Admixture (HRWR): ASTM C 494, Type G. Subject to compliance, one of the following:

Eucon 537 by Euclid Chemical

Rheobuild 7161 by Master Builders

Mighty RDI by Monex

Daracem by W.R. Grace

CURING & SEALING COMPOUNDS:

Liquid Membrane Forming Curing Compound: ASTM C309, Type 1, Class A, clear styrene acrylate type, 30% solids content minimum. Maximum moisture loss shall not exceed 0.055 grams/sq.cm. when applied at coverage rate of 200 s.f. /gallon. Manufacturer's certification required. Subject to compliance provide one of the following:

Super Rez Seal by Euclid Chemical

Kure-N-Seal 30 by Sonneborn

Super Floor Coat by Euclid Chemical

MasterSeal 66 by Master Builders

Dissipating Resin Curing Compounds: Conform to ASTM C 309, Type 1-D. Film must chemically break down in two to four week period. Subject to compliance provide one of the following:

Kurez DR by Euclid Chemical

Kure-N-Seal by Sonneborn

Master Seal by Master Builders

Sealco 309 by Gifford Hill

RELATED MATERIALS:

Bonding Compound: Polyvinyl acetate or acrylic base, for use in non-structural repairs. Subject to compliance, one of following:

Polyvinyl Acetate (Interior Only):

Euco Weld by Euclid Chemical

Everweld by L&M

Weld-Crete by Larsen Products

Acrylic or Styrene Butadiene:

Daraweld C by W.R. Grace

Sonocrete by Sonneborn

SBR Latex by Euclid Chemical

Everbond by L&M

Acrylic Bondcrete by The Burke Co.

Acryl-Set by Master Builders

Stonlock LB2 by Stonhard

Epoxy Adhesives: ASTM C 881 100% Solids, 100% reactive, two (2) component material suitable for use in structural repairs, on dry or damp surfaces. Subject to compliance, one of the following:

Thiopoxy by W.R. Grace Chemical

Sikadur 32 Hi-Mod by Sika

Euco Epoxy Systems by Euclid Chemical

Burke Epoxy M.V. by The Burke Co.

Epabond by L&M Builders

Concresive 1001 by Master

Patching/Leveling Mortar: Free flowing, polymer modified cementitious coating for use in floor slab repairs. Subject to compliance, one of the following:

Thin Coat by Euclid Chemical

Sikatop 21 by Sika Chemical

Durotop by L&M Const. Chemicals

Sonopatch by Sonneborn

Underlayment Compounds: Free flowing, self-leveling, pumpable, cementitious base compound. Subject to compliance, one of the following:

Flo-Top by Euclid Chemical

Pourcrete by Master Builders

Thoro Underlayment Self-Leveling by Thoro System Products

Levelex by L&M Construction Materials Inc.

Absorptive Cover: Burlap cloth from jute or kenaf, approximately 9 oz./sq./ yd., AASHTO M 182, Class 2.

Moisture-Retaining Cover: One (1) of the following, complying with ASTM C 171:

- waterproof paper
- polyethylene film
- polyethylene-coated burlap

Waterstops: Flat, dumbbell type or center bulb type rubber or polyvinyl chloride, or square type bentonite at construction joints and other joints as indicated; size to suit joints. Rubber waterstops, Corps of Engineers CRD-C 513; polyvinyl (PCV) waterstops, Corps of Engineers CRD-C 572; bentonite waterstops, "Volclay Water Stop RX" by the American Colloid Company.

Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

Vapor Barrier: Provide vapor barrier cover over prepared base material where indicated. Use only materials resistant to decay when tested in accordance with ASTM E 154; polyethylene sheet not less than 8 mils thick.

Vapor barrier shall comply with the North Carolina Weights and Measures Act (G.S. 81A) and North Carolina Department of Agriculture packaging and labeling regulations (2 N.C.A.C. 38.0300) with respect to length, width, thickness and weight.

Non-Shrink Grout: Pre-mixed, non-corrosive, non-metallic, non-staining containing selected silica sands, Portland cement, shrinkage compensating and water reducing agents. Product shall require only addition of water and comply with requirements of CRD-C621-80. Minimum compressive strength when tested according to ASTM C-109 per manufacturers maximum allowable water content – 2500 psi after one day; 7000 psi after twenty-eight (28) days. Subject to compliance, one of the following:

Supreme Grout by Gifford-Hill

N-S Grout by Euclid Chemical

Crystex by L & M Const. Chemicals

SikaGrout 212 by Sika

Stonecrete NM 1 by Stonehard

PROPORTIONING AND DESIGN OF MIXES:

Contractor is responsible for preparation of design mixes for each class of concrete used in construction. Use an independent testing facility acceptable to Engineer for design, preparation and reporting proposed mix designs. Any concrete mixes designed specifically to be pumped shall be submitted for review.

All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on Basis of Field Experience and/or Trial Mixtures" of ACI 318-89. If trial batches are used, mix design shall be prepared by an independent testing laboratory and achieve a compressive strength 1200 psi higher than specified strength.

Mix Adjustments: Contractor may request mix adjustments when characteristics of materials, project conditions, weather, test results, or other circumstances warrant. Laboratory test reports for revised mix designs and strength results must be submitted to Structural Engineer and reviewed before using in work.

Admixtures: Use either specified water-reducing admixture, mid-range or high-range water-reducing admixture in all concrete.

All pumped concrete shall contain specified MRWR or HRWR. All water reducers shall only be plant added. Concrete containing MRWR or HRWR shall be considered a separate class of concrete requiring a concrete mix design submittal in conformance with this specification.

Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1/2% within the following limits.

<u>Maximum Aggregate Size</u>	<u>Total Air Content</u>
1-1/2"	4.5%
1"	4.5%
3/4"	5.0%
1/2"	5.5%

Water-Cement Ratio: All concrete subjected to freezing and thawing, including exterior sidewalks, stairs and pavements, shall have maximum water-cement ratio of 0.50.

Slump Limits: All concrete containing specified HRWR or MRWR shall have a maximum slump of 8" for normal weight concrete and 6" for lightweight concrete. All other concrete shall have a maximum slump of 4".

PART 3 – EXECUTION**FORMWORK:**

General: Design, erect, support, brace, and maintain formwork to support vertical and lateral static and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Form ties to be factory-fabricated, adjustable-length, removable, or snap-off metal designed to prevent form deflection and spalling concrete surfaces upon removal.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

Preparation of Form Surfaces: Coat contact surfaces of forms with a non-residual, low VOC, form-coating compound and/or re-coat surfaces of re-used forms. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in strict accordance with manufacturer's instructions.

Earth Formed Elements: Footings and slab turndowns may be formed by excavation provided earth will stand upright after vertical cuts. Dewater, clean and level bottoms of excavations receiving concrete.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

Screed Supports for Slabs on Steel Deck: Set screed supports over steel beam lines. Screed supports shall not be supported off of steel deck within the span between steel beam lines.

Vapor Barrier: Lap joints 6" minimum.

REMOVAL OF FORMS AND SUPPORTS:

Formwork Not Supporting Weight of Concrete: Sides of beams, walls, columns and similar parts of work may be removed after cumulatively curing at not less than 50 degree F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained until concrete attains at least 70% of required 28-day strength.

Form Facing Materials: May be removed four (4) days after placement or shorter periods where results of concrete strength tests provide satisfactory results and only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

Minimum Curing Period: Curing and protection procedures shall be continued after removal of formwork and facing materials as prescribed in ACI 347 Section 3.6.2.3 and with regard for concrete admixtures and temperature conditions. Shorter periods may be acceptable to the Structural Engineer where results of concrete strength tests permit. In no case shall any curing period be less than 48 hours. Where exposure to temperatures of less than 40 degrees F occurs, minimum required curing period shall be increased by the length of time of the exposure below that temperature.

CONCRETE REINFORCEMENT:

Fabrication and Delivery: Fabricate reinforcing as detailed with indicated sizes. Cut, bend and form to required lengths, shapes and assemblies without causing damage or kinks to the reinforcing steel. Reinforcement shall not be heated for the purpose of bending the bars.

Bundle and tag reinforcement with information to identify reinforcing for proper placing. Transport to and store at site to avoid damaging or covering reinforcing with grease, mud, or other deleterious materials.

Placing Reinforcement: Comply with CRSI recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

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

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

Place reinforcement to obtain no less than the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

Install welded wire fabric in longest lengths practicable. Lap adjoining pieces at least one and one-half (1-1/2) full mesh and lace splices with wire.

Place specified vapor barrier as indicated on the drawings, prior to placing steel for slabs on grade.

Lap Splices: Full contact lap splices are required for all reinforcing where lap splices are indicated, unless detailed otherwise on the drawings.

Refer to the drawings for splice lap lengths required for each bar size and for each concrete strength and density.

JOINTS:

Construction Joints: Locate construction joints not shown on drawings, so as not to impair strength and appearance of structure, as acceptable to Engineer. For elevated flatwork, locate in center one-third of spans unless indicated otherwise on the drawings.

Provide keyways at least 1-1/2" deep in construction joints in walls and between walls and footings.

Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

Waterstops: Provide waterstops in construction joints as indicated; install to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field fabricate joints in waterstops in accordance with manufacturer's printed instructions.

Isolation Joints in Slabs-on-Grade: Construction isolations joints in slab-on grade as indicated in the drawings at points of contact between slabs and vertical surfaces, such as column pedestals and foundation walls.

Joint filler and sealant materials are specified in Division 7 of these specifications.

Control (Contraction) Joints in Slabs-on-Grade: Construct control joints in slab-on-grade to form panels of patterns as shown in the drawings.

Form control joints by inserting approved plastic strip into fresh concrete until top surface of strip is flush with slab surface. Prior to concrete being floated, remove top section of insert and clean groove of loose debris.

Saw cuts shall be made within 24 hours after slab finishing without dislodging aggregate.

Joint sealant material is specified in Division 7 of these specifications. Slabs shall cure 60 days minimum prior to filling.

INSTALLATION OF EMBEDDED ITEMS:

Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Tolerance for anchor bolts and other embedded items as follows:

1. 1/8" center to center of any two (2) bolts within anchor bolt group, where anchor bolt group is defined as "set" of anchor bolts which receive single fabricated steel shipping piece.
2. 1/4" center to center of adjacent anchor bolt groups.
3. Maximum accumulation of 1/4" per 100' along established column line of multiple anchor bolt groups, but not exceed total of 1" where established column line is actual field line representative of centers of as-built anchor bolt along line of columns.
4. 1/4" from center of any bolt group to established column line through that group.

Tolerance specified above apply to offset dimensions shown on plans, measured parallel and perpendicular to nearest established column line for individual columns shown on plans to be offset from established column lines. Unless shown otherwise, anchor bolts are set perpendicular to theoretical bearing surface.

Reglets: Install to receive top edge of foundation sheet waterproofing where occurs and to receive thru-wall flashings in outer face of concrete frame at exterior walls where flashing is indicated on the drawings at lintels, relieving angles and other conditions.

CONCRETE MIXES:

Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump.

Adjustments to concrete shall not be made at the construction site for any reason including addition of mix water. All mix materials shall be incorporated together at the point of batching.

Mixing and Delivery Time: When air temperature is between 85 degree F and 90 degree F, reduce mixing and delivery time from 1-1/2 hours to seventy-five (75) minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to sixty (60) minutes. During other conditions contributing to rapid setting of concrete, shorter mixing time than specified in ASTM C-94 may be required.

When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F nor more than 80 degrees F at any time during mixing, transporting or placing. Do not use frozen materials or materials containing ice or snow. Do not use materials containing antifreeze agents or chemical accelerators unless accepted in mix designs by the Engineer.

Concrete Batch Tickets: Collected and retained by Contractor, with copies provided to ITL. Concrete batch tickets shall contain all information specified in ASTM C-94, paragraph "Batch Ticket Information" and including project identification name and number and time at point of batch discharge. Ticket shall also clearly show amount of water for entire batch which may be added in field that will not exceed water/cement ratio specified by design mix and the amount of water actually added in the field, if any.

Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one (1) cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than five (5) minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes to mixing time by fifteen (15) seconds for each additional cu. yd., or fraction thereof.

Make record by batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix, type, mixtime, quantity, and amount of water introduced. Job-site mixing shall only be used for incidental work and with the approval of the structural engineer.

CONCRETE PLACEMENT:

Placement Inspection:

Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Placement shall comply with ACI 301.

General: Placement shall comply with ACI 301 “Specification for Structural Concrete for Buildings” and with AC I 304 “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete”, and herein specified.

Deposit concrete continuously or in layers. No concrete shall be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness. Provide construction joints as shown on the drawings and/or as herein specified where concrete cannot be placed continuously. Deposit concrete as near as practicable to its final location to avoid segregation.

Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24” and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidating Placed Concrete: Use mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation in accordance with ACI 309 “Standard Practice for Consolidation of Concrete”.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than is visibly effective for the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6” into preceding layer. Do not insert vibrators into preceding layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing degradation of concrete mix.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Maintain reinforcing in proper position during all placing operations.

Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints until placing of a panel or section is completed. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of rises or depressions. Do not disturb slab surfaces prior to beginning finishing operations.

Concrete Footings: Footings and other foundations shall be placed only on certified compacted fill or approved undisturbed subgrade as noted on the drawings. Footings shall not be loaded until concrete has reached a minimum of 75% of specified strength. Construction joints are not permitted in individual column footings.

Concrete Walls: Maximum length of wall pours shall not exceed seventy-five linear feet (75’-0”) in any single pour. Chamfered and doveled construction joints shall be placed between pours as shown on the drawings. Horizontal construction joints are not permitted unless detailed or shown on the drawings. Location of all proposed construction joints shall be approved by the Engineer prior to detailing of reinforcing. Exterior faces of walls shall be true to line to receive other work. Water stops shall be provided when indicated on the drawings. Vertical control joints shall be spaced a maximum of twenty-five feet (25’-0”) and shall be chamfered as shown on the drawings.

Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. Cold weather conditions are defined as a mean daily temperature of less than 40 degrees F for three (3) successive days. When temperatures of more than 50 degrees F occur during more than half of any 24-hour period, conditions are no longer regarded as requiring cold weather placing.

When air temperature has fallen to or is expected to fall below degrees F, uniformly heat water and aggregates before mixing to obtain concrete mixture temperature of not less than 50 degrees F and no more than 80 degrees F, at point of placement. Do not use frozen material or material containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Where placement will occur under cold weather conditions, two (20) additional test cylinders are required. Refer to "Testing and Inspection" in this specification section.

Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degree F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Fog spray forms, reinforcing steel and subgrade thoroughly before placing concrete.

FINISH OF FORM SURFACES:

Rough Form Finish: For formed concrete surfaces not exposed to view in finish work or concealed by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

Smooth Form Finish: For formed concrete surfaces exposed to view, or to be covered with coating material applied directly to concrete, or covering material applied directly to concrete, such as waterproofing, dampproofing, parging or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

Smooth Rubbed Finish: Provide this finish for all exposed concrete surfaces scheduled to receive paint, including epoxy paint.

Moisten concrete surfaces and rub with carborundum brick or other abrasive until uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

Grout Cleaned Finish: Provide for all smooth form finished surfaces.

Combine one part portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.

Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

Related Unformed Surfaces: At tops of walls and horizontal offsets at surfaces occurring 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.

MONOLITHIC SLAB FINISHES:

Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

After placing slabs, plane surface to a tolerance for floor flatness F_f of not less than 15 and floor levelness F_l of not less than 13. Slope surfaces uniformly to drains where required. After leveling and before final set, roughen surface with stiff brushes, brooms, or rakes.

Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish F_f and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing or sand-bed pavers.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance for floor flatness F_f 18 and floor levelness F_l of not less than 15. Cut down high spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth, granular texture.

Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces with resilient flooring, carpet, tile, paint or other thin film finish coating system. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, with surface plane tolerance of F_f 20 and F_l 17. Grind smooth surface defects which would telegraph through applied floor covering system.

Trowel and Fine Broom Finish: Apply trowel and fine broom finish where ceramic or quarry tile is to be installed with thin-set mortar. Apply trowel finish as specified, then immediately follow with fine brooming to slightly scarify surface.

Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

Sealer/Dustproofer Finish: Apply a second coat of specified clear styrene acrylate type curing/sealing compound to all exposed interior concrete floors where indicated on drawings. Compound shall be applied in strict accordance with directions of manufacturer and just prior to completion of construction.

CONCRETE CURING AND PROTECTION:

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than seven (7) days. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by liquid membrane curing, and by combinations thereof.

1. Moisture cure by one or more of the following methods:
 - a. Keeping concrete surface continuously wet by covering with water.
 - b. Continuous water fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water

and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces

and edges, with 4" lap over adjacent absorptive covers.

2. Moisture cover cure by covering concrete surfaces with moisture-retaining power cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3", and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Liquid membrane cure by applying specified curing/sealing compound or curing/hardener compound to exposed interior slabs and to exterior slabs, walks, and curbs as soon as final finishing operations are complete (within two (2) hours). Apply uniformly in continuous operation by power-sprayer or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.

Do not use membrane curing compounds on surfaces to be covered with coating material applied directly to concrete; liquid floor hardener, waterproofing, dampproofing, flooring, painting, and other coatings, and finish materials, unless otherwise acceptable to Engineer.

Floors in areas receiving quarry tile, ceramic tile and liquid floor hardener shall be wet cured by use of moisture-retaining cover. Under no circumstances shall chemical hardeners or curing agents be applied to the concrete. The concrete floors shall cure a minimum of seven (7) days prior to application of the surface material. Keep the concrete floor free of all dirt, debris, paint, oil, and and/or other matter which might prevent adhesion of the surface material. Protect during the entire curing period and until final surface material has been applied and cured.

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

Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor toppings, and other flat surfaces by application of appropriate curing compound. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

MISCELLANEOUS CONCRETE ITEMS:

Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades in place. Mix, place and cure concrete as herein specified, to blend with in place construction. Provide other miscellaneous concrete shown or required to complete work.

Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

CONCRETE SURFACE REPAIRS:

Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms when acceptable to Engineer. Cut out honeycomb, rock pockets, voids over ¼” in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1”. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush coat the area to be patched with specified bonding agent. Place Patching mortar after bonding compound has dried.

For exposed to view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match the color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

Repair of Formed Surfaces: Remove and replace concrete defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01” wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen (14) days. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.

Repair defective areas, except random cracks and single holes not exceeding 1” diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and exposed reinforcing steel with at least ¾” clearance all round. Dampen concrete surfaces in contact with patching concrete and apply bonding compounds. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one-part Portland cement to 2-1/2 parts fine aggregate passing #16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than seventy-two (72) hours.

Use epoxy-based mortar for structural repairs, where directed by Engineer.

Repair methods not specified above may be used, subject to acceptance of Structural Engineer.

Leveling of floors for subsequent finishes shall be achieved by use of specified underlayment material.

END OF SECTION 03310