

- (5) Surface water, water added, and total water used.
 - (6) Slump, air content, and temperature of heated concrete.
 - (7) Capacity and condition of mixing truck.
 - (8) Percent capacity loaded, condition of heating installation.
 - (9) Period of inspection and number and size of batches delivered.
 - (10) Age of testing, method of curing.
 - (11) Truck number, time of transit, date and supplier's name.
5. Inspection of Batch Plant Operation
1. Required to insure that concrete delivered to the job site complies with the specifications and design mix. The testing laboratory will provide this service as directed by the Commissioner.
6. Plant Inspection Reports
1. Shall be submitted in four (4) copies, and include the following items:
 - (1) Location of plant and job site location.
 - (2) Concrete design mix number and concrete design strength.
 - (3) Type, source, and amount of cement.
 - (4) Aggregates and admixture used.
 - (5) Surface water, water added, and total water used.
 - (6) Slump, air content, and temperature of heated concrete.
 - (7) Capacity and condition of batching installation.
 - (8) Condition of heating installation.
 - (9) Period of inspection and number and size of batches delivered.
7. Records and Schedules
1. The Contractor must maintain concrete pouring schedules and records with marked drawings indicating the time and date of placing concrete in the various sections of the work.
 - (1) Keep these drawings on file for reference, and deliver to the Commissioner upon completion of the Work.
8. Concrete Mix Design and Control
1. The Contractor must employ, at his expense, an independent testing laboratory, approved by the Commissioner, to design the mix or mixes for each type of concrete required in accordance with the specifications and drawings.
 2. No concrete will be placed until mix designs and 28 day test results are submitted and approved.
 3. The Contractor must request mix design, or designs, in writing and furnish this testing laboratory with necessary material to prepare the mix, or mixes, a minimum of 35 days prior to placement of concrete.

4. The adequacy of a design will be verified by tests on a minimum of 6 cylinders; 2 tested at 3 days, 2 tested at 7 days and 2 at 28 days, in accordance with ASTM C 192 and C 39 and by slump test in accordance with ASTM C 143.
 5. The testing laboratory will submit copies of the mix design, or designs, and test results to the Commissioner for approval before concrete is placed. If there is more than one design, each design will indicate where it is to be used.
 6. If at anytime during construction the concrete resulting from the approved mix design proves to be unsatisfactory for any reason, such as lack of workability; insufficient strength, the Contractor must immediately notify the testing laboratory and the Commissioner. The laboratory will verify the deficiency with additional testing and modify the design, subject to the Commissioner's approval, until a satisfactory concrete is obtained.
 7. Strength requirements of concrete will be noted on the drawings.
 8. When an approved water reducing admixture is used in accordance with Manufacturer's recommendations, cement requirements may be reduced. Mix designs will indicate use of admixtures.
 9. Slump will be 3" plus or minus 1" for footings and foundations walls, and 3" plus or minus ½" for balance of structure. The Commissioner's testing laboratory will have the right to reject any concrete which arrives at job site in excess of specified slump. No water will be added to design mix unless as determined in accordance with ASTM C 143.
 10. All concrete exposed to weather or in contact with earth or backfill, including interior slab on grade, will be air-entrained. Air-entrained concrete will be made with an air-entraining admixture. Total air content will be approximately 4 to 6 percent (plus or minus 1 percent), or as indicated hereinafter under "Concrete Types" - estimate of quantities.
 11. Minimum cement content will be 5 bags per cu. yd. of concrete. Water content per sack of cement, including free water contained in aggregates will not exceed 6 gallons. Fine aggregate will not be less than 1/3, nor more than ½ of total aggregate.
 12. A plasticizing admixture may be used when approved by the Commissioner for the purpose of reducing water requirements for a given consistency and strength of concrete and for increasing workability. Mixture will be used in accordance with Manufacturer's recommendations.
9. Manufacturer's Certification
1. Submit certification that products meet or exceed the specified requirements.

1.5 QUALITY ASSURANCE:

1. Contractor Qualifications: Installation of cast-in-place concrete work must be performed only by a qualified installer. The term qualified means experienced in performing the Work required by this section. The qualified Installer will be responsible for demonstrating to the Commissioner's satisfaction that he/she has sufficient experience in its role. The Installer must submit evidence of such qualifications upon request by the Commissioner.

2. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:
 1. ACI 315, Details of Concrete Reinforcement, as published by the American Concrete Institute, current edition.
 2. ACI Detailing Manual, (SP-66), as published by the American Concrete Institute, current edition.
 3. ACI 318, Building Code Requirements for Reinforced Concrete, as published by the American Concrete Institute, current edition.
 4. AWS D1.4, Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction, as published by the American Welding Society, current edition.
 5. CRSI, Manual of Standard Practice, as published by the Concrete Reinforcing Steel Institute, current edition.
 6. ACI 117, Standard Tolerances for Concrete Construction and Materials, as published by the American Concrete institute, current edition.
 7. CRSI, Placing Reinforcing Bars, as published by the Concrete Reinforcing Steel Institute, current edition.

1.6 DELIVERY, STORAGE AND HANDLING:

1. Materials will be stored in strict accordance with the Manufacturer's printed directions, copies of which will be furnished to the Commissioner.
2. Protect materials against damage from mechanical abuse, plaster, salts, acids, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials will be removed from the premises, and all damaged materials replaced with new materials.
 1. Protect materials against damage from mechanical abuse, salts, acids, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials will be removed from the premises, and all damaged materials replaced with new materials.
 2. Properly label all bars with weatherproof tags to facilitate identification.
3. Access and Storage Areas
 1. All access routes and storage areas will be subject to the approval of the Commissioner in order to reduce interference with Airport Operations.

1.7 ENVIRONMENTAL REQUIREMENTS:

1. When cold weather conditions as defined in ACI 306 exist, place and cure concrete in accordance with requirements of same.
2. When hot weather conditions as defined in ACI 305 exist, place and cure concrete in accordance with same.

1.8 SPECIAL REQUIREMENTS:

1. Field Measurements - Before proceeding with the fabrication of the work, the Contractor must verify all dimensions and take such measurements as are required for proper fabrication and installation of the work.
2. Coordination - Coordinate Work of this section with related Work specified in the other divisions/sections of the Contract Documents.
3. Elevation of depressions in concrete curb weirs require special attention to achieve elevation shown on design drawings. See design drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA:

1. General
 1. Regular concrete work will consist of Portland cement, fine aggregate, coarse aggregate, plasticizing admixture, and water. Other types of concrete will vary the cement, aggregates, and admixtures as required to produce the desired features. Concrete will be proportioned, mixed, placed, cured, and finished as hereinafter specified. Each material for the entire job will come from the same source. The following types of concrete will be used where indicated on the drawings or specified:
 1. Regular Concrete.
2. Admixtures
 1. Used in concrete will be produced by reputable manufacturers and used in accordance with the Manufacturer's printed directions, subject to approval of the Commissioner.
3. Portland Cement
 1. ASTM C 150, Type I normal Portland cement; or Type III (High-early strength cement) as approved by the Commissioner.
4. Aggregate for Normal Weight Concrete
 1. All fine and coarse aggregate will conform to ASTM C 33.
 2. Fine Aggregates - Natural or artificial, hard clean sand.
 3. Coarse Aggregates - Crushed stone or gravel, except blast furnace slag will not be accepted. Aggregate sizes will meet the following:
 1. Size 57, for footings foundations, walls, beams, slabs on fill and reinforced slabs 6" or greater thickness.
 2. Size 7, for applied toppings.
 3. Size 67, for other concrete, unless otherwise specified.
 4. Exposed Aggregates - Merrimac Pea Gravel.

5. Water
 1. Will be clean, fresh, potable.
6. Admixtures
 1. Concrete admixtures will comply with ASTM C 494 (Water reducing) or ASTM C 260 (Air Entraining), produced by recognized Manufacturers subject to Commissioner's approval.
 2. Air Entraining Admixture
 1. ASTM C 260, Add only to normal Portland cement concrete to meet requirements specified for air content.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Air Mix", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "MB-VR", (Master Builders, Inc., Downers Grove, IL 60515.)
 - (3) "Darex", (W.R. Grace & Co., Bedford Park, IL 60638.)
 - (4) "Sika AER", (Sika Corp., Lynhurst, NJ 07071.)
 3. Water Reducing Admixture
 1. ASTM C 494, Type A, and not containing any; chloride ions added during manufacture.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Eucon WR-75", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "Pozzolith" 122N, (Master Builders, Inc., Downers Grove, IL 60515.)
 - (3) "WRDA with Hycol", (W.R. Grace & Co., Bedford Park, IL 60638.)
 - (4) "Plastocrete", (Sika Corp., Lynhurst, NJ 07071.)
 4. Water Reducing, Retarding Admixture
 1. ASTM C 494, Type D. When high temperatures, placing or humidity conditions dictate
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Eucon Retarder-75", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "Pozzolith 100-XR", (Master Builders, Inc., Downers Grove, IL 60515.)
 - (3) "Daratard HC", (W.R. Grace & Co., Bedford Park, IL 60638.)

- (4) "Plastiment", (Sika Corp., Lynhurst, NJ 07071.)
5. Water Reducing, Accelerating Admixture
 1. ASTM C 494, Types C or E. When increased initial set is required without corrosive effect on metals.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Accelguard", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "Pozzolith 100-HE", (Master Builders, Inc., Downers Grove, IL 60515.)
 - (3) "Darex Set Accelerator", (W.R. Grace & Co., Bedford Park, IL 60638.)
 6. Plasticizing Admixture
 1. Products of one of the following Manufacturers will be acceptable:
 - (1) "Pozzolith-N", (Master Builders, Inc., Downers Grove, IL 60515.)
 - (2) "WRDA", (W.R. Grace & Co., Bedford Park, IL 60638.)
 - (3) "Plastiment", (Sika Corp., Lynhurst, NJ 07071.)
 2. When ambient temperature is expected to exceed 80 degrees F during placing and finishing operations.
 - (1) Products of one of the following Manufacturers will be acceptable:
 - (1) "Pozzolith - R", (Master Builders, Inc., Downers Grove, IL 60515.)
 - (2) "Daratard", (W.R. Grace & Co., Bedford Park, IL 60638.)
 - (3) "Plastiment", (Sika Corp., Lindenhurst, NJ 07071.)
 7. Fly Ash
 1. ASTM C-618, used in accordance with industries recommendations as plasticizing agent.
 8. Calcium chloride will not be used.
 7. Non-shrink Pre-mixed Grout
 1. Metallic Type
 1. Products of one of the following Manufacturers will be acceptable:
 - (1) "Firmix", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "Embeco 153", (Master Builders, Inc., Downers Grove, IL 60515.)

- (3) "Ferrolith G", (Sonneborn Products Co., Hartville, SC 29550.)
 - 2. Non-Metallic Type
 - 1. Products of one of the following Manufacturers will be acceptable:
 - (1) "Euco N-S", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "SonogROUT", (Sonneborn Products Co., Hartville, SC 29550.)
 - (3) "Upcon", (USM Corporation).
 - (4) "F-100" (Sauereisen Cements Company).
- 8. Bonding Agent
 - 1. Products of one of the following Manufacturers will be acceptable:
 - 1. Epoxy type, 100% solids
 - (1) "Euco Epoxy #452 (dry surface), #463" (dry or damp surface), The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "Sikadur Hi-Mod" (dry or damp surface), Sika Corp., Lynhurst, NJ 07071.
 - (3) "Duralbond 102" (dry or damp surface), Dural International Corp.
 - (4) "Emecole 101 Series Epoxy", Emecole, Inc. Romeoville, IL 60446
 - (5) "Degussa Epofil" and "Degussa Concrevice 1210 IUG", Degussa Building Systems, Shakopee. MN 55379
- 9. Patching and Surfacing Compound
 - 1. Products of one of the following Manufacturers will be acceptable:
 - 1. Epoxy type, 100 % solids
 - (1) "Euco Epoxy #456 Mortar (dry surface), #460 (dry or damp surface)", (The Euclid Chemical Company, Cleveland, OH 44110.)
 - (2) "Sikadur Lo-Mod Mortar", (dry or damp surface), Sika Corp., Lynhurst, NJ 07071.
 - (3) "Duraltex" (dry or damp surface), (Dural International Corp.).
- 10. Hydraulic Repair Mortar
 - 1. Products of one of the following Manufacturers will be acceptable:
 - 1. "Waterplug", (BASF Building Systems, Shakopee, MN 55379)
 - 2. "SilkaSet Plug", Sika Corp., Lyndhurst, NJ 07071
 - 3. "Thoroc Plug", Degussa Building Systems, Shakopee, MN 55379

11. Waterstops

1. Products of one of the following Manufacturers will be acceptable:
 1. "Durajoint", (W.R. Grace & Co., Bedford Park, IL 60638.)
 2. "Sealtight Waterstops", (W.R. Grace & Co., Bedford Park, IL 60638.)
 3. "Volclay Waterstop Rx", (CETCO Building Materials Corp., Arlington Heights, IL.)
2. Products of type numbers as called for on the drawings.

12. Expansion Joint Filler

1. Products of one of the following Manufacturers will be acceptable:
 1. "Rodofoam" - W.R. Grace & Co., Bedford Park, IL 60638;
 2. "CRC Recoverex Hard" - Construction Research Corp.;
 3. ASTM D 1752, Type 1., "Gray Sponge Rubber" - W.R. Meadows, Inc., Elgin, IL 60121;
 4. "Cementone Code 3329" - W.R. Grace & Co., Bedford Park, IL 60638;
 5. "Neofirm" - Construction Research Corp.
2. Fillers will be full depth of slabs, less allowance at top for sealant. Unless otherwise directed allowance at top of all joints for sealant will be ½" below finished surface.

13. Curing Materials

1. Absorptive Cover
 1. Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with ASSHO M 182, Class 3 or cotton mats complying with ASTM C 440.
2. Moisture-Retaining Cover
 1. Provide one (1) of the following:
 - (1) Waterproof Paper - ASTM C 171, Type 1 or Type 11.
 - (2) Polyethylene Sheeting - AASHO M 171.
 - (3) Polyethylene-coated burlap.
3. Liquid Membrane Curing Compound
 1. ASTM C 309, Type 1, resin type, clear, unless otherwise directed, for vertical and horizontal surfaces guaranteed not to affect the bond of applied finished.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Horn Clear-Seal" - W.R. Grace & Co., Bedford Park, IL 60638.

(2) "Acri Seal S" - Toch Brothers Division, Carboline Company, St. Louis MO 63144;

(3) "Kure-N-Seal" - Sonneborn-Contech Shakopee, MN 55379.

14. Cementitious Waterproofing

1. "Tegraproof" by BASF
2. Meadow-Coat by WR Meadows
3. Sikagard 63N by Sika

2.2 CONCRETE TYPES AND USES:

1. Minimum cement content as indicated below. Should tests indicate greater cement content is required, such will be used at no additional cost to the City. Use Type 1 unless otherwise specified.
2. Plasticizing admixture will be used in all concrete, except lean concrete.

2.3 MIXING CONCRETE:

1. Concrete mixing, measuring and delivery equipment will be certified by the National Ready Mix Concrete Association. Methods will be subject to Commissioner's approval and in accordance with ACI 614, and 304.
 1. Site-Mixed Concrete - Provide a batch type mixer equipped with accurate timing and measuring devices and operate in accordance with Manufacturer's recommendations. Provide equipment to measure amount of free moisture in the aggregate.
 1. The mixing time for each batch, after all solid materials are in mixing drum and provided, that all mixing water is introduced before 1/4 of mixing time has elapsed, will be not less than 1 minute for mixers having a capacity of 1 cu. yd.
 2. Ready-Mixed Concrete
 1. ASTM C 94, and as herein specified. Concrete for this Project will be ready-mix concrete and will be batched and delivered from a plant approved by the and in strict accordance with the requirements set forth in ASTM C 94, subject to all provisions specified herein regarding materials, strength, proportioning, consistency and delivery time.
 - (1) Delete the references for allowing additional water to be added to the batch for material with insufficient slump.
 - (2) Additional of water to the batch, either at the plant or at the jobsite, will not be permitted, except upon specific approval of the Commissioner in each instance.
 3. The rate of delivery of the ready mixed concrete will be such that the interval between placing of successive batches will be 30 minutes or less to prevent "cold joints". The elapsed time between the introduction of mixing water to the cement and aggregate and completion of discharge will not exceed one (1) hour.

1. Minimum mixing for each batch will be that required to produce a uniform mixture of materials but in no case less than 50 revolutions after all materials are in the mixer, including water.
2. The ready-mixed concrete producer will submit duplicate delivery tickets, one (1) for the Contractor and one (1) for the Commissioner, with each load of concrete delivered to the job. Delivery tickets will provide the following information:
 - (1) Date
 - (2) Name of ready-mix concrete plant
 - (3) Contractor
 - (4) Job Location
 - (5) Type (Standard or High Early Strength) and brand of cement.
 - (6) Cement content in bags per cubic yard of concrete.
 - (7) Truck number.
 - (8) Time dispatched and time unloaded.
 - (9) Amount of concrete in load in cubic yards.
 - (10) Admixtures in concrete, if any.
 - (11) Type and maximum size of aggregate.
 - (12) Water added at job, if any.
 - (13) Name of person who authorized addition of water.
3. Close control of mixing time will be maintained for air entrained concrete.
4. The testing laboratory engaged by the Commissioner will periodically check batch proportions and yield strength, and will have continuous access to the mixer.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

1. Before commencing installation, examine substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the Work. Remove hardened concrete, debris and other foreign materials from the interior of forms and from the inside of the mixing and conveying equipment. Start of Work will indicate acceptance of the substrate.
2. Concrete will not be placed until all reinforcement is securely and properly fastened in its correct position; all anchors, sleeves, inserts, pipes, conduits, and other items required to be embedded therein have been inspected and approved by the Commissioner.
3. Conduit and piping embedded in concrete will be located by the trades concerned, between the bottom and top reinforcement. Where crossovers are necessary, they will not displace reinforcement from its required position.
 1. Conduit and piping parallel to reinforcing steel will not be supported by or tied directly to the steel.
 2. It will be supported on bar chairs or support bars provided solely for that purpose.
4. Discontinue concrete operations when the air temperature reaches 40 degrees F, and is descending, and do not resume until the air temperature is 35 degrees F, and ascending, except when written approval of the Commissioner is obtained.

5. Accelerating or antifreeze admixtures will not be used. The Contractor is responsible for the protection of finished concrete against all damage or injury, including freezing until the work has been completed and accepted.
6. For slabs on grade, do all final grading, compacting, trimming as required to prepare the finished sub-base. Building up of sub-base under forms after they are in place will not be permitted. In no case will concrete be placed upon frozen subgrade material.
7. All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances and finishing, will be corrected as directed by the Commissioner at the Contractor's expense, without extension of time therefore. The Contractor must also be responsible for the cost of corrections to any other part of the work affected by or resulting from corrections to the concrete work.

3.2 WATERSTOPS:

1. Provide waterstops for construction joints where indicated on the drawings. Waterstops, corner pieces, and method of sealing splices will be subject to approval of the Commissioner.
2. Waterstops of special shape will be provided as shown on the drawings. Minimum thickness of material will be 3/16".

3.3 CONSTRUCTION JOINTS:

1. Construction joints will be as approved by the Commissioner with keyed joint in foundation walls and near the center of span of reinforced slabs, beams, joists, and girders, unless otherwise shown. Create additional construction joints only with approval of the Commissioner.
2. Where horizontal construction joints occur roughen the surface of the previously placed and hardened concrete and remove foreign matter and laitance. Saturate the surface with water and apply a thin coat of neat cement paste before depositing fresh concrete.

3.4 GROUTING WORK:

1. Mix and place pre-mixed grout in accordance with the printed instructions of the grout Manufacturer.

3.5 PLACING CONCRETE - GENERAL:

1. When more than single strength concrete is required, the location of each concrete type will be as shown.
2. Provide adequate runways, chutes, and other means of conveying concrete into place. Use chutes or tremies for placing concrete where a drop of more than 5'-0" is required.
3. Do not place concrete until base is acceptable, reinforcement is securely and properly fastened in its correct position, and accessories and other items required to be embedded there in have been placed and anchored. Inspect reinforcement for secure fastening and accurate position.
4. Methods of placing concrete, such as pumping or by conveyors, will be subject to review by the Commissioner.
5. Use short troughs or pipes aids in placing concrete and arrange in such a manner that the ingredients of the concrete are not separated.

6. Dropping the concrete a distance of more than 5"0" or depositing a larger quantity at any point and running or working it along the forms will not be permitted.
7. Mix and place concrete exposed in the finish work to procure smooth, even surfaces of dense concrete, and clean sharp arrises and outside corners.
8. Place concrete so that the pressure caused by the wet concrete will not exceed those used in the design of the forms.
9. Do not place concrete for floor slabs, beams, or footing on wet, muddy, or frozen sub-grades.
10. Before placing slabs or other heavy fill over freshly placed foundation walls, piers or other filled forms, allow at least 24 hours for shrinkage and settlement.
11. Use special care to prevent splashing concrete on forms and reinforcement, and remove any hardened deposits before covering with fresh concrete.
12. Place concrete continuously between construction joints. When necessary, because of an emergency only, to place less than a complete horizontal layer in one (1) operation, terminate the pour with a keyed vertical joint.
13. In any given lift, place and compact each lift before the preceding one (1) has taken its initial set. Lines of separation between the lifts, or between layers will not be acceptable. Deposit and compact the concrete so that exposed surfaces will be smooth and of uniform texture.
14. Place concrete with the aid of internal mechanical vibrator equipment capable of 9,000 or more impulses per minute. Vibration will be transmitted directly to the concrete. The duration of vibration at any location will be the minimum necessary to produce thorough compaction.
15. Place concrete flat work in layers 12" to 18" deep and in walls and large volumes in layers not over 24" deep. Vibrate into place in a manner that will not cause the ingredients to separate. Where necessary, supplement vibrators by hand spading to secure these results. Keep vibrators constantly in motion and do not hold in one location. Long enough to draw a pool of grout or water from the concrete. Maintain spare equipment to avoid breakdown.
16. Place concrete immediately after mixing, and in no case more than 60 minutes after initial mixing. Review article "Mixing Concrete" under Part 2 "Products" for plant, mixing, batching and etc. for "Ready-Mix Concrete"
17. Roughen, clean, and moisten construction joints before placing concrete. Apply bonding compound and place new concrete after bonding compound becomes tacky.
18. The area to be placed will not exceed 60 ft. in any horizontal direction, nor exceed an area of 2,000 sq. ft. For slabs on grade pour slab in a checkerboard sequence. Minimum of 24 hours will elapse between the placing of adjacent units. Provide construction joints between units in accordance with the typical details shown

3.6 PLACING FOOTING AND FOUNDATIONS:

1. Bottoms of excavations will be properly leveled off before placing concrete. Footing and foundations will be of sizes and shapes as shown on the drawings.
 1. Place concrete as soon as possible after excavations have been completed and as a continuous pour unless otherwise directed.

2. Where different levels are indicated for wall footings, the footings will be stepped as shown on the drawings.
3. Form vertical construction joints in footings in approved locations.

3.7 PLACING CONCRETE WALLS:

1. Remove keying strips from tops of footings and scrub top surfaces of footings clean before forms are erected.
2. Place concrete for foundations walls, enclosing walls, and other walls shown to be of concrete to dimensions shown or marked. Finish true and level on top for reception of floors, walls, beams, slabs, and other elements.

3.8 PLACING CONCRETE FLOORS:

1. Floor slabs will be level, plane surfaces, unless otherwise indicated on the drawings. Surface will be pitched to drains as required.
 1. All top of slab elevations will be determined by the use of preset runners supported by adjustable chairs set at the proper elevation.
 1. The Commissioner's Representative will have the right to obtain check readings, by use of a surveyors level, to verify the elevations of the runners and the supporting formwork.
 2. The Contractor is to organize the work such that these readings may be obtained, before beginning concrete placement, and not cause any delay in the work.
 2. Concrete for all slabs will be placed continuously between construction joints; consolidated by vibration or other suitable means; brought to the correct level with a straight edge and struck off.
 1. Use bull floats or darbies to force the coarse aggregate down and as required to produce a smooth surface, free from humps and hollows.
 3. All slabs will be power-floated and will also be hand-floated as specified for certain finishes.
 1. Power-floating will begin when the water sheen has disappeared, and/or the mix has stiffened sufficiently that the weight of a man standing on it leaves only a slight imprint on the surface.
 2. Face to the desired state, the concrete will be allowed to stiffen or become harden before beginning the second floating operation.
 4. Additional finishing, including brooming, brushing and steel troweling; will be as specified herein.
 5. When steel trowel finish is specified both power and hand troweling will be required.
 1. Power troweling will begin as soon as little or no cement paste clings to the blades.

2. Troweling will be continued until the surface is dense, smooth, and free of all minor blemishes such as trowel marks.
2. The maximum variation in surface tolerance for troweled finishes "B" and "D" will be $\frac{1}{8}$ " in 10'-0". If variations greater than this exist, the Commissioner may direct the Contractor to grind the surfaces to bring them within the requirements. Patching of low spots will not be permitted. Grinding will be done as soon as possible, preferably within three (3) Days, but not until the concrete is sufficiently strong to prevent dislodging coarse aggregate particles.
 1. Sprinkling of dry cement or a mixture of dry cement and sand on the surface of the fresh concrete to absorb water or to stiffen the mix will not be permitted.
 2. Float concrete slab to receive finish materials to true lines and level leave ready to receive other materials. Depress slabs as detailed or otherwise noted.
 3. Place floors perfectly true, except pitched where indicated, and at the correct levels for receiving finished floor materials. Fill in and finish around pipe sleeves which have been set to receive mechanical and electrical work.
 4. Where floor drains are installed in floor slabs, finish the floors level around walls and provide a definite uniform pitch to drains. Unless otherwise indicated, pitch to drains will be not less than 1/16 inch per foot. Special care will be taken to prevent water pockets.

3.9 CONCRETE FINISHES - FORMED SURFACES:

1. General
 1. Remove form and form-tie-ins.
 2. Perform all patching as hereinafter specified, and patch formed surfaces exposed to view as hereinafter specified under paragraph 3.10, "Patching of Formed Concrete."
2. Immediately after removing forms, inspect concrete surfaces.
 1. Concrete work not formed as shown on the drawings, or which for any reason is out of alignment or level or shows defective surfaces, will be removed unless the Commissioner grants permission to patch a defective area.
 1. Permission to patch any special area will not be considered a waiver of the Commissioner's right to require complete removal of the defective work if the patching is not satisfactory.
 2. Patching will be done before the concrete is thoroughly dry.
 3. Mix patching mortar of the same materials and of the same proportions as used for the concrete, except that the coarse aggregate will be omitted.
 1. When normal gray cement was used in the concrete, substitute light cement for the gray cement to match color of surrounding concrete.
 2. For white concrete areas use white cement.
 3. Dampen the dry mix and allow to stand for a period of one (1) hour during which time mix with a trowel to prevent setting.

4. Compact the mortar into place and screed off so as to leave the patch slightly higher than the surrounding surface.
 1. Do not disturb for a period of one (1) to two (2) hours to permit initial shrinkage before final finishing.
 2. Finish patches in such a manner and texture as to match the adjoining surface.
5. After removal of forms withdraw tie rods or break off form ties, wet the resulting holes, and fill solidly with mortar.
 1. For holes passing entirely through the wall, use a plunger type grout gun to force the mortar through the wall starting at the back face.
 2. Hold a piece of burlap or canvas over the hole on the outside and when the hole is completely filled, strike off the excess mortar with a cloth flush with the surface.
 3. Fill holes not passing entirely through the wall with a small tool that will permit packing the hole solid with mortar.
 - (1) Strike off excess mortar flush with the surface of the wall using a cloth.
 - (2) In exposed face of mortar embed aggregate similar to that on adjacent surface.
3. Finish No. 1 (Concealed Below Grade Concrete)
 1. Patch all form tie holes, aggregate pockets, honeycomb and defective areas as required with 1:2 Portland cement-sand mortar.
4. Finish No. 2 (Exposed Non-Architectural Concrete)
 1. Same as Finish No. 1, except fins and ridges will also be removed.
5. Finish No. 3 (Smooth Concrete)
 1. Concrete will be smooth, placed and finished as required to provide even, dense surfaces of uniform color, free from cracks, aggregate pockets or honeycomb so that a minimum of after treatment of the finished surfaces will be required.
 2. Fill form tie holes with 1:2 Portland cement-sand mortar. Patch any aggregate pockets, honeycomb and other defective areas and remove all fins, form joint marks, rough spots and other defects by rubbing with a Carborundum stone until these defects and rough areas are completely removed and surfaces are free from imperfections so as to produce dense, smooth, uniform finish. Additional patching requirements will be as hereinafter specified under paragraph 3.10, "Patching of Formed Concrete."

3.10 PATCHING OF FORMED CONCRETE:

1. Concrete patching, when necessary to obtain the required profiles, lines or levels, will be subject to the Commissioner's approval and will utilize the specified Bonding agents or Patching and Surfacing Compound.

2. Prior to application of bonding agent, or patching and surfacing compound, remove all dust, dirt, grease, oil, wax or loose material from surfaces to be repaired.
3. Build-up patching to match appearance of surrounding exposed concrete surfaces. Apply Bonding Agent to honey-combed areas, aggregate pockets or other voids and fill with mortar composed of Portland cement and selected aggregate of type and mixture as required to match existing concrete and finish to match existing surfaces. Cure new patches as required to prevent cracks.
4. Patching and surfacing compound may be used for thin patches which are not exposed or are not required to match the color, texture, and finish of surrounding concrete surfaces.

3.11 CONCRETE SURFACE REPAIRS:

1. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Commissioner.
2. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.
 1. Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
3. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Commissioner. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
 1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
4. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Commissioner.
4. Repair defective areas, except random cracks and single holes not exceeding 1 inch (25 mm) in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. 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.
5. Repair isolated random cracks and single holes 1 inch (25 mm) or less 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. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
6. Repair cracks and holes with water seepage around existing pipe sleeves through concrete walls with hydraulic repair mortar.
7. Perform structural repairs with prior approval of Commissioner for method and procedure, using specified epoxy adhesive and mortar.
8. Repair methods not specified above may be used, subject to acceptance of Commissioner.

3.12 QUALITY CONTROL TESTING DURING CONSTRUCTION

1. General: The Owner may employ a testing agency to perform tests and to submit test reports.
2. Sampling and testing for quality control during concrete placement may include the following, as directed by Commissioner.
 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 4. Compression Test Specimen: ASTM C 31; one set of four 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 required.

5. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. (4 cu. m) plus additional sets for each 50 cu. yd. (38 cu. m) more than the first 25 cu. yd. (19 cu. m) of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Commissioner may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three 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 (3.4 Mpa).
3. Test results will be reported in writing to Commissioner, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
4. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
5. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Commissioner. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03300

STRUCTURAL CONCRETE

SECTION 03320

PART 1 - GENERAL

1.1 SECTION INCLUDES:

1. Work under this section is subject to the requirements of the Contract Documents.
2. Furnish and install all Structural Concrete Work as shown on the Drawings and as specified herein, including but not limited to the following:
 1. Footings and Concrete Curb.
 2. Concrete slab on grade.
 3. Grouting.
3. Install all items as shown on the Drawings and as specified to be furnished under other sections, including but not limited to the following:
 1. Embedded angle in curb.
 2. Embedded pipe at each drain valve.

1.2 RELATED WORK:

1. As specified in the following divisions:
 1. Division 2 - Site Work
 2. Division 5 - Structural Steel

1.3 REFERENCES:

1. "Specifications for Structural Concrete for Buildings" ACI 301-05.
2. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", except minimum cement content will be herein specified.
3. ACI 306 "Recommended Practice for Cold weather Concreting".
4. ACI 311 "Recommended Practice for Concrete Inspection".
5. ACI 605 "Recommended Practice for Hot Weather Concreting".
6. ASTM C 94 "Specifications for Ready Mixed Concrete".
7. Copies of the above publications will be made available by the Contractor on the job site at all times.
8. Unless otherwise indicated, the latest edition of the specifications, will govern the work.
9. Concrete work will comply with federal, state and local building codes, including the City of Chicago Building Code.

1.4 SUBMITTALS:

1. Submit the following
 1. Shop Drawings
 1. Concrete Pour Schedule.
 2. Samples and/or Product Data
 1. Product Data
 - (1) Concrete Mix Design
 2. Samples
 - (1) All aggregates, 20 lbs. each.
 3. Test Reports
 1. The Commissioner will employ an approved testing laboratory which will make tests and perform inspection in accordance with these specifications, at no cost to the Contractor. The Contractor must cooperate with the testing laboratory in every respect.
 2. The testing laboratory will submit five (5) copies of its test cylinder reports which are to include as far as applicable the following items:
 - (1) Amount and location of the pour in structure, type of the structure, date of the pour.
 - (2) Concrete design mix number and concrete design strength.
 - (3) Proportion, type, and amount of cement.
 - (4) Aggregates and admixture used.
 - (5) Surface water, water added, and total water used.
 - (6) Slump, air content, and temperature of heated concrete.
 - (7) Capacity and condition of mixing truck.
 - (8) Percent capacity loaded, condition of heating installation.
 - (9) Period of inspection and number and size of batches delivered.
 - (10) Age of testing, method of curing.
 - (11) Truck number, time of transit, date and supplier's name.
 3. During progress of the Work, the testing service will mold and laboratory cure concrete cylinders in accordance with ASTM C 31. Compressive strength tests will be in accordance with ASTM C 39.
 - (1) One (1) set of strength tests will consist of four (4); standard cylinders of each cubic yards of concrete or fraction thereof placed in any one (1) day.

- (2) Each class of mix will be represented by not less than a set of four (4) tests regardless of concrete quantity placed at the time.
 - (3) Two cylinders will be tested at 7 Days, two at 28 Days in accordance with ASTM C 39.
 - (4) Determine air content for air entrained concrete in accordance with ASTM C 173 or C 231.
 - (5) Two (2) Slump Tests - ASTM C 143. Keep a slump cone at the site at all times.
4. Concrete strength tests will be evaluated in accordance with ACI 214 "Recommended Practice for Evaluation of Compression Test Results of Field Concrete". Compressive strength of concrete will conform to the following criteria:
- (1) The average of any three (3) sets of consecutive strength tests of twenty-eight (28) Days laboratory cured specimens for each class of concrete will exceed or equal the specified strength for that class and no individual strength test result will fall below the required strength by more than 500 psi.
5. If compressive strength tests fail to meet the above minimum requirements, concrete represented by such tests will be considered questionable and will be subjected to the following further testing at the expense of the Contractor:
- (1) Core samples will be secured, prepared, and tested in accordance with ASTM C 42.
 - (2) If the core tests specified above fail to meet strength requirements or should it be impractical to take such cores the Commissioner may order load tests which will be conducted and the results evaluated in accordance with Chapter 20 of ACI 318.
 - (3) Failure of any portion of the structure to pass a load test will result in rejection of such portion and the Contractor must remove and reconstruct such condemned areas at his expense.
6. When, in the opinion of the Commissioner, the laboratory tests are not indicative of the quality of concrete in place, additional tests of the hardened concrete may be taken. The Contractor must not bear the cost of such tests unless their results confirm that the concrete in place is deficient.
4. Inspection of Batch Plant Operation
1. Required to insure that concrete delivered to the job site complies with the specifications and design mix. The testing laboratory will provide this service as directed by the Commissioner.
5. Plant Inspection Reports
1. Will be submitted in four (4) copies, and include the following items:
 - (1) Location of plant and job site location.

- (2) Concrete design mix number and concrete design strength.
- (3) Type, source, and amount of cement.
- (4) Aggregates and admixture used.
- (5) Surface water, water added, and total water used.
- (6) Slump, air content, and temperature of heated concrete.
- (7) Capacity and condition of batching installation.
- (8) Condition of heating installation.
- (9) Period of inspection and number and size of batches delivered.

6. Records and Schedules

1. The Contractor must maintain concrete pouring schedules and records with marked drawings indicating the time and date of placing concrete in the various sections of the work.
 - (1) Keep these drawings on file for reference, and deliver to the Commissioner upon completion of the Work.

7. Concrete Mix Design and Control

1. The Contractor must employ, at his expense, an independent testing laboratory, approved by the Commissioner, to design the mix or mixes for each type of concrete required in accordance with the specifications and drawings.
2. No concrete will be placed until mix designs and twenty-eight (28) day test results are submitted and approved.
3. The Contractor must request mix design, or designs, in writing and furnish this testing laboratory with necessary material to prepare the mix, or mixes, a minimum of 35 Days prior to placement of concrete.
4. The adequacy of a design will be verified by tests on a minimum of 6 cylinders; 2 tested at 3 Days, 2 tested at 7 Days and 2 at 28 Days, in accordance with ASTM C 192 and C 39 and by slump test in accordance with ASTM C 143.
5. The testing laboratory will submit copies of the mix design, or designs, and test results to the Commissioner for approval before concrete is placed. If there is more than one design, each design will indicate where it is to be used.
6. If at anytime during construction the concrete resulting from the approved mix design proves to be unsatisfactory for any reason, such as lack of workability; insufficient strength, the Contractor must immediately notify the testing laboratory and the Commissioner. The laboratory will verify the deficiency with additional testing and modify the design, subject to the Commissioner's approval, until a satisfactory concrete is obtained.
7. Strength requirements of concrete will be noted on the drawings. Concrete will be proportioned to achieve an average strength of 500 psi higher than design strength shown. If no design strength is shown, the design strength of the concrete will be 3500 psi at 28 Days.
8. When an approved water reducing admixture is used in accordance with Manufacturer's recommendations, cement requirements may be reduced. Mix designs will indicate use of admixtures.

9. Slump will be 3" plus or minus 1" for footings and foundations walls, and 3" plus or minus ½" for balance of structure. The Commissioner's testing laboratory will have the right to reject any concrete which arrives at job site in excess of specified slump. No water will be added to design mix unless as determined in accordance with ASTM C 143.
 10. All concrete exposed to weather or in contact with earth or backfill, including interior slab on grade, will be air-entrained. Air-entrained concrete will be made with an air-entraining admixture. Total air content will be approximately 4 to 6 percent (plus or minus 1 percent), or as indicated hereinafter under "Concrete Types" - estimate of quantities.
 11. Minimum cement content will be 5 bags per cu. yd. of concrete. Water content per sack of cement, including free water contained in aggregates will not exceed 6 gallons. Fine aggregate will not be less than 1/3, nor more than ½ of total aggregate.
 12. A plasticizing admixture may be used when approved by the Commissioner for the purpose of reducing water requirements for a given consistency and strength of concrete and for increasing workability. Mixture will be used in accordance with Manufacturer's recommendations. A maximum reduction in cement content of ½ sack of cement per cubic yard may be made, provided all other requirements are met.
 13. Tensile and bending tests on each heat of steel. Furnish two (2) copies of the Manufacturer's certificates or mill tests of all reinforcing steel.
8. Manufacturer's Certification
1. Submit certification that products meet or exceed the specified requirements.

1.5 QUALITY ASSURANCE:

1. Contractor Qualifications: Erection and Installation of structural concrete work will be performed only by a qualified Erector. The term qualified means experienced in performing the Work required by this section. The qualified Erection will be responsible for demonstrating to the Commissioner's satisfaction that he/she has sufficient experience in its role. The Erection must submit evidence of such qualifications upon request by the Commissioner.
2. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:
 1. ACI 315, Details of Concrete Reinforcement, as published by the American Concrete Institute, current edition.
 2. ACI Detailing Manual, (SP-66), as published by the American Concrete Institute, current edition.
 3. ACI 318, Building Code Requirements for Reinforced Concrete, as published by the American Concrete Institute, current edition.
 4. AWS D1.4, Recommended Practice for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction, as published by the American Welding Society, current edition.

5. CRSI, Manual of Standard Practice, as published by the Concrete Reinforcing Steel Institute, current edition.
6. ACI 117, Standard Tolerances for Concrete Construction and Materials, as published by the American Concrete institute, current edition.
7. CRSI, Placing Reinforcing Bars, as published by the Concrete Reinforcing Steel Institute, current edition.

1.6 DELIVERY, STORAGE AND HANDLING:

1. Materials will be stored in strict accordance with the Manufacturer's printed directions, copies of which will be furnished to the Commissioner.
2. Protect materials against damage from mechanical abuse, plaster, salts, acids, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials will be removed from the premises, and all damaged materials replaced with new materials.
 1. Protect materials against damage from mechanical abuse, salts, acids, and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials will be removed from the premises, and all damaged materials replaced with new materials.
 2. Properly label all bars with weatherproof tags to facilitate identification.
3. Access and Storage Areas
 1. All access routes and storage areas will be subject to the approval of the Commissioner in order to reduce interference with Airport Operations.

1.7 ENVIRONMENTAL REQUIREMENTS:

1. When cold weather conditions as defined in ACI 306 exist, place and cure concrete in accordance with requirements of same.
2. When hot weather conditions as defined in ACI 305 exist, place and cure concrete in accordance with same.

1.8 SPECIAL REQUIREMENTS:

1. Field Measurements - Before proceeding with the fabrication of the work, the Contractor must verify all dimensions and take such measurements as are required for proper fabrication and erection of the work.
2. Coordination - Coordinate Work of this section with related Work specified in the other divisions/sections of the Contract Documents.
3. Construct curb to elevation tolerance specified on design drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA:

1. General
 1. Regular concrete work will consist of Portland cement, fine aggregate, coarse aggregate, plasticizing admixture, and water. Other types of concrete will vary

the cement, aggregates, and admixtures as required to produce the desired features. Concrete will be proportioned, mixed, placed, cured, and finished as hereinafter specified. Each material for the entire job will come from the same source. The following types of concrete will be used where indicated on the drawings or specified:

1. Regular Concrete.
2. Air entrained concrete.

2.2 REINFORCEMENT MATERIALS:

1. Steel bars will be new deformed billet steel bars, complying with ASTM A 615, grade 60.
2. Welded wire fabric will comply to ASTM A 185.
3. Accessories
 1. Bar supports and other accessories necessary to hold bars in proper position while concrete is being placed.
 2. Bar supports for reinforcement over vapor barrier or waterproofing will have 16 gauge flat sheet metal bases for legs.
 3. Bar supports which come in contact with forms for concrete exposed to view in the finished exterior or interior structure will have plastic or plastic tipped legs.

2.3 MATERIALS:

1. Portland Cement
 1. ASTM C 150, Type I normal Portland cement; or Type III (High-early strength cement) as approved by the Commissioner.
2. Aggregate for Normal Weight Concrete
 1. All fine and coarse aggregate will conform to ASTM C 330.
 2. Fine Aggregates - Natural or artificial, hard clean sand.
 3. Coarse Aggregates - Crushed stone or gravel, except blast furnace slag will not be accepted. Aggregate sizes will meet the following:
 1. Size 57, for footings foundations, walls, beams, slabs on fill and reinforced slabs 6" or greater thickness.
 2. Size 7, for applied toppings.
 3. Size 67, for other concrete, unless otherwise specified.
3. Admixtures
 1. Used in concrete will be produced by reputable Manufacturers and used in accordance with the Manufacturer's printed directions, subject to approval of the Commissioner.
 2. Plasticizing Admixture

1. Products of one of the following Manufacturers will be acceptable:
 - (1) "Pozzolith-N" - Master Builders, Inc., Downers Grove, IL 60515.
 - (2) "WRDA" - W.R. Grace & Co., Bedford Park, IL 60638.
 - (3) "Plastiment" - Sika Corp., Lynhurst, NJ 07071.
2. When ambient temperature is expected to exceed 80 degrees F during placing and finishing operations.
 - (1) Products of one of the following Manufacturers will be acceptable:
 - (1) "Pozzolith - R", Master Builders, Inc., Downers Grove, IL 60515.
 - (2) "Daratard" - W.R. Grace & Co., Bedford Park, IL 60638.
 - (3) "Plastiment" - Sika Corp., Lynhurst, NJ 07071.
3. Concrete admixtures will comply with ASTM C 494 (Water reducing) or ASTM C 260 (Air Entraining), produced by recognized Manufacturers subject to Commissioner's approval.
4. Water Reducing Admixture
 1. ASTM C 494, Type A, and not containing any; chloride ions added during manufacture.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Eucon WR-75" - The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "Pozzolith - 22N", Master Builders, Inc., Downers Grove, IL 60515.
 - (3) "WRDA with Hycol" - W.R. Grace & Co., Bedford Park, IL 60638.
 - (4) "Plastocrete" - Sika Corp., Lynhurst, NJ 07071.
5. Water Reducing, Retarding Admixture
 1. ASTM C 494, Type D. When high temperatures, placing or humidity conditions dictate
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Eucon Retarder-75" - The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "Pozzolith 100-XR" - Master Builders, Inc., Downers Grove, IL 60515.
 - (3) "Daratard HC" - W.R. Grace & Co., Bedford Park, IL 60638.
 - (4) "Plastiment" - Sika Corp., Lynhurst, NJ 07071.

6. Water Reducing, Accelerating Admixture
 1. ASTM C 494, Types C or E. When increased initial set is required without corrosive effect on metals.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Accelguard" - The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "Pozzolith 100-HE" - Master Builders, Inc., Downers Grove, IL 60515.
 - (3) "Darex Set Accelerator" - W.R. Grace & Co., Bedford Park, IL 60638.
7. Air Entraining Admixture
 1. ASTM C 260, Add only to normal Portland cement concrete to meet requirements specified for air content.
 2. Products of one of the following Manufacturers will be acceptable:
 - (1) "Air Mix" - The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "MB-VR" - Master Builders, Inc., Downers Grove, IL 60515.
 - (3) "Darex" - W.R. Grace & Co., Bedford Park, IL 60638.
 - (4) "Sika AER" - Sika Corp., Lynhurst, NJ 07071.
8. Water
 1. Will be clean, fresh, potable.
9. Fly Ash
 1. ASTM C-618, used in accordance with industries recommendations as plasticizing agent.
10. Calcium chloride will not be used.
4. Non-shrink Pre-mixed Grout
 1. Metallic Type
 1. Products of one of the following Manufacturers will be acceptable:
 - (1) "Firmix" - The Euclid Chemical Company, Cleveland, OH 44110.
 - (2) "Embeco 153" - Master Builders, Inc., Downers Grove, IL 60515.
 - (3) "Ferrolith G" - Sonneborn Products Co., Hartville, SC 29550.

2. Non-Metallic Type

1. Products of one of the following Manufacturers will be acceptable:

- (1) "Euco -S" - The Euclid Chemical Company, Cleveland, OH 44110.
- (2) "SonogROUT" - Sonneborn Products Co., Hartville, SC 29550.
- (3) "Upcon" - USM Corporation.
- (4) "F-100" - Sauereisen Cements Company, Pittsburgh, PA 15238.

5. Expansion Anchors

1. Epoxy adhesive anchor assemblies, embedded in existing concrete, as shown on the drawings. Reinforcement steel bar dowels, ASTM A615, Grade 60.

2. Products of one of the following Manufacturers will be acceptable:

1. Hilti, Inc. USA.
2. Simpson Anchor Systems.
3. Smith Fastener Company.

2.4 CONCRETE TYPES AND USES:

1. Minimum cement content as indicated below. Should tests indicate greater cement content is required, such will be used at no additional cost to the City. Use Type 1 unless otherwise specified.
2. Plasticizing admixture will be used in all concrete, except lean concrete.
3. Lightweight concrete will not weigh more than 110 lb/cu. ft.

2.5 MIXING CONCRETE:

1. Concrete mixing, measuring and delivery equipment will be certified by the National Ready Mix Concrete Association. Methods will be subject to Commissioner's approval and in accordance with ACI 614, and 304.

1. Site-Mixed Concrete - Provide a batch type mixer equipped with accurate timing and measuring devices and operate in accordance with manufacturer's recommendations. Provide equipment to measure amount of free moisture in the aggregate.

1. The mixing time for each batch, after all solid materials are in mixing drum and provided, that all mixing water is introduced before $\frac{1}{4}$ of mixing time has elapsed, will be not less than 1 minute for mixers having a capacity of 1 cu. yd.

2. Ready-Mixed Concrete

1. ASTM C 94, and as herein specified. Concrete for this Project will be ready-mix concrete and will be batched and delivered from a plant approved by the and in strict accordance with the requirements set forth in ASTM C 94, subject to all provisions specified herein regarding materials, strength, proportioning, consistency and delivery time.

- (1) Delete the references for allowing additional water to be added to the batch for material with insufficient slump.
 - (2) Additional of water to the batch, either at the plant or at the jobsite, will not be permitted, except upon specific approval of the Commissioner in each instance.
3. The rate of delivery of the ready mixed concrete will be such that the interval between placing of successive batches will be 30 minutes or less to prevent "cold joints". The elapsed time between the introduction of mixing water to the cement and aggregate and completion of discharge will not exceed one (1) hour.
1. Minimum mixing for each batch will be that required to produce a uniform mixture of materials but in no case less than 50 revolutions after all materials are in the mixer, including water.
 2. The ready-mixed concrete producer will submit duplicate delivery tickets, one (1) for the Contractor and one (1) for the Commissioner, with each load of concrete delivered to the job. Delivery tickets will provide the following information:
 - (1) Date
 - (2) Name of ready-mix concrete plant
 - (3) Contractor
 - (4) Job Location
 - (5) Type (Standard or High Early Strength) and brand of cement.
 - (6) Cement content in bags per cubic yard of concrete.
 - (7) Truck number.
 - (8) Time dispatched and time unloaded.
 - (9) Amount of concrete in load in cubic yards.
 - (10) Admixtures in concrete, if any.
 - (11) Type and maximum size of aggregate.
 - (12) Water added at job, if any.
 - (13) Name of person who authorized addition of water.
 3. Close control of mixing time will be maintained for air entrained concrete.
 4. The testing laboratory engaged by the Commissioner will periodically check batch proportions and yield strength, and will have continuous access to the mixer.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

1. Before commencing installation, examine substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the work. Remove hardened concrete, debris and other foreign materials from the interior of forms and from the inside of the mixing and conveying equipment. Start of Work will indicate acceptance of the substrate.
2. Concrete will not be placed until all reinforcement is securely and properly fastened in its correct position; all anchors, sleeves, inserts, pipes, conduits, and other items required to be embedded therein have been inspected and approved by the Commissioner.

3.2 CONCRETE PLACEMENT - GENERAL:

1. When more than single strength concrete is required, the location of each concrete type will be as shown.
2. Provide adequate runways, chutes, and other means of conveying concrete into place. Use chutes or tremies for placing concrete where a drop of more than 5'-0" is required.
3. Do not place concrete until base is acceptable, reinforcement is securely and properly fastened in its correct position, and accessories and other items required to be embedded there in have been placed and anchored. Inspect reinforcement for secure fastening and accurate position.
4. Methods of placing concrete, such as pumping or by conveyors, will be subject to review by the Commissioner.
5. Use short troughs or pipes aids in placing concrete and arrange in such a manner that the ingredients of the concrete are not separated.
6. Dropping the concrete a distance of more than 5'0" or depositing a larger quantity at any point and running or working it along the forms will not be permitted.
7. Mix and place concrete exposed in the finish work to procure smooth, even surfaces of dense concrete, and clean sharp arrises and outside corners.
8. Place concrete so that the pressure caused by the wet concrete will not exceed those used in the design of the forms.
9. Do not place concrete for floor slabs, beams, or footing on wet, muddy, or frozen sub-grades.
10. Before placing slabs or other heavy fill over freshly placed foundation walls, piers or other filled forms, allow at least 24 hours for shrinkage and settlement.
11. Use special care to prevent splashing concrete on forms and reinforcement, and remove any hardened deposits before covering with fresh concrete.
12. Place concrete continuously between construction joints. When necessary, because of an emergency only, to place less than a complete horizontal layer in one (1) operation, terminate the pour with a keyed vertical joint.
13. In any given lift, place and compact each lift before the preceding one (1) has taken its initial set. Lines of separation between the lifts, or between layers will not be acceptable. Deposit and compact the concrete so that exposed surfaces will be smooth and of uniform texture.
14. Place concrete with the aid of internal mechanical vibrator equipment capable of 9,000 or more impulses per minute. Vibration will be transmitted directly to the concrete. The duration of vibration at any location will be the minimum necessary to produce thorough compaction.
15. Place concrete flat work in layers 12" to 18" deep and in walls and large volumes in layers not over 24" deep. Vibrate into place in a manner that will not cause the ingredients to separate. Where necessary, supplement vibrators by hand spading to secure these results. Keep vibrators constantly in motion and do not hold in one location. Long enough to draw a pool of grout or water from the concrete. Maintain spare equipment to avoid breakdown.

16. Place concrete immediately after mixing, and in no case more than 60 minutes after initial mixing. Review article "Mixing Concrete" under Part 2 "Products" for plant, mixing, batching and etc. for "Ready-Mix Concrete"
17. Roughen, clean, and moisten construction joints before placing concrete. Apply bonding compound and place new concrete after bonding compound becomes tacky.
18. The area to be placed will not exceed 60 ft. in any horizontal direction, nor exceed an area of 2,000 sq. ft. For slabs on grade pour slab in a checkerboard sequence. Minimum of 24 hours will elapse between the placing of adjacent units. Provide construction joints between units in accordance with the typical details shown.

3.3 CONCRETE PLACEMENT:

1. All freshly placed concrete will be protected from the elements and from all defacements due to other operations. In general, concrete will be protected against loss of moisture from its surface by using approved methods as necessary or required to keep the concrete in a moist condition for a period of at least seven (7) Days.
2. Concrete sealer will be product approved by the Commissioner, applied in accordance with Manufacturer's instructions. In event of extremely hot weather, care will be taken to prevent premature drying, flash setting and plastic shrinkage of the fill.

3.4 INSTALLATION:

1. Concrete will not be placed until all reinforcement is securely and properly fastened in its correct position; all anchors, sleeves, inserts, pipes, conduits, and other items required to be embedded therein have been inspected and approved by the Commissioner.
2. Discontinue concrete operations when the air temperature reaches 40 degrees F, and is descending, and do not resume until the air temperature is 35 degrees F, and ascending, except when written approval of the Commissioner is obtained.
3. Accelerating or antifreeze admixtures will not be used. The Contractor is responsible for the protection of finished concrete against all damage or injury, including freezing until the work has been completed and accepted.
4. All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances and finishing, will be corrected as directed by the Commissioner at the Contractor's expense, without extension of time therefore. The Contractor must also be responsible for the cost of corrections to any other part of the Work affected by or resulting from corrections to the concrete work.
5. Forms will remain in place long enough to allow concrete to set properly. Do not remove supporting forms or shoring until concrete has sufficient strength to carry its own weight and the loads upon it safely.
6. Forms or shoring will not be removed without the Commissioner's approval.
7. Removal of forms and shoring will be in accordance with ACI 318.

3.5 GENERAL CLEAN-UP:

1. All rubbish and debris resulting from the work of this section must be collected, removed from the site and disposed of legally.

END OF SECTION 03320

STRUCTURAL STEEL

SECTION 05120

PART 1 - GENERAL

1.1 SECTION INCLUDES:

1. Work under this section is subject to the requirements of the Contract Documents.
2. Furnish and install all Structural Steel Work as shown on the Drawings and as specified herein, including but not limited to the following:

1. Columns
2. Beams
3. Valve Protection Detail
4. Grating
5. Plates, shims, clips, fasteners, etc., necessary to install structural steel.

1.2 REFERENCES:

1. "Manual of Steel Construction", American Institute of Steel Construction.
2. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", American Institute of Steel Construction.
3. "Code of Standard Practice for Steel Buildings and Bridges", American Institute of Steel Construction.
4. AWS D1.1 "Structural Welding Code", American Welding Society.
5. AWS SR-1 "Special Ruling for Gas-Metal Arc Welding with Carbon Dioxide Shielding", American Welding Society.
6. ASTM A588/A588M-05 Standard Specification for high-strength low alloy steel with 50 ksi minimum yield point to 4-inches thick.
7. ASTM A847 Weathering Steel for HSS (Hollow Structural Sections).
8. ANSI/NAAMM MBG 532-00-heavy duty metal bar grating manual.

1.3 SUBMITTALS:

1. Submit the following
 1. Shop Drawings
 1. Shop drawings will show all materials, method of joining, sizes of members, and thickness of metal, and will contain full and complete information regarding joints and fastenings.
 - (1) Drawings will show relative layout of walls, beams, girders, and other supports, as well as openings, all correctly dimensioned.

- (2) Items will be plainly marked for location on the job and referenced to the shop drawings.
 - 2. Use AWS symbols to indicated welding and show length, size, and spacing (if not continuous).
 - (1) Auxiliary view will be shown to clarify all welding.
 - (2) Such as "¼ inch weld" and "tack weld " will not be acceptable.
 - 3. Compare and cross check structural steel shop drawings with shop drawings of reinforced cast-in-place concrete and other work related to structural steel that are available at the time detailing is being done.
 - 4. Erection diagrams clearly indicate the method and sequence of erection, item mark numbers, equipment loads and calculations indicating the adequacy of the permanent construction to sustain equipment and construction loads and required tolerance for setting embedded items.
- 2. Test Reports
 - 1. Submit test reports necessary to show compliance with the Contract Documents.
- 3. Manufacturer's Certification
 - 1. Submit certification that products meet or exceed the specified requirements.
 - (1) Furnish the Commissioner with two (2) Certified copies of mill reports covering the chemical and physical properties of all steel used in the Work.
 - (1) Certification of Welders; hereinafter specified.

1.4 QUALITY ASSURANCE:

- 1. Contractor Qualifications: Installation of structural steel must be performed only by a qualified Installer. The term qualified means experienced in performing the Work required by this section. The qualified Installer will be responsible for demonstrating to the Commissioner's satisfaction that he/she has sufficient experience in its role. The Installer must submit evidence of such qualifications upon request by the Commissioner.
- 2. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:
 - 1. Structural steel details, fabrication, and erection will conform to AISC "Manual of Steel Construction" unless otherwise shown or specified.
 - 2. All structural steel material will be ASTM A 588 (Corten-B) including all structural steel tubes and plates, unless noted otherwise.
 - 3. Shop and field welding procedures and standards of acceptance will be in accordance with AWS D1.1 "Structural Welding Code", American Welding Society.
 - 4. Raised-Pattern Plate (Checkered Plate) will be ASTM A588 (Corten-B) Conforming to ASTM A786.

5. All banded grating material will be ASTM A588 (Corten-B)

1.5 DELIVERY, STORAGE AND HANDLING:

1. Exercise care in storing, handling and erecting structural steel and provide necessary blocking or other supports required and in supporting it properly at all to insure that no piece will be bent, twisted, or otherwise damaged. Damaged material will be corrected to the approval of the Commissioner before being erected, or replace when so directed by the Commissioner.

2. Protection - Protect materials against damage from mechanical abuse, plaster, salts, acids, staining and other foreign matter by an approved means during transportation, storage and erection and until completion of construction work. All unsatisfactory materials will be removed from the premises, and all damaged materials replaced with new materials.

3. Access and Storage Areas

1. All access routes and storage areas will be subject to the approval of the Commissioner in order to reduce interference with Airport Operations.

1.6 SPECIAL REQUIREMENTS:

1. Field Measurements - Before proceeding with the fabrication of the work, the Contractor must verify all dimensions and take such measurements as are required for proper fabrication and erection of the work.

2. Coordination - Coordinate Work of this section with related Work specified in the other divisions/sections of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIAL AND WORKMANSHIP:

1. Except as otherwise noted or specified, all materials, unit stresses, fabrication, assembly erection and painting will be in accordance with the American Institute of Steel Construction Specification for Design, Fabrication and Erection of Structural Steel of Buildings.

2. All steel shapes, plates, steel bars, and raised pattern plates, unless otherwise specified, will conform to ASTM A 588 (Corten-B) Weathering Steel. All welding will be with E70 electrodes and in accordance with procedures and recommendations of the American Welding Society as referred from the AISC Specifications.

3. Shop assembled members will be welded.

1. No field riveting will be permitted.

1. Field connections will be high strength bolted or welded.

2. All exposed fasteners will be tamper proof type.

4. Where welding occurs, it will be by the electric arc process in accordance with American Welding Society's Code for Arc and Gas Welding in Building Construction.

5. Execute all welding by operators who have been qualified previously by tests as prescribed by the American Welding Society's Standard Qualification Procedure" to perform the work required.

1. Certification that each operator has passed the tests must be furnished to the Commissioner upon requested.

6. Provide all connections, clip angles, anchors, etc., necessary for complete erection.

7. No burning of steel will be permitted in the field.
 1. Members burned in the shop will be finished to an acceptable appearance, equal to a sheared finish.
 1. Holes will not be burned in either shop or field.
 2. No cutting of structural shapes will be done in the field without the consent of the Commissioner.
8. Materials will be properly marked and match-marked where field assembly is required. The sequence of shipments will be such as to expedite erection and minimize the field handling of material.
9. Use care in handling and erection to insure that steel will not be twisted, bent or otherwise damaged, and should any difficulty be encountered, it will be immediately reported to the Commissioner.
10. Contractor must examine the structural framing to receive ornamental formed metal panels, and notify the Commissioner in writing of conditions detrimental to the proper and timely completion of the Work.
 1. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the erector and the Commissioner.
11. Furnish and install all additional clips, angles, braces, framing and supports required for anchoring work to the structural frame of the building.
 1. Provide proper expansion joints in continuous metal work where required, as approved by the Commissioner.
 2. Exposed work will be finished smooth and even with close joints and connections.
 3. Exterior joints and connections will be formed to exclude water.
12. I-Beam Supports
 1. Main supports within the 125-ft diameter shall be W4x13 I-beams of ASTM CorTen weathering steel or ASTM galvanized carbon steel, positioned on a 5-ft center-to-center pitch.
 2. Vertical supports within the 125-ft diameter shall be shall be 2-½ inch corrosion resistant pipe or tubing welded to ½ x 4 x 7 inch bearing plates of corrosion resistant steel, positioned on a 10-ft center-to-center pitch along the length of each I-beam.
13. Galvanized Grating
 1. Grating shall be ASTM welded, galvanized carbon steel 19W4 grating consisting of 1-¼ inch high x 3/16 inch thick bearing bars on a 1-3/16 inch pitch, with a 4 inch crossbar pitch, and a serrated walking surface.
 2. Each grating panel shall be 3 x 15 feet in size. The length of each panel shall be positioned 90-degrees to the I-beams. Each 3x15 panel shall span 3 I-beams minimum. Smaller panels sections (infill areas) shall span no greater than a 5-foot length.
 3. Grating and supports shall be capable of handling 100 pounds per square foot of foot traffic loads (but no vehicular traffic).

14. Welding Electrodes

1. In accordance with AWS standards.

15. Stud Connections

1. Threaded studs of design suitable for end welding to steel beams using automatic stud welding equipment. Studs will conform to ASTM A 108, Grades I015, I017 or I020, and will be chamfered on the welding end. Studs will be for use with arc-shields (ferrules of high vent design, and will be flux filled.

2. Studs and accessories manufactured by one of the following Manufacturers will be acceptable:

1. K.S.M. Division Omark Industries, Inc.
2. Nelson Stud Welding Division; Gregory Industries, Inc.
3. Vulcan Threaded Products, Inc.

16. Anchor Bolts

1. Epoxy Adhesive Anchor assemblies, embedded in existing concrete slab, as shown on the drawings. AISI 304/316 stainless steel rods.

1. Products of one of the following manufacturers will be acceptable:

- (1) Hilti Inc USA
- (2) Simpson Anchor Systems
- (3) Smith Fastener Company

2.2 DESIGN:

1. Complete the design of connections for sections of the structure and connections not fully detailed on the Drawings, conforming to applicable codes and standards.

2. Details indicated on the Drawings may be modified in order to simplify or expedite erection. Such modifications will be submitted prior to shop detailing.

1. Do not make changes, substitution, or modifications subsequent to approval of shop drawings without resubmission and accepted of the Commissioner.

2.3 SHOP WELDERS QUALIFICATION:

1. Welders for shop fabrication, including tack welders, will be certified. Those currently certified, and who are performing under the classification necessary for their Work for this Contract, need not be recertified. Aforementioned certification by the Contractor will be acceptable if submitted prior to welding for the Project.

2. In the event that the Commissioner or the testing laboratory retained by the Commissioner, requests, in writing, recertification of a welder doing Work for this Contract, the welder will be required to do so for this work.

1. The tests and certification will be paid for by the Commissioner if the welder passes the certification tests. Otherwise the costs incurred will be paid for by the Contractor.

2.4 MARKING:

1. Mark each member with an identifying mark. Marks will not be duplicated for different types of steel and will be legible throughout fabrication and visible during field erection.
2. Identifying marks will correspond to marks shown on approved erection of diagrams.

2.5 FABRICATION:

1. Materials will be new, clean and free from excessive mill scale, flake, rust or pitting.
2. Fabricate only from approved shop drawings. Substitutions of sections or modifications of details will be made only when approved by the Commissioner, and at no additional cost to the Commissioner.
1. Cut or dress abutting joints true and straight to allow a close fit.
2. All members will be free from twist, kinks, buckles, or open joints and will be made accurately so that when assembled, parts will come together without distortion and shimming.
3. Parts assembled with bolts will be in close contact, except where separators are required. Separators will be close fitting.
4. Members to be milled will be completely assembled and riveted or welded before milling.
5. Column bases will be rolled. Bearing ends of columns and tops of column base plates over 3" thick will have machined bearing surfaces, 3" and under will be straightened by pressing to provide satisfactory contact bearing between plate and column above. Shimming in accordance with agreed upon procedures will be permitted at column splices.
6. Machined bearing surfaces will be coated with Type 3 metal primer immediately after machining.
7. Butt welds on exterior exposed surfaces and where indicated on the Drawings will be ground flush.
8. Drill required holes in base or bearing plates.
 1. Drill grout holes in column bearing plates where shown.
 2. Drill holes in members for the work of other sections where shown on the Drawings or when information is provided before final shop drawing approval for specific members.
9. Where noted or required use threaded end welded stud connectors. Stud connectors will be visually inspected after welding.
 1. Weld fillets will not be less than 90% circumferential around the weld base. If required, connector will be tested by hammering 20 degrees from the vertical without weld failure.
 2. If connector fails this test or it if cannot be returned to an acceptable erect position, it will be replaced.
10. Furnish epoxy adhesive anchor bolt assemblies and templates in ample time to prevent delay in the work shown in other sections.

2.6 SHOP FINISHES:

1. Following items of structural work will not be painted:

1. All steel shapes, plates, sheet steel, steel bars, raised pattern plates and banded grating.

PART 3 - EXECUTION

3.1 INSPECTION:

1. Before commencing steel erection, examines substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the Work. Start of Work will indicate acceptance of the substrate.

3.2 FIELD WELDERS QUALIFICATIONS:

1. Field welders will be qualified according to applicable specification for Manual shielded-arc welders and according to AWS SR-1 for gas metal-arc welders.

1. Those currently certified for the classifications necessary for their work will not be required to be re-certified. The aforementioned certification will be acceptable if submitted to the Commissioner prior to the start of any field welding.

2. In the event the Commissioner or the Testing Laboratory retained by the Commissioner requests in writing for the re-qualification of welder at any time during the erection welding activities of the Project, said welder will be requalified.

1. If the welder passes, the Commissioner will pay the costs or retesting.

2. If the welder fails to pass, the Contractor must pay the costs.

3. Gas metal-arc welders (including inner ship) need only be qualified for those weld positions for which they will be actually engaged.

4. Manual shielded arc welders will be qualified for at least unlimited horizontal groove and vertical fillet welds.

3.3 ERECTION EQUIPMENT:

1. Furnish erection equipment, derricks, hoists, planking, and other equipment required for the proper and safe execution of all erection work.

2. Provide temporary bracing, guys or other devices required to provide safety and stability for the erection of structural steel.

1. Leave bracing in place until steel work is in final position and approved.

2. Maintain adequate lateral support throughout construction.

3.4 ERECTION:

1. Assume responsibility for the correct fitting of all structural members and for the elevation and alignment of the finished structure and any adjustments necessary in the steel frame because of discrepancies in elevations and alignment.

2. Work will be assembled and erected in place as rapidly as the progress of other work will permit.
3. No welding or bolts will be done until as much of the structure as will be stiffened by the welding or bolting has been properly aligned.
4. Where shims are required to plumb columns, use thin steel shims equal in strength to column strength. Drive shims tight, filling the gap.
5. No cutting of structural shapes in the field will be allowed without being accept by the Commissioner.

3.5 TESTS AND INSPECTIONS:

1. The Commissioner reserves the right to have materials and workmanship subject to inspections and tests in either mill or shop witnessed by an independent testing laboratory retained by the Commissioner.

1. Contractor must notify the Commissioner of mill and shop schedules so that arrangements can be made for a representative of the Commissioner or testing laboratory to be present when inspection or tests are to be made.

2. Periodic inspection and tests which may be required by the Commissioner is in addition to the Contractors constant inspection and will not relieve the Contractor of the responsibility to furnish satisfactory materials and workmanship.

3. Check all shop welds by visual means, by magnetic particle methods conforming to ASTM E 709, or by ultrasonic methods conforming to ASTM E 164.

4. The Commissioner will engage the services of an independent testing laboratory to perform the following field tests and submit three (3) copies of all reports to the Commissioner.

1. Corrective measures, including additional and more complete testing which may result from these tests, will be the Contractor's responsibility at not additional cost to the City.

1. All welds will be visually inspected.

2. All full or partial penetration welds in field erected work will be ultrasonically tested in accordance with the requirements of ASTM E 164.

5. Cooperate with the laboratory and leave all staging in place until inspections and tests have been completed.

6. Prior to placement of banded grating, provide a survey of the structural steel components, including but not limited to the following:

1. Alignment and plumbness of all columns at all levels.

2. Alignment, related to column center lines, for the ends of all beams (horizontal plane).

7. Surveyor will be approved by the Commissioner. Three copies of the survey will be submitted to the Commissioner for his record.

8. The Commissioner reserves the right to reject material at any time before final acceptance of the structure when, in the opinion of the Commissioner, materials or workmanship do not conform to specification requirements.

3.6 GENERAL CLEAN-UP:

1. All rubbish and debris resulting from the Work of this section must be collected, removed from the site and disposed of legally.

PART 4 - MEASUREMENT AND PAYMENT

4.01

1. The work under this item will not be measured or paid for separately, but will be included in the Contract lump sum price.

4.02

Payment for material stored off site:

- A. Payment for material stored off site will be limited only to the cost of material and fabrication. Costs associated with the storage, handling, insurance or other associated costs will not be included in payment for materials stored off-site.
- B. The following material is authorized for payment for material stored off site:
 1. ASTM A588 Grating
 2. ASTM A588 Steel

END OF SECTION 05120

JOINT SEALS

SECTION 07900

PART 1 - GENERAL

1.1 SECTION INCLUDES:

1. Work under this section is subject to the requirements of the Contract Documents.
2. Furnish and install Joint Seals and cementitious waterproofing as shown on the Drawings and as specified herein, including but not limited to the following:
 1. Preparing substrate surfaces.
 2. Joint around perimeter of exterior openings such as - louvers, pipes and ducts, and all other exterior openings as noted on Drawings or as required (use 1 part or 2 part polyurethane).
 3. Joints in exterior pavement (1 part polyurethane sealant).
 4. Existing burn pit slab and other concrete exposed to water pool, use cementitious waterproofing (see Section 03300).
 5. Other miscellaneous joints, interior and exterior, shown on the Drawings to be caulked or sealed except those specified under other sections.

1.2 RELATED WORK:

1. As specified in the following divisions:
 1. Division 2 - Site Work
 2. Division 3 - Concrete
 3. Division 5 - Metals
 4. Division 15 - Mechanical

1.3 REFERENCES:

1. ASTM C 790 - Use of Latex Sealing Compounds.
2. ASTM C 804 - Use of Solvent-Release Type Sealants.
3. ASTM C 834 - Latex Sealing Compounds.
4. ASTM D 1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
5. ASTM D 1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
6. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS:

1. Submit the following
 1. Product Data
 1. Product Data:
 - (1) Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
 - (2) Manufacturer's Literature - Materials description and installation instructions for each compound and filler.
 - (3) Manufacturer's Installation Instructions - Indicate special procedures, surface preparation and perimeter conditions requiring special attention.
 2. Manufacturer's Certification
 1. Certify that products meet or exceed the specified requirements.
 2. Mockup
 1. Mockup may remain as part of the Work under the conditions that all work complies with the requirements of the Contract Documents and has been approved to remain as part of the Work, by the Commissioner.

1.5 QUALITY ASSURANCE:

1. Contractor Qualifications - Installation of Joint Seals must be performed only by a qualified installer. The term qualified means experienced in performing the Work required by this section. The qualified Installer will be responsible for demonstrating to the Commissioner's satisfaction that he/she has sufficient experience in its role. The Installer must submit evidence of such qualifications upon request by the Commissioner.
2. Perform Work in accordance with the latest edition, of the appropriate divisions, of the following:
 1. Sealant Manufacturer's requirements for preparation of surfaces and material installation instructions.
3. Obtain sealant materials only from Manufacturers who will, upon request by the Commissioner, send a qualified technical representative to visit the site at the beginning of the joint sealing work and periodically thereafter as necessary to ensure the proper installation of the sealing compounds.

1.6 DELIVERY, STORAGE AND HANDLING:

1. Materials must be delivered to the Project in sealed containers bearing Manufacturer's name and material identification. Materials must be stored in strict accordance with the Manufacturer's printed directions, copies of which will be furnished to the Commissioner.
2. Protect materials against damage from mechanical abuse, plaster, salts, acids, staining and other foreign matter by an approved means during transportation, storage and

erection and until completion of construction work. All unsatisfactory materials must be removed from the premises, and all damaged materials replaced with new materials.

3. Access and Storage Areas.
 1. All access routes and storage areas will be subject to the approval of the Commissioner in order to reduce interference with Airport Operations.

1.7 WARRANTIES AND GUARANTEES:

1. The following materials have special Manufacturer's Warranties for the periods listed with each item, which may originate, in part or in whole, with the manufacturer or the fabricator and such warranties must be passed through the Contractor to the Department;
 1. Entire joint sealing installation.
2. The Contractor must repair or replace defective materials and workmanship during the Contract Period and for five (5) years from the date of Substantial Completion of the Project. Defective material and workmanship include, but are not limited to, the following:
 1. Warranty the entire joint sealing installation to be complete and free from defects in materials, workmanship, and finish.
 2. Warranty must include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.
 1. Contractor must specifically agree that warranty includes, but is not limited to any of the following defects in joints caulked with these sealants:
 2. Adhesive or cohesive failure in joints where movement is under a maximum of 45% as defined by Standard ASTM rubber testing elongation methods.
 3. Cracking or brittleness developing on surface of material.

1.8 ENVIRONMENTAL REQUIREMENTS:

1. Maintain temperature and humidity recommended by the sealant Manufacturer during and after installation.
2. Maintain materials, pavement and surrounding air temperature to minimum 50 degrees F (10 degrees C) prior to, during completion of Grout Work, the weather must not be rainy or foggy.

1.9 SPECIAL REQUIREMENTS:

1. Coordination - Coordinate Work of this section with related Work specified in the other divisions/sections of the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS:

1. Polyurethane Sealant - One (1) part. Use primer recommended by the sealant Manufacturer. Primer and sealant must not cause visible stain on top surface of the substrate to which they are applied. The following products are acceptable:
 1. "NP1" - ChemRex, Inc., Sonneborn Building Products, Shakopee, MN 55379.
 2. "Dymonic" - Tremco, Inc., Beachwood, OH 44122.
 3. "Dynatrol I" - (Pecora Corp.; Harleysville, PA).
2. Polyurethane Sealant - Two (2) part. Use primer recommended by the sealant Manufacturer. Primer and sealant must not cause visible stain on top surface of the substrate to which they are applied. The following products are acceptable:
 1. "NP2" - ChemRex, Inc., Sonneborn Building Products, Shakopee, MN 55379.
 2. "Dymeric" - Tremco, Inc., Beachwood, OH 44122.
 3. "Dynatrol II" - Pecora Corp., Harleysville, PA.
3. Primers, Solvents, and Cleaners - Non-staining materials recommended by sealant Manufacturer for conditions of application; primers as necessary or required for the particular joint materials and sealant to be used, and solvents which will clean substrate without deleterious effect.
4. Backer Rods and Strips - Closed cell, expanded polyethylene foam, "Ethafoam", as manufactured by The Dow Chemical Co., Bay City, MI 48707.; "Expand -O-Foam ", as manufactured by Williams Products Inc., Troy, MI 48084; or "Closed cell backer", as manufactured by ChemRex, Inc., Sonneborn Building Products; Shakopee, MN 55379. "Styrofoam" will not be acceptable. Furnish continuous lengths in diameter or thickness 1/3 larger than joint widths, and depths as shown on drawings or as directed.
5. Bond Breaker - Polyethylene tape film or other approved material compatible with sealant. Bond breaker is required where sealant would otherwise bond to back surface of joint recess.

PART 3 - EXECUTION

3.1 INSPECTION:

1. Before commencing installation, examine substrate surfaces to determine that they are free of conditions which might be detrimental to proper and timely completion of the Work. Start of Work will indicate acceptance of the substrate.
2. Verify that joint backing and release tapes are compatible with sealant.

3.2 TIME OF APPLICATION:

1. The joints must be sealed immediately following the curing period or as soon thereafter as weather conditions permit, and before the pavement is opened to traffic, including construction traffic.

3.3 PREPARATION:

1. Clean substrate and remove protective coatings which might fail in adhesion or interfere with bond of compound so that surfaces are free of deleterious substances which might impair the work. Elastomeric sealants must not be applied to joint surfaces previously

treated with paint, lacquer, sealer, curing compound, water repellent or other coatings unless such coatings have been entirely removed.

2. Prime substrate in accordance with the instructions of the sealant Manufacturer.
3. Install bond breakers in locations and of type recommended by the sealant Manufacturer to prevent bond of sealant to surfaces where such bond might impair the performance of the sealant.
4. Before applying materials, joints must be clean. Remove dust and other loose debris with a stiff brush or compressed air. Wire brush to remove rust or corrosion from metals. If concrete joints were "wet" sawed, remove laitance from sides of joint by approved means. Eliminate traces of oil, grease, or lacquers with a solvent wash, using toluene, xylene, or methylethyl ketone (MEK) applied with a clean brush and wipe dry with frequently changed clean rags.
5. Mortar must be sound and free of excess mortar dust. Do not apply sealant to concrete surfaces until the concrete is completely cured (28 Days minimum, longer in damp locations).

3.4 INSTALLATION OF JOINT SEALANTS:

1. Mix and install all materials in accordance with the Manufacturer's printed instructions. Unless otherwise directed conform with the following:
 1. Sealants must not be installed below a temperature of 40 degrees F unless the Manufacturer specifically permits application of sealants at a lower temperature. If job conditions require the installation of sealants below 40 degrees F (or below the minimum installation temperature recommended by the Manufacturer), consult the Manufacturer's representative and establish the minimum provisions required to ensure satisfactory work.
 2. Confine sealants to joint areas shown. Use masking tape to prevent staining of adjoining surfaces or spillage and migration of sealants out of the joints. Remove excess sealant and clean adjoining surfaces as may be required to eliminate any indication or soiling or migration.
 3. Use power driven equipment wherever possible to install sealants so as to ensure uniformity of application and the highest quality of workmanship.
 4. Apply primer only to sides of working joints and not to back surfaces. Use masking tape along the joint edge before application of primer on areas where the highest standards of appearance are required. Remove masking tape immediately after the joint has been tooled and before the material skins over.
 5. Fill joints deeper than _" to proper depth with specified backup material, using a diameter approximately 25% to 50% greater than the width of the joint. Apply backup material only after application of primer.
 6. When placing material against a rigid bondable material in working joints, lay strips of bond breaker over back face of the rigid material to prevent material from bonding. Apply bond breaker only after application of primer.
 7. Unless otherwise detailed, where joint is less than ½" wide, depth of material must be not less than ¼" nor greater than width of joint. Where joint is between ½" and 2" wide, depth of material must be _" maximum.