State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

ADDENDUM # 1

1/14/15
Solicitation #7549222

Title: Community College of Rhode Island Renewal Project

Submission Deadline: 2/04/15 @ 10:00 AM

Per the issuance of <u>ADDENDUM # 1</u> the following are noted:

[X] See Attached

Prospective bidders and all concerned are hereby advised of the attached changes/modifications for the above referenced RFQ and are hereby requested to change their copies accordingly.

Interested Parties should monitor this website on a regular basis, for any additional information that may be posted.

Gary P. Mosca
Senior Buyer

SECTION 00 9111
ADDENDUM 1

PART 1 - GENERAL

This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated **October 20th, 2014**. Acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may disqualify the Bidder.

This Addendum consists of **1** page.

1.01 CHANGES TO PROJECT MANUAL – All added specification sections follow this page and are dated October 20th, 2014.

A. Add Section 01 4533 "Code Required Special Inspections and Procedures"' 2 pages, including attachments:

1. Inspections Final Reports, 2 pages.
2. Statement of Special Inspections, 7 pages.

B. Add Section 03 1100 "Concrete Formwork", 7 pages.

C. Add Section 03 1510 "Concrete Control Construction and Expansion Joints", 5 pages.

D. Add Section 03 2000 "Concrete Reinforcing", 4 pages.

E. Add Section 03 3000 "Cast-In-Place Concrete", 17 pages.

E. Add Section 03 6000 "Grouting", 4 pages.

F. Add Section 05 1200 "Structural Steel Framing", 10 pages.

G. Add Section 10 7313 "Shade Awning", 3 pages.

1.02 CHANGES TO DRAWINGS

A. N/A.

1.03 QUESTIONS AND ANSWERS

A. N/A.

1.04 SUBSTITUTIONS

A. N/A.

1.05 ADDITIONAL INFORMATION

A. N/A.

END OF SECTION

SECTION 01 4533

CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. The Latest Rhode Island State Building Code, under which this project is designed and will be built, requires the structural engineer of record (SER) to provide a program of structural tests and special inspections for this project in accordance with Chapter 17, 2012 International Building Code. The SER is the structural engineer who is in responsible charge of the preparation of the structural drawings and structural specifications for this project and whose Rhode Island professional engineering seal appears on said structural drawings.

B. The SER has prepared a document entitled Statement of Special Inspection, which has been or will be submitted to the building official who has jurisdiction over this project, with the application for a building permit.

C. The program of structural tests and inspections shall not relieve the Contractor or its subcontractors of their responsibilities and obligations for quality control of the work, their other obligations of supervising the work, for any design work which is included in their scope of services, and for full compliance with the requirement of the Contract Documents. Furthermore, the detection of, or failure to detect, deficiencies or defects in the Work during the testing and inspection conducted pursuant to the program shall not relieve the Contractor or its subcontractor of their responsibility to correct all deficiencies or defects, whether detects or undetected, in all parts of the Work, and to otherwise comply with all requirements of the Contract Documents.

D. The program of structural tests and inspection does not apply to the Contractor's equipment, temporary structures used by the Contractor to construct the project, the Contractor's means, methods, and procedures, and job site safety.

E. The structural testing and special inspection required by this Section is in addition to the inspections required by the Building Officials. Special inspection is not a substitute for inspection by a local municipal building inspector. Specially inspected work which is installed or covered without the approval of the Engineer or local municipal building inspector is subject to removal or exposure.

F. The Owner shall employ the Special Inspectors or approved Testing Agencies.

G. Special Inspector shall be an independently established and recognized agency regularly engaged in conducting tests or furnishing professional and inspection services and shall be approved by the Building Official and/or SER. The agency shall disclose all possible conflicts of interest so that objectivity can be confirmed. The agency shall have adequate equipment to perform all required tests. Personnel performing special inspection activities shall have qualifications according to the requirements for special inspector as noted below.

H. Special Inspectors as selected and approved by the Building Official and SER shall:

1. Be a qualified person, who shall have the minimum qualifications indicated in the *Statement of Special Inspection,* and demonstrate competence, to the satisfaction of the Building Official and SER, for inspection of the particular type of construction or operation requiring special inspection.
2. Be under the supervision of a professional engineer registered in the state in which work is under construction.
3. Observe the work assigned for conformance with the approved Drawings and Specifications and shall keep records of inspections or tests. The work inspected or tested shall be clearly identified, deficiencies noted, and resolutions stated.
4. Furnish inspection reports directly to the SER. The SER will submit the reports to the Building Official and Construction Manager/General Contractor and the Owner. Reports shall indicate that work inspected was done in conformance with approved construction documents. Discrepancies shall be brought to the immediate attention of the Contractor for correction, then, if uncorrected, the attention of the Building Official and SER prior to completion of that phase of work.
5. Submit a final signed report stating the work was in conformance with the approved Drawings and Specifications and the applicable workmanship provisions of the governing state code.

I. Special Inspector shall review this specification and Chapter 17 of the Inspection Building Code. In the event of conflict with this specification and the Building Code, the Code shall govern.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Where the document *Statement of Special Inspections* indicates that a structural component or system is subject to structural tests and inspections by Chapter 17, 2012 International Building Code and that the SER for the project has not been retained to design said component or system or to prepare a performance specification for said component system, and the Architect has not otherwise provided for the structural design of said component or system, the Contractor shall retain, or require others under his direction to retain, a professional engineer registered in Rhode Island to design said component or system and to provide the required program of structural tests and inspections for said component or system.

B. The Contractor shall provide free and safe access to the Work for the SER and all other individuals who are observing the work or performing structural tests or inspections. The Contractor shall provide all ladders, scaffolding, staging, and up-to-date safety equipment, all in good and safe working order, and qualified personnel to handle and erect them, as may be required for safe access.

END OF SECTION

Final Report of Special Inspections

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal

Final Report of Special Inspections

Agent's Final Report

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal or Certification

Statement of Special Inspections

Project: *CCRI Knight Campus Entry Renewal*

Location: *400 East Avenue, Warwick, Rhode Island*

Owner: *Community College of Rhode Island*

Design Professional in Responsible Charge: *Pare Corporation*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Monthly* or ☐ per attached schedule.

Prepared by:

Michael J. Rongione, P.E. Pare Corporation

(type or print name)

Signature Date

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**	*To Be Determined*	
2. SER – Structural Engineer of Record	*Pare Corporation*	*8 Blackstone Valley Place* *Lincoln, RI* *(401)-334-4100*
3. GE – Geotechnical Engineer	*To be Determined*	
4. OIAF – Owner's Inspection Agency (Field)	*To Be Determined*	
5. OIAP – Owner's Inspection Agency (Plant)	*To Be Determined*	
6. ARCH – Architect of Record	*Brewster Thornton Group Architects*	*150 Chestnut Street* *Providence, RI* *401-861-1600*

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category	*A*
Quality Assurance Plan Required (Y/N)	*No*

Description of seismic force resisting system and designated seismic systems:

Quality Assurance for Wind Requirements

Nominal Design Wind Speed (3 second gust)	*105*
Wind Exposure Category	*C*
Quality Assurance Plan Required (Y/N)	*No*

Description of wind force resisting system and designated wind resisting components:

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and Testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and Testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the firm* performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE*	Structural Engineer – under the supervision of, or a licensed SE or PE specializing in the design of building structures
PE/GE*	Geotechnical Engineer – under the supervision of, or a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

* denoted edits made by Pare Corporation

Other

_____ _____

Soils and Foundations

Item	Agency # (Qualif.)	Scope
1. Shallow Foundations (periodic)	*GE* *(PE/GE)*	*Inspect soils below footings for adequate bearing capacity and consistency with construction documents, specifications, and geotechnical report.* *Inspect removal of unsuitable material and preparation of subgrade prior to placement of sand/gravel fill or granular fill.*
2. Testing of Sand/Gravel Fill or Granular Fill (periodic)	*GE* *OIAF* *(PE/GE)*	*Perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of fill material for conformance to the specifications. (OIAF)*
3. Placement of Sand/Gravel Fill or Granular Fill (continuous)	*GE* *OIAF* *(PE/GE)*	*Inspect placement, lift thickness, and compaction of sand/gravel fill or granular fill (OIAF).*
4. Density of Sand/Gravel Fill or Granular Fill (continuous)	*SER* *GE* *OIAF* *(PE/GE)*	*Perform field density tests of the in-place fill in accordance with the construction documents and specifications (GE, OIAF).* *Review test reports for conformance to the construction documents (SER, GE)*

Cast-in-Place Concrete

Item	Agency # (Qualif.)	Scope
1. Mix Design (periodic)	*SER* *OIAF* *(ACI-CCI ICC-RCSI)*	*Review mix designs for all classes of concrete for conformance to specifications Proportioning of materials shall be in accordance with ACI318. (SER)* *Perform plant inspection for use of proper mix proportions and techniques (OIAF). Review OIAF reports (SER).* *Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design. (OIAF)*
2. Material Certification (periodic)	*SER*	*Review material certificates of compliance or other acceptable documentation for all materials used in the concrete mix designs for conformance with the construction documents.*
3. Reinforcement Installation (periodic)	*SER* *OIAF* *(ACI-CCI ICC-RCSI)*	*Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters. (SER, OIAF)*
4. Formwork Geometry (periodic)	*OIAF*	*Inspect formwork for general conformance with the construction documents. Review formwork to insure the finished concrete size and shape for conformance to the construction documents.*
5. Anchor Rods (periodic)	*SER* *OIAF*	*Inspect size, length, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.*
6. Concrete Placement (continuous)	*SER* *OIAF* *(ACI-CCI ICC-RCSI)*	*Review ready mix truck delivery tickets for proper class of concrete and required admixtures. Inspect placement of concrete. Verify conformance to specifications including cold-weather and hot-weather placement procedures. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated. (OIAF)* *Review OIAF reports (SER).*
7. Sampling and Testing of Concrete (continuous)	*SER* *OIAF* *(ACI-CFTT ACI-STT)*	*Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064) for conformance with construction documents. (OIAF)* *Review concrete test reports for conformance with the construction documents (SER).*
8. Curing and Protection (periodic)	*PE* *OIAF* *(ACI-CCI ICC-RCSI)*	*Inspect curing, cold weather protection and hot weather protection procedures (OIAF).* *Review OIAF reports (SER).*

Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures	*SER* *(AWS/AISC -SSI ICC-SWSI)*	*Review each shop fabrication including fabricator's and welder's certificates and quality control procedures including steel joists and steel deck.* *Verify whether Fabricator holds a current AISC Category I or II certification, or is a member of the Structural Steel Fabricators.* *Review OIAF reports.*
2. Material Certification (periodic)	*SER* *OIAF* *(AWS/AISC -SSI ICC-SWSI)*	*Review certified mill test reports for structural steel including steel joists and steel deck. (SER)* *Verify identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes. (OIAF)*
3. Bolting (Bearing Type - periodic) (Slip-Critical Type – continuous for turn of the nut or calibrated wrench method)	*SER* *OIAF* *(AWS/AISC -SSI ICC-SWSI)*	*Inspect installation and tightening of high-strength bolts. Verify bolt size and grade and that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections. (OIAF)* *Review reports (SER).*
4. Welding (continuous except periodic for single pass fillet welds < 5/16" or floor and deck welds)	*SER* *OIAF* *(AWS-CWI ASNT)*	*Visually inspect all welds in accordance with construction documents and approved shop drawings. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds. (OIAF)* *Continuous inspection of ultrasonic testing of all full-penetration welds. (OIAF)* *Review all reports. (SER)*
5. Structural Framing, Details, and Assemblies (periodic)	*SER* *OIAF* *(PE/SE)*	*Visually inspect steel frame for compliance with structural drawings, approved erection drawings, AISC Code of Standard Practice including bracing, member configuration and connection details.* *Inspect for size, grade of steel, camber, and installation.* *Review for conformance with approved shop drawings and construction documents.*

SECTION 03 1100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions apply to the Work of this Section.

1.02 SCOPE

A. This section specifies requirements for concrete formwork to produce cast-in-place concrete structures as shown on the Drawings and as specified herein. The work shall consist of designing, furnishing, constructing and removing formwork for all cast-in-place concrete structures.

B. Use forms, wherever necessary, to confine the concrete and shape it to the required lines, and to provide the specified finish. Construct forms with sufficient strength to structurally support the work, and withstand the pressure resulting from placement and vibration of the concrete, and maintain forms rigidly in position. Construct forms sufficiently tight to prevent loss of mortar from the concrete.

1.03 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 117: Standard Specification for Tolerances for Concrete Construction and Materials.
   2. ACI 301: Standard Specification for Structural Concrete.
   3. ACI 347: Guide to Formwork for Concrete.

B. Rhode Island State Building Code.

1.04 DESIGN REQUIREMENTS

A. Design formwork to support vertical loads and lateral pressures resulting from placement and vibration of concrete in accordance with the requirements of ACI 301 and ACI 347, and as specified herein.

B. Camber the formwork to compensate for anticipated deflections due to the weight and pressure of the fresh concrete and due to construction loads.

C. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations. Use wedges or jacks, individually or in combination for adjustment.

D. Design forms and falsework to include assumed values of live loads, dead load, weight of moving equipment operated on formwork, concrete mix, height of drop, vibrator frequency, ambient temperature, lateral stability, and other factors pertinent to the safety of the structure during construction.

E. Provide and design forms to conform with expansion and construction joint locations.

1.05 SUBMITTALS

A. Submittals for the following items shall be made in accordance with the requirements as specified. Refer to Section 01 33 00 SUBMITTAL PROCEDURES for provisions and procedures.

B. Submit the following at least 30 days before the first concrete placement:

1. Manufacturer's data and installation instructions for proprietary form accessories, form coatings, pipe sleeves and seals, form ties and manufactured form systems if used.
2. Certification that form coatings comply with the requirements of this Section.

1.06 QUALITY ASSURANCE

A. Provide in accordance with the requirements as specified.

B. Tolerances:

1. Permissible surface irregularities for the various classes of concrete surface finish as specified in Section 03 3000, Cast-in-Place Concrete, are defined as "finishes", and are to be distinguished from tolerances as specified herein. Deviations from the established lines, grades, and dimensions will be permitted to the extent set forth herein.
2. The tolerance limits specified in this Section and the surface finish irregularities permitted in Section 03 3000, Cast-in-Place Concrete, are not the limits to which forms may be built or by which damaged from sheathing may be used. These limits are provided only for the occasional slight misalignment or irregularity of surface, which may occur despite a serious effort to build and maintain the forms accurately and securely with an even surface. These limits will be allowed only for inadvertent or relatively infrequent irregularities of the degree mentioned, but practices and form materials will be prohibited which without doubt will result in the creation of additional irregularities, even though these would be within the limits specified.
3. Where specific tolerances are not stated herein or shown on the Drawings for a structure, portion of a structure, or other feature of the work, permissible deviations will be interpreted conforming to the tolerances stated herein for similar construction. Specific maximum or minimum tolerances as shown on the Drawings in connection with any dimension shall be considered as supplemental to the tolerances specified herein and shall govern. Concrete forms shall be set and maintained within the tolerance limits necessary to ensure that the completed work will be within the tolerances specified. Concrete construction that exceeds the tolerance limits specified or as shown on

the Drawings shall be remedied or removed and replaced by the Contractor at no cost to the Owner.

4. Tolerances shall be as specified in ACI 117, Standard Specifications for Tolerances for Concrete and Materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with smooth faced undamaged plywood or metal, metal-framed plywood faced or other acceptable panel-type facing materials approved by Engineer, to provide continuous, straight, smooth as-cast surfaces, and produce a uniform and consistent texture and pattern on the surfaces. Metal patches on forms for these surfaces will not be permitted. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on the drawings.

1. Use overlaid plywood complying with U.S. Product PS-1 “A-C or B-B High Density Overlaid Concrete Form”, Class I.
2. Use plywood complying with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Tubular Fiber Forms:

1. Provide forms with spirally constructed laminated plies of fiber.
2. Provide forms with wall thickness as recommended by the manufacturer to meet load requirements of the various uses and sizes.
3. Provide forms with wax coated outside surfaces for moisture resistance.
4. Provide forms with inside surface coated with bond-breaker compound.

D. Form Ties:

1. Form Ties: For concrete structures, which will not be in view or buried below finish grade, use carbon steel factory-fabricated, removable or stay in place snap-off type form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units, which will leave no metal closer than 1-1/2” to surface. Provide ties which, when removed, will leave holes not larger than 1” diameter in concrete surface. Patch all holes with non-shrink grout.
2. Form ties and spreaders for walls in areas exposed to view shall be Stainless Steel Cone–Tight Tyscru by Richmond Screw Anchor Co.; Dayton Sure-Grip and Shore Co.; or substitute approved by Engineer with Plastic cone-tight type cones having a 1” setback and a taper from 1” to 1-1/4”. Tycone holes shall be sealed with plastic set back plugs, color as selected by Engi-

neer from manufacturer's standard color selection or filled with non-shrink grout. Tyscru ties shall be sized to satisfy loading requirements.

3. In lieu of form ties specified above, fiberglass form tie systems shall be used. Fiberglass form ties shall be standard gray color. The concrete structure shall be finished by grinding the fiberglass form tie flush with the finish surface of the concrete structure.
    a. If tapered architectural holes are required, dummy tapered cones having a 1" setback and a taper from 1" to 1-1/4 shall be fastened to the interior of the formwork to achieve the specified pattern on the finish structure.

E. Form Releasing Agents: Provide commercial formulation form-releasing agents that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. Volatile organic compound emissions of form coating agent shall not exceed 2.09 pounds per gallon (350 mg/L grams per liter).

F. Chamfer Strips: Provide 1-inch triangular fillets, unless noted otherwise on drawings, to form all exposed concrete corners. Material shall be rubber or polyvinyl chloride type, or smooth clear, sealed softwood.

PART 3 - EXECUTION

3.01 INSPECTIONS

A. Examine the substrate and conditions under which work of this Section is to be performed, and correct unsatisfactory conditions, which would prevent proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 FORM CONSTRUCTION

A. General:
1. Construct forms as designed and in accordance with Contractor's approved working drawings conforming to ACI 347, to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level, and plumb work in finished structures.
2. Provide for openings, offsets, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required. Use selected materials to obtain required finishes.
3. Forms for concrete which accommodate work of other trades, fabricated before the opportunity exists to verify the measurements of adjacent construction, shall be accurately sized and located as dimensioned on the Drawings. In the event that deviation from the Drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions as approved by the Engineer, at no cost to the Owner.

B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage concrete surfaces.
2. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Brace temporary closures and set tightly to temporary openings on forms in as many inconspicuous locations as possible, commensurate with design requirements. Form intersecting planes to provide true, clean cut corners.

C. Falsework:

1. Erect falsework and support, brace, and maintain it to safely support vertical, lateral, and asymmetrical loads applied until complete structure has attained design strength. Construct falsework so that adjustments can be made for take-up and settlement, and access is provided for inspection.
2. Provide wedges, jacks or chamfer strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to product work of required dimensions.

D. Forms for Exposed Concrete:

1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes
2. Provide sharp clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or grits to maintain true, square intersections.
3. Use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material, which will produce bow.

E. Corner Treatment:

1. Unless shown otherwise, form chamfers with 1-inch by 1-inch strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints on exposed concrete. Extend terminal edges to required limits and miter chamfer strips at changes in direction.

F. Control Joints: Locate as indicated on the Drawings.

1. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Verify size and location of openings, recesses and sleeves with the trade requiring such items. Accurately place and securely support items to be built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove encrusted mortar and grout, chips, wood, sawdust, dirt, and other debris just before concrete is placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.03 FORM COATINGS

A. Coat form contact surfaces with form-releasing agent before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces that will be bonded to fresh concrete. Apply in strict compliance with manufacturer's instructions.

B. Remove surplus coating on form surfaces before placing concrete.

3.04 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into the forms, anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

B. Set edge forms or bulkheads and intermediate screed strips for slabs, to obtain required elevation and contours in the finished slab surface. Provide and secure units to support types of screeds required.

3.05 REMOVAL OF FORMS

A. Formwork not supporting concrete, such as sides of walls, columns, and similar parts of the Work, may be removed after cumulatively curing at not less than 50 degrees F for 72 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operation, and provided that curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as elevated beams, joists, slabs and other structural elements may not be removed until concrete has attained 70% of its design minimum 28-day compressive strength, and has cumulatively cured for no less than 7 days. Concrete shall have sufficient strength to safely support its own weight and construction live loads and lateral pressures. Determine potential compressive strength of in-place concrete testing field-cured specimens representative of the concrete location or members, as specified in Section 03 30 00, Cast-in-Place Concrete.

C. Form facing material may be removed one day after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

D. Form ties: The concrete structure shall be finished by grinding the fiberglass form ties flush with the finish surface of the concrete structure.

3.06 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Apply new form releasing agent to all form areas that will be in contact with concrete.

B. Do not reuse forms if there is any evidence of surface wear and tear, splits, fraying, delamination or other damage which would impair the quality of the concrete surface or prevent obtaining the specified concrete finish.

END OF SECTION

SECTION 03 1510

CONCRETE CONTROL, CONSTRUCTION, AND EXPANSION JOINTS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions apply to the Work of this Section.

1.02 SCOPE

A. All work necessary to provide construction joints, expansion joints, and control joints in structural or plain concrete as indicated and specified.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

B. C 920: Specification for Elastomeric Joint Sealants.

C. C1193: Guide for Use of Joint Sealants.

D. D1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

E. D1752: Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.04 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with the requirements as specified in Section 01 3300, SUBMITTAL PROCEDURES.
   1. Manufacture's printed data and literature for all specified materials and locations where materials are to be used.
   2. Manufacture's printed instruction for:
      a. Treatment of cut surfaces of premolded expansion joint filler.
      b. Preparation of concrete for joint sealant.

B. Samples of joint fillers.

C. Color samples or charts for joint sealants.

1.05 QUALITY ASSURANCE

A. Provide in accordance with the requirements as specified in Section 01 45 00, QUALITY CONTROL.

B. Do not omit control, construction, or expansion joints.

C. Do not add or relocate control, construction, or expansion joints without written authorization from the Engineer.

D. Cast slabs and beams monolithically without horizontal joints.

E. Do not use horizontal joints within foundation mats, base slabs, footings, pile caps, slabs on grade or elevated beams and slabs.

F. Provide control, construction, and expansion joints in concrete fills and toppings at the same location as the control, construction and expansion joints in the supporting concrete.

G. Reject material exceeding expiration date for use.

H. Insure that concrete surfaces to receive joint sealant are cleaned in accordance with the printed instructions of the joint sealant manufacture.

1.06 DELIVERY AND STORAGE

A. Transport, handle and deliver materials to the job site in the manufacturer's sealed bags, unopened containers or banded pallets.

B. Store materials off the ground on a platform or skids and protect with covers from snow, rain and ground splatter.

C. Store joint sealants in a dry warm location to prevent freezing.

D. Store plastic products under cover in a dry cool location, out of direct sunlight.

PART 2 - PRODUCTS

2.01 PREMOLDED JOINT FILLER

A. Provide premolded–joint filler conforming to ASTM D1752, Type I or Type II.

B. Provide Type III self-expanding cork where specifically indicated.

C. Provide joint filler of same thickness as expansion joint width indicated.

D. Provide maximum length filler manufactured to minimize field splicing.

2.02 JOINT SEALANT

A. Horizontal Expansion and Construction Joints: Provide one-component, self-leveling, polyurethane-base joint sealant for expansion joints in horizontal surfaces and surfaces inclined less than 30 degrees from the horizontal. Acceptable products:
   1. Sikaflex-1CSL by Sika Corporation
   2. Approved equivalent.

B. Provide joint sealant for expansion joints in walls and surfaces inclined greater than 30 degrees from the horizontal conforming to ASTM C920, Type S or M, Grade NS, Class 25.

C. Horizontal Control Joints: Provide 2-component, self-leveling 100% solids, flexible, control joint resin. Acceptable products:
   1. Sikadur 51 SL by Sika Corporation
   2. Approved equivalent.

D. Provide compatible joint sealants as recommended by manufacturer when they abut each other.

E. Provide sealant intended for continuous submergence in liquid containing structures.

2.03 BOND BREAKER FOR JOINT SEALANTS

A. Provide polyethylene tape, coated tape or metal foil.

2.04 BACK-UP MATERIAL FOR JOINT SEALANTS

A. Provide polyethylene foam or polychloroprene foam rubber.

B. Do not use material impregnated with oil, bitumen or similar substances.

C. Provide back-up material as recommended by joint sealant manufacturer that is compatible with the joint sealant and has the same expansion/contraction capability as joint sealant.

PART 3 - EXECUTION

3.01 CONSTRUCTION JOINTS

A. Locate and install construction joints as indicated or, if not indicated, locate so as not to impair the strength and appearance of the structure. Submit proposed construction joint locations for approval.

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

C. Key groove all construction joints unless otherwise indicated. Wall horizontal joints need not be keyed except where specifically indicated.

D. Key grooves shall be one-third the thickness of the thinner member and 1-1/2-in. deep unless otherwise indicated.

E. Use tapered key groove forms to permit form removal without damage to the groove. Taper not to exceed 2 inches per foot.

F. Center waterstops in construction joints unless otherwise indicated. Secure waterstops in position by tie wire to adjacent reinforcing every 12 inches.

G. Consolidate concrete during placement in the vicinity of key groove without damaging or dislodging waterstop.

H. Remove all key groove forms.

I. Clean key groove of laitance, curing sealant, foreign materials and protrusions of hardened concrete. Roughen by bush hammer or lightly sandblast to expose coarse aggregate. Blow out debris and dust with oil-free compressed air.

J. Protect exposed key groove and waterstop from damage.

3.02 EXPANSION JOINTS

A. Install expansion joints in accordance with the manufacturers printed instructions and as indicated.

B. Center waterstops in expansion joints unless otherwise indicated. Secure waterstops in position by tie wire to adjacent reinforcing every 12 inches.

C. Consolidate concrete during placement in vicinity of expansion joint without damaging premolded joint filler and waterstop.

D. Prepare joint to receive sealant by sand-blasting then blowing out the joint with clean, dry, compressed air.

3.03 PREMOLDED JOINT FILLER

A. Treat cut surface of premolded joint filler in conformance with manufacturer's printed instructions.

B. Place premolded joint filler against the bulkhead form and fasten to the inside of the form with noncorrosive fasteners. Remove all fasteners when bulkhead form is removed.

C. Prevent disturbance of or damage to premolded joint filler.

D. Fill expansion joint completely with premolded joint filler, except as specified below.

E. Secure wood strips to expansion joint surfaces, which are to receive joint sealant.

F. Use tapered wood strips with the smaller width being the same width as the expansion joint and of depth necessary to install the joint sealant and back-up materials.

G. Use materials to secure the premolded joint filler and wood strips that will not harm concrete or affect the joint sealant bond to concrete.

H. Do not remove wood strips until forms are removed as specified in the Concrete Formwork section.

I. Clean groove of laitance, curing sealant, foreign materials and protrusions of hardened concrete. Blow out debris and dust with oil-free compressed air.

3.04 CONTROL JOINTS

A. Saw-cut control joints at locations indicated on the Drawings or at locations approved by the Engineer of Record if not shown on the Drawings.

B. Saw cut joints to ¼ of the depth of the slab or concrete member immediately after slab finishing.

C. All control joints shall be made within 8 hours of concrete placement.

D. Prepare all control joints to receive sealant by high-pressure washing after saw-cutting, sand-blasting after the joints are dry, and then blowing out the joints with clean, dry, compressed air.

3.05 JOINT SEALING

A. Seal the dry clean concrete in joints in conformance with manufacturer's printed instruction.

B. Install back-up and bond breaker materials where required or recommended by the manufacturer.

C. Prime concrete, fill flush with joint sealant to required thickness, tool to concave shape and seal in conformance with manufacturer's printed instructions and ASTM C1193.

D. Prevent spilling joint sealant over adjoining surfaces. Use tape adjacent to joint as required. Remove all tape completely from concrete surface after installing joint.

E. Do not prime concrete or install joint sealant when sealant, air or concrete temperature is less than 40 deg. F. or as required by manufacturer.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions apply to the Work of this Section.

1.02 SCOPE

A. This Section specifies all work necessary to provide all concrete reinforcement such as reinforcing steel, welded wire fabric, and concrete inserts as shown on the Drawings and as specified herein.

1.03 REFERENCES

A. American Concrete Institute (ACI)

1. ACI 315: Details and Detailing of Concrete Reinforcement
2. ACI 315R: Manual of Engineering and Placing Drawings for Reinforced Concrete Structures

B. American Society for Testing and Materials (ASTM):

1. A185: Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
2. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. A 706/A 706M: Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement

C. American Welding Society (AWS):

1. AWS D1.4: American Welding Society, Structural Welding Code, and Reinforcing Steel.

D. Rhode Island State Building Code.

1.04 SUBMITTALS

A. Submittal for the following items shall be made in accordance with the requirements as specified.

B. Shop Drawings:

1. Shop drawings for reinforced concrete structures shall be submitted after the concrete pour sequences, construction joint locations, and placement schedules have been approved by the Engineer.
2. At least 30 days before each scheduled concrete placement, submit shop drawings covering the reinforcing steel details, bar lists, support bars and details, locations of reinforcing bar cut-offs, splices, development lengths and placement details. Prepare shop drawings in accordance with ACI 315 and 315R from reinforcement details shown on the drawings.
3. Mill Certificates: Accompanying the shop drawings, submit steel producer's certification of mill analysis, tensile, and bend tests for reinforcing steel.
4. Welder's certification in conformance with AWS D1.4, when welding is indicated or specified. Testing of welds shall be conducted and witnessed by an independent testing laboratory prior to welding of reinforcement. Maintain qualification and certification records at the job site, readily available for examination of test results.

C. Manufacture's literature including installation instructions for the following.

1. Supports

1.05 QUALITY ASSURANCE

A. Provide in accordance with the requirements of the Quality Control section and as specified.

B. Do not fabricate reinforcement until shop and placement drawings have been approved by the Engineer.

C. Tolerances:

1. Tolerances shall be as specified in ACI 315R.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver reinforcement to the job site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on shop drawings.

B. Storage: Store reinforcement at the job site in a manner to prevent damage and accumulation of dirt and excessive rust.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing bars shall be newly rolled deformed bars conforming to ASTM A615 Grade 60, unless otherwise indicated on the Drawings.

1. Bars to be welded shall conform to ASTM A706 deformed, Grade 60.
2. Provide mill bent reinforcing bars, bent cold to the dimensions indicated and conforming to the requirements of ACI SP-66.

B. Welded wire fabric shall conform to ASTM A 185, with a minimum ultimate tensile strength of 70,000 psi. Provide in sizes indicated. Provide support bars and reinforcing bar supports as specified to obtain the concrete cover.

C. Bar support and accessories shall be galvanized or plastic coated and shall conform to ACI 315. Provide minimum size number 5 support bars.

D. Provide 3-in. by 3-in. plain precast concrete blocks and precast concrete doweled blocks for reinforcing bar supports in foundation mats, base slabs, footings, pile caps, grade beams and slabs on grade. Provide block thickness to produce concrete cover of reinforcement as indicated. Provide blocks of Type II cement with 3000 psi minimum compressive strength in conformance with the Section 03 30 00, Cast-in-Place Concrete.

E. Wire for tying reinforcement in place shall be No. 16 AWG or heavier black soft-annealed wire

2.02 FABRICATION

A. Fabricate reinforcement only after shop drawings have been returned by the Engineer marked “Approved”.

B. Provide reinforcing bars that have been cut and bent before shipment. If bars must be bent on site, bend reinforcing steel cold, and do not straighten or rebend in a manner, which will damage the material. Bend in conformance with requirements of ACI SP-66 or with ASTM A767 when reinforcement is to be galvanized.

C. Splices:

1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying for the full length of the splice. All lap splices shall be ACI 318, Class B, unless indicated otherwise on the Drawings.
2. Adjacent splices shall be staggered whenever possible.

PART 3 - EXECUTION

3.01 GENERAL

A. General: Comply with Concrete Reinforcing Steel Institute’s recommended Practice for “Placing Reinforcing Bars”, for details and methods of reinforcement placement and supports, and as herein specified.

3.02 PLACEMENT

A. Comply with the specified standards for details and methods of reinforcement placement and supports, and as herein specified. Comply with concrete protective cover requirement indicated on the Drawings.

B. Clean reinforcement to remove loose rust and mill scale, earth, and other materials that would reduce or destroy bond with concrete.

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

D. Place reinforcement to obtain the specified coverage for concrete protection. Arrange, space, and securely tie bars and bar supports together with wire, to hold reinforcement accurately in position during concrete placement operation. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh.

F. Provide supports of sufficient numbers and strengths to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for conveying equipment and similar construction loads.

G. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items. Bars moved more than three inches are subject to approval of Engineer. Place required number of bars.

H. Position dowels accurately, rigidly support, and securely tie. Align dowels normal to concrete surface before concrete placement. Setting dowels into wet concrete is prohibited.

I. Provide and place safety caps on all exposed ends of vertical reinforcement.

J. Tie a minimum of 25 percent of all intersecting bars in foundation mats, base slabs, footings, pile caps, slabs on grade and elevated slabs.

K. Do not splice reinforcement steel in foundation mats, base slabs, beams, girders, slabs and walls at points of maximum stress unless otherwise indicated.

L. Lap splice welded wire fabric reinforcement at least one full mesh. Stagger splices to avoid continuous laps in either direction and wire tightly together. Straighten rolled welded wire fabric reinforcement into flat sheets before use.

M. Provide continuous reinforcement through construction joints.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions apply to the Work of this Section.

1.02 SCOPE

A. This Section specifies requirements for furnishing, placement, finishing, curing and protecting of all concrete, plain and reinforced as shown on the Drawings and as specified herein. Review and approval of the Contractor's Working drawings by the Engineer does not relieve the Contractor of the responsibility for the adequacy of Work.

1.03 REFERENCES

A. General: Where the language in any of the documents referred to herein be in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory for these Specifications.

B. American Concrete Institute (ACI):

1. ACI 117: Standard Tolerances for Concrete Construction and Materials (except as modified in this Specification Section for anchor rod placement).
2. ACI 211.2: Standard Practice for Selecting Proportions for Structural Lightweight Concrete
3. ACI 213: Guide for Structural Lightweight Aggregate Concrete
4. ACI 301: Specifications for Structural Concrete
5. ACI 302: Guide for Concrete Floor and Slab Construction
6. ACI 304R: Guide for Measuring, Mixing, Transporting and Placing Concrete.
7. ACI 305R: Hot Weather Concreting
8. ACI 306: Cold Weather Concreting
9. ACI 308: Standard Practice for Curing Concrete
10. ACI 309R: Guide for Consolidation of Concrete
11. ACI 318: Building Code Requirements for Structural Concrete
12. American Society for Testing and Materials (ASTM):
13.
14. C31 Making and Curing Concrete Compression and Flexural StrengthTest-Specimens in the Field
15. C33 Specification for Concrete Aggregates
16. C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
17. C94 Specifications for Ready Mixed Concrete
18. C127 Standard test method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
19. C136 Sieve Analysis of Fine and Coarse Aggregate
20. C138 Unit Weight, Yield, and Air Content of Concrete

21. C143 Test for Slump of Portland Cement Concrete
22. C150 Specification for Portland Cement
23. C171 Sheet Materials for Curing Concrete
24. C172 Sampling Fresh Concrete
25. C173 Standard test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
26. C205 Standard Specifications for Portland Blast Furnace Slag Cement
27. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
28. C260 Specification for Air-Entraining Admixtures for Concrete
29. C309 Specification for Liquid Membrane Forming Compounds for Curing Concrete
30. C340 Standard Specifications for Portland-Pozzolan Cement
31. C494 Specification for Chemical Admixtures for Concrete
32. C618 Standard Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
33. C827 "Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
34. C845 Standard Specifications for Expansive Hydraulic Cement
35. C989 Specification for Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars
36. C1017 Standard Specifications for Chemical Admixtures for Use in Producing flowing Concrete
37. C1064 Test Method for Temperature of Freshly Mixed Portland-Cement Concrete
38. C1107: Specification for Packaged Dry, hydraulic Cement Grout (Non-Shrink)
39. C1157 Standard Performance Specifications for Silica Fume in Cementitious Mixtures
40. C1240 Standard Specification for Silica Fume for Use in Hydraulic-Cement Concrete
41. D1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
42. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

C. Federal Specifications (Fed. Spec.):

1. TT-S-00230: Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures)

1.04 DESIGN REQUIREMENTS

A. Codes: Building concrete shall be in conformance with the requirements of ACI 318, and the Rhode Island State Building Code.

B. Coordinate use of curing compounds with the floor coatings.

C. Air-entrain all exterior exposed concrete.

1.05 SUBMITTALS

A. Product Data: Submit design mix including color additives as applicable. Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, synthetic fibers,

admixtures, color additives, patching compounds, waterstops, joint systems, curing compound, and others as requested by the Engineer.

B. Shop Drawings: Submittals included in the Section shall be in accordance with the requirements specified. Submit Working drawings for all Work under this Section to the Engineer for approval. Show location of joints, concrete pouring sequence, schedule dates, rate of placement and methods. All concrete mix designs shall conform to ACI-318, Chapter 5 and as specified. All concrete mix designs and concrete material tests shall be signed and sealed by a Professional Engineer in the State of Rhode Island.

C. Samples: Submit samples of materials as specified, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete, concrete materials, and mix design tests.

E. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

F. Submit prior to start of Work written reports of each proposed mix for each class of concrete. Do not begin concrete production until mixes have been approved by the Engineer.

G. Batch Ticket Information: Provide concrete delivery tickets showing job name and location, date and time of delivery, quantity of concrete, quality and type of concrete, admixtures, amount of water added, and all other relevant information as described in ASTM C-94. Submit original batch tickets and 2 copies at the end of each week.

1.06 QUALITY ASSURANCE

A. Provide in accordance with the requirements as specified.

B. Concrete Testing Service: The Contractor shall employ and pay an independent testing laboratory to perform material evaluation tests and to design concrete mixes and provide copies of recently made material tests and mix designs.

C. Materials and installed Work may require testing and retesting at anytime during progress of Work. Allow free access to material stockpiles and facilities. All tests, including retesting of rejected materials and installed Work, shall be done at Contractor's expense.

D. Workmanship: The Contractor is responsible for correction of corrected Work that does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed at no additional cost to the Owner.

1.07 DELIVERY, STORAGE AND HANDLING

A. Order concrete from batching plant so that trucks arrive at discharge locations when concrete is required. Avoid excessive mixing of concrete or delays in placing successive layers of concrete in forms.

B. Deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the water-cement ratio, slump, air entrainment, temperature and homogeneity.

C. Concrete not conforming to specification, unsuitable for placement, exceeding the time or temperature limitations or not having a complete delivery batch ticket will be rejected.

1.08 JOB SITE

A. Weather: Protect concrete from damage and reduced strength or performance due to weather extremes during mixing, placing and curing.

B. Cold Weather: Unless special precautions are taken to protect concrete, do not Work when temperatures are below 40°F or when temperatures are expected to fall below 40°F within 72 hours after placing concrete.
   1. Comply with ACI 306 in cold weather.
   2. Maintain concrete temperature of at least 60°F. Reinforcement, forms and ground in contact with concrete shall be free of frost.

C. Keep concrete and formwork at least 50°F for at least 96 hours after placing concrete.
   1. The use of calcium chloride in any form is not permitted. Non-chloride accelerator shall be used when ambient temperature is below 50°F.
   2. Admixture manufacturer shall provide technical assistance at no additional cost. A manufacturer's representative shall be available for consultation by phone or on site upon 72-hour notice.
   3. Hot Weather: Concrete, when deposited, shall be less than 85°F. Cool the mix in a manner acceptable to the Engineer if the concrete temperature is higher.
   4. Comply with ACI 305 in hot weather.
   5. Retarder shall be used when ambient temperature exceeds 80°F.

D. Schedule delivery of colored concrete to provide consistent mix times from batching until discharge.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II for all Work unless otherwise specified. Use one brand of cement throughout project.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Use ¾" maximum size for all concrete, except for slabs-on-grade use 1-1/2" maximum. Provide aggregates from a single source for exposed concrete.

C. Water: Clean, potable and free from foreign materials such as oils, acids, alkalis, and organic materials in amounts harmful to concrete and embedded steel. Provide water which meets ACI/ASTM requirements for concrete mix water.

D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include the following
   a. "Air-Mix"; Euclid Chemical Co.
   b. Sika Aer"; Sika Corp.
   c. "MB-VR or MB-AE"; Master Builders
   d. "Darex AEA" or "Daravair"; W.R. Grace
   e. Or equal.

E. Water Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1% chloride ions. Follow manufacturer's recommendations for amount of admixture to be added to the concrete. Admixture shall be compatible with air-entraining admixtures.
   1. "WRDA Hycol"; W. R. Grace.
   2. "Eucon WR-75"; Euclid Chemical Co.
   3. "Pozzolith Normal"' Master Builders
   4. "Plastocrete 160"; Sika Chemical Corp.
   5. Or equal.

F. High-Range Water Reducing Admixture (SuperPlasticizer): ASTM C 494, Type F or Type G and containing not more than 0.1% chloride ions. Follow manufacturer's recommendations.
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include the following:
      a. "WRDA 10" or "Daracem"; W. R. Grace.
      b. "PSP"; Protex Industries Inc.
      c. "Super P"; Anit-Hydro.
      d. "Sikament"; Sika Chemical Corp.
      e. "Rheobuild"; Master Builders.
      f. Or equal.

G. Water Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E or C, and containing not more than 0.1% chloride ions.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. "Accelguard 80"; Euclid Chemical Co.
      b. "Pozzutec 20"; Master Builders, Inc.
      c. "PolarSet"; Grace Construction Products.
      d. Or equal.

H. Water Reducing, Retarding Admixture: ASTM C 494 Type D, and containing not more than 0.1% chloride ions.
   1. Products: Subject to compliance with requirements, products that may be incorporated in the Work include the following:
      a. "Edoco 20006"; Edoco Technical Products.
      b. "Pozzolith Retarder"; Master Builders.
      c. "Eucon Retarder 75"; Euclid Chemical Co.
      d. "Daratard"; W. R. Grace.
      e. "Plastiment"; Sika Chemical Co.
      f. Or equal.

I. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1% chloride ions are not permitted.

2.02 RELATED MATERIALS

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

B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. Per sq. yd., complying with AASHTO M 182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. Polyethylene-coated burlap.

D. Joint Sealants shall be provided in color to match color of concrete.

E. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. “Masterseal”; Master Builders.
      b. “A-H 3 Way Sealer”; Anti-Hydro Waterproofing Co.
      c. “Ecocure”; Euclid Chemical Co.
      d. “Clear Seal”: A.C. Horn, Inc.
      e. “Sealco 309”; Gifford-Hill/American Admixtures.
      f. “J-20 Acrylic Cure”; Dayton Superior.

F. Underlayment Compound: Free flowing, self-leveling, pumpable cementitious base compound.
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. “Ardex K-15”; Ardex Engineered Cements.
      b. “Silflo 200”; Silpro Masonry Systems.
      c. “Ultra/lPlan”; Mapei.

G. Bonding Compound: Polyvinyl acetate or acrylic base.
   1. Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
      a. Acrylic or Styrene Butadiene:
      b. “J-40 Bonding Agent”; Dayton Superior Corp.
      c. “Everbond”; L & M Construction Chemicals.
      d. “Hornweld”; A. C. Horn, Inc.
      e. “Daraweld C”; W. R. Grace.

H. Adjustable inserts: Adjustable inserts shall be hot-dip galvanized in conformance with ASTM A123 and A153. Adjustable insets shall be:
   1. Ductile iron wedges inserts, Type F-7 manufactured by Dayton Sure-Grip & Shore Co.
   2. Malleable iron peerless wedge inserts, insert as manufactured by Richmond Screw, Anchor Co., Inc.
   3. Malleable iron wedge inserts, Type HW as manufactured by Hohmann & Barnard Inc.

I. Vapor barrier shall be Stego Wrap Vapor Barrier (15 mil) or equivalent, in accordance with ASTM E 1745. Use caution to avoid perforations in the vapor barrier material. Install barrier in accordance with ASTM E 1643 and ASTM F 710 guidelines.

J. Concrete Moisture Vapor Reduction Admixture (MVRA): MVRA shall be provided at all slabs-on-grade and slabs-on-metal deck.

MVRA Basis-of-Design Product: "Barrier One High Performance Concrete Admixture" by Barrier One, Inc. Other admixtures must be compatible with the MVRA. Subject to compliance with requirements, comparable products which may be incorporated in the Work include, but are not limited to, the following:

1. Moxie 1800 Super Admix; Moxie International.
2. Concure Systems Admixture; Concure Systems, Inc.

2.03 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Submit written reports for review of design mix for specified strength of concrete within 15 days prior to start of Work. Do not begin concrete production until mixes have been reviewed.

C. Strength: Provide concrete having the following minimum compressive strength at 28 days:

1. Class 4000 – 3/4" normal weight concrete: Typical, unless noted otherwise.
2. Class 4000 – 1 1/2" (max) normal weight concrete: Use in slabs-on-grade (only)

The concrete quality, mixing and placing shall conform to ACI-318, Chapter 5.

Design mixes to provide normal weight concrete with the following properties, as indicated:

Minimum Design Compressive Strength	Minimum Strength fc 7 days	Laboratory Testing Age 28 day	Minimum ** Cement Content/cu.yd.	Maximum* W/C Ratio
4,000 (3/4") psi	2,400 psi	4,000 psi	565	.45
4,000 (1 1/2") psi	2,400 psi	4,000 psi	520	.45

*Maximum: Decrease if possible
**Minimum: Increase as necessary to meet all other stated requirements.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in Work.

E. Admixtures:
   1. Use water-reducing admixture or high range water reducing admixture (super plasticizer) in all concrete in strict accordance with the manufacturer's printed instructions.
   2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F in strict accordance with the manufacturer's printed instructions.
   3. Use high-range water-reducing admixture in pumped concrete required to be watertight, and concrete with water/cement ratios below 0.40.
   4. Use air-entraining admixture in all concrete except interior slabs, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content as follows:
      a. ¾" aggregate normal weight concrete: 6.0% with a tolerance of ±1%
      b. 1½" aggregate normal weight concrete: 5.5% with a tolerance of ±1%

F. Consistency:
   1. The consistency shall be uniformly maintained within the allowable range of slump for the job materials. Ordinarily the slump shall not be less than 1-1/2" inch nor more than 4 inches, unless in the opinion of the Engineer, job conditions warrant exceeding these limits. The consistency shall be determined by the AASHTO Method T-119. This range of slump is to be maintained for all concrete including pumped concrete.
   2. Concrete containing HRWR admixture (super-plasticizer): Not more than 7" after addition of HRWR to site-verified 1-1/2" to 4" slump concrete.
   3. Ramps, slabs and sloping surfaces: Not more than 3 inches.
   4. Reinforced foundation systems: Not less than 1-1/2" inch nor more than 4 inches.

G. Concrete Moisture Vapor Reduction Admixture (MVRA) shall be used in strict accordance with the manufacturer's printed instructions. The MVRA manufacturer shall provide a minimum 10-year warranty effective from the date of substantial completion. In order to qualify for the warranty, the following items must be implemented prior to placement of the concrete:
   1. Concrete mix design is submitted to MVRA manufacturer for review and comment.
   2. Concrete supplier must verify in writing that strict water/cement ratio compliance has been met for all concrete batches utilizing the waterproofing admixture.
   3. Concrete supplier must verify in writing that manufacturer's instructions for use at batch plant were strictly followed for batches provided for the job.

2.04 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When air temperature is between 85°F (30° C) and 90°F (32° C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

C. During cold weather heat water, sand and cement materials per recommendations of ACI 306.

D. High Early Strength Concrete: Follow manufacture's product specific installation guidelines. Cement shall be added to a pre-measured amount of water that does not exceed the manufacturer's maximum recommended water content. Material can be extended up to 60% using pea gravel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Batch, mix and deliver Portland cement concrete in conformance with ASTM 94. Batch all constituents at central batching or mixing plant. Produce concrete in conformance with ACI 301 and as specified.

B. Seasonal Conditions:

C. Conform to ACI 305R and as specified for hot weather concreting. Do not add retarder admixture to any concrete.

D. Conform to ACI 306R and as specified for cold weather concreting. Do not add accelerator admixture to any concrete.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into Work, anchorage devices and other embedded items required for other Work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Install anchor rods, accurately located, to elevation required and complying with the following tolerances (acceptable deviation from rod locations shown on the Drawings):
   1. 3/4" and 7/8" diameter rods: +/- 1/4"
   2. 1", 1-1/4", and 1-1/2" diameter rods: +/- 3/8"
   3. 1-3/4", 2", and 2-1/2" diameter rods: +/- 1/2"

C. Clean embedded items of oil, ice, dirt and all other foreign items.

D. For embedded pipes, complete all necessary testing requirements prior to placing concrete.

3.03 PLACING CONCRETE

A. General:
   1. Concrete formwork shall satisfy the requirements of Section 03 1100, Concrete Formwork. Do not place concrete until the depth, character and adequacy of forms, falsework, embedments, and the placing of the steel reinforcement have been approved by the Engineer. The method and manner of placing the concrete shall be such as to avoid segregation of aggregate and displacement of the reinforcement. Troughs, pipes and chutes may be used as aids in placing concrete when necessary. Dropping the concrete a distance of more than five

feet, or depositing a large quantity at one point, will not be permitted. Concrete shall be placed upon clean, damp surfaces, free from running water, or upon properly consolidated soil.

2. Do not add water to concrete during delivery, at the Project site, or during placement, unless approved by the Engineer of Record.
3. Before placing concrete, and if agreed upon by the Engineer of Record, water may be added at the Project site, subject to the limitations of ACI 301.
   a. Do not add water to concrete after adding high-range water-reducing admixtures.
4. Retempering of concrete by adding water or any other material shall not be permitted.
5. Concrete placement, finishing and curing, and all other pertinent construction practices shall be in accordance with ACI 117 and ACI 301. In addition to the requirements of ACI 117 and ACI 301, the following shall apply:
   a. Concrete shall be placed so that a uniform appearance of surfaces will be obtained.
   b. Concrete shall be placed and consolidated free of rock pockets, honeycombs, and voids.
   c. Concrete shall be deposited as nearly as practicable in its final position, to avoid segregation due to rehandling or flowing, and shall not be subjected to any procedure that will cause segregation.
   d. Concrete shall be placed and consolidated in walls in approximately 18-inch layers, proceeding at a uniform rate or per the form designer's recommendation.
   e. Subgrade shall be slightly moist when the concrete is placed for floor slabs, to prevent excessive loss of water from the concrete mix.

B. Consolidating:
1. Consolidate concrete with suitable mechanical vibrators operating within concrete. When necessary, vibrating shall be supplemented by hand spading with suitable tools to assure proper and adequate consolidation. Vibrators shall be manipulated so as to Work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any joint shall be of sufficient duration to accomplish consolidation but shall not be prolonged to the point where segregation occurs.
2. Employ as many vibrators and tampers as necessary to secure the desired results. For every two vibrators required for the job, an additional standby vibrator shall be kept on the site. Do not place subsequent layers of concrete until the previous layer has been consolidated as specified. Internal vibrators shall have a minimum frequency of 8000 vibrations per minute when immersed in concrete and shall have sufficient amplitude to effectively consolidate the concrete.
3. Prevent the following practices:
   a. Pushing of concrete with vibrator.
   b. External vibration of forms.
   c. Allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete.
   d. Allowing vibrator to vibrate against the contact faces of forms.

C. Cold Weather: Do not place concrete when the ambient temperature is below 40°F, unless specifically authorized by the Engineer. Conform to the requirements of ACI 306R during cold weather.

D. Hot Weather: Do not place concrete with a mix temperature exceeding 90°F, unless specifically authorized by the Engineer. Conform to the requirements of ACI 305R during hot weather.

E. Construction Joints:
   1. When the placing of concrete is suspended, necessary provisions shall be made for joining future Work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, such provisions shall be made for grooves, steps, keys, dovetails, reinforcing bars or other devices as may be prescribed. Before depositing new concrete against concrete which has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout. Install joint sealant where shown on the Drawings, in accordance with manufacturer's instructions.
   2. Joints shall be perpendicular to the main reinforcement.
   3. Construction joints in floors shall be located within the middle third spans of slabs, beams, and girders.
   4. Expansion and Control Joints: Expansion and control joints shall be constructed in the locations and to the dimensions and details shown on the Drawings.

F. Defective Work:
   1. All defective Work disclosed after the forms have been removed shall be immediately removed and replaced. If dimensions are deficient, or if the surface of the concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Engineer cannot be repaired satisfactorily, the entire Section shall be removed and replaced at no cost to the Owner.
   2. Other Work considered to be defective includes, but is not limited to, the following:
      a. Concrete in which defective or inadequate steel reinforcement has been placed.
      b. Concrete incorrectly formed, or not conforming to details and dimensions on the Drawings or with the intent of these documents, or the concrete surfaces of which are out of plumb or level beyond specified tolerances.
      c. Concrete below specified strength.
      d. Concrete containing wood, cloth, or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the Drawings.

3.04 CONCRETE FINISHING

A. Exposed concrete surfaces shall be true, smooth, and free from open or rough spaces, depressions, or projections. The concrete in horizontal plane surfaces shall be brought flush with the finished top surface at the proper elevation and shall be struck off with a straightedge and floated. Mortar finishing will not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

B. Following placement of concrete for slabs and floors, tamp to force coarse aggregate away from surface, bull float, and steel trowel. Floor areas designated to receive a floor coating shall receive a finish as recommended by the coating manufacturer. Steel trowel finish shall be provided for surfaces that will receive flooring and all exposed floor areas.

C. Overall conformance to design grade shall be within ¾" of design elevation.

D. The following requirements shall govern concrete finishes so indicated on the Drawings.
   1. Float Finish: Force coarse aggregate away from surface; float to a smooth and even surface.
   2. Trowel Finish:
      a. After floating, begin the first trowel finish operation using a power-driven trowel; begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.
      b. Do not over-trowel or start troweling late.
      c. Consolidate the concrete surface by the final hand troweling operation, free from trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10'-0" when tested with a 10'-0" straight–edge.
   3. Apply nonslip broom finish to exterior concrete as specified, immediately after trowel finishing; roughen the concrete surface by brooming in the direction perpendicular to the main traffic route.
      a. Use a fiber bristle broom.
      b. Frequently clean broom to avoid deep brooming.
   4. Finishing Formed Surface:
      a. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or Concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.
      b. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampprooofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projects, completely removed and smoothed.
      c. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than one (1) day after form removal.
         1) Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do no apply cement grout other than that created by the rubbing process.
      d. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.
         1) Combine one part Portland Cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard Portland Cement and white Portland Cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
         2) Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with

clean burlap. Keep damp by fog spray for at least thirty-six (36) hours after rubbing.

e. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar uniformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent uniformed surfaces unless otherwise indicated.

E. Monolithic Slab Finishes

1. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
   a. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
2. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
   a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using gloat blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
3. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or thinset quarry tile, paint, or another thin film-finish coating system.
   a. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final toweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-toweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 25 (floor flatness) and F(L) 20 (Floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
4. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately flow by slightly scarifying the surface with a fine broom.
5. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   a. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
6. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, sloped walks.
   a. After completing float finishing and before starting trowel finish, uniformly spread 25 lbs. Of dampened non-slip aggregate per 100 sq. ft. of surface.

Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.

b. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose non-slip aggregate.

3.05 CURING AND PROTECTION

A. Initial Curing: All concrete shall be properly cured and protected in accordance with ACI 308. Maintain concrete above 50 degrees F during first seven days after placing. The Work shall be protected from the elements, flowing water, and from defacement of any nature, during construction. The concrete shall be cured as soon as it has sufficiently hardened, by covering with an approved material. Water-absorptive coverings shall be thoroughly saturated when placed, and kept saturated for a period of at least seven days. Curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Where wooden forms are used, they shall be kept wet at all time until removed, to prevent the opening of joints and drying out of the concrete. Membrane curing compounds shall be coordinated with the surface to be painted, covered with plaster, covered with sealer, and other surfaces which curing compound would adversely affect subsequent construction.

B. Duration of Curing: The final curing shall continue until the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50°F, has totaled 7 days beyond the initial curing period.
   1. If high-early strength concrete has been used, the final curing shall continue for a total of 3 days beyond the initial curing period.
   2. Rapid drying at the end of the curing period shall be prevented.

C. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the curing period shall be kept wet.
   1. If forms are to be removed during the curing period, one of the specified curing materials or methods shall be employed immediately.
   2. Such curing shall be continued for the remainder of the curing period.

3.06 CONCRETE SURFACE REPAIRS

A. General: Any defective Work disclosed after removal of forms shall be immediately removed and replaced. If in the opinion of the Engineer, the surface of the concrete cannot be repaired satisfactorily, the entire Section shall be removed and replaced at no additional expense to the Owner.

B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Engineer.

C. Cut out honeycomb, rock pockets, voids over 1” in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1”. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

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

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

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

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

H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. 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.

I. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

J. Perform structural repairs with prior approval of the Engineer for method and procedure, using specified epoxy adhesive and mortar.

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

3.07 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Program of Structural Test and Inspections of cast-in-place concrete work will be established by the Structural Engineer of Record (SER) who will direct the implementation of tests as carried out by an Independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in mill, shop, and/or filed by the SER and/or Testing Agency. Such inspection and testing shall not relieve the Contractor of his responsibility to

provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.

B. The General Contractor shall notify the SER and the Testing Agency prior to start of any phase of concrete work so as to afford them reasonable opportunity to inspect the work. Such notification shall be made at least 24 hours in advance.

C. 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; one for each day's pour of each type of air-entrained concrete.
   3. Concrete Temperature: Test hourly when air temperature is 40°F and when 80°F and above; and each time a set of compression test specimens are required.
   4. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. 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.
      a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches if fewer than 5 are used.
      b. When total quantity of a given class of concrete is less than 50 cu. yds, strength test may be waived by the Engineer if, in his judgment, adequate evidence of satisfactory strength is provided.
      c. 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.
      d. Strength level of concrete will be considered satisfactory if both of the following requirements are met:
         1) Every arithmetic average of any three consecutive strength tests equals or exceeds the specified 28-day compressive strength (f'c).
         2) No individual strength test results falls below the specified 28-day compressive strength (f'c) by more than 500 psi when f'c is 5000 psi or less; or by more than 0.1 x f'c when f'c is greater than 5000 psi.

D. Test results will be reported in writing to the Engineer 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 and 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.

E. 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.

F. Additional Tests: The Contractor's Independent testing service shall 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 the

Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

G. Concrete Moisture Vapor Reduction Admixture (MVRA) Requirements: A representative or agent of the MVRA manufacturer must be present at the jobsite during placement of all MVRA treated concrete. Do not proceed without this representative being present. The General Contractor is to notify the manufacturer, and make available to the site and batching plant for tests, inspection, and recommendations pertaining to the product.

END OF SECTION

SECTION 03 6000
GROUTING

PART 1 - GENERAL

1.01 SCOPE

A. This Section specifies the furnishing and installing non-shrink grout for pump, motor, and equipment base plates or bedplates; column base plates and miscellaneous base plates; and other uses of grout as indicated on the Drawings. Unless otherwise specified, all grouting shall be done with non-shrinking grout.

B. This section also specifies furnishing and installing two component epoxy systems for grouting of anchor bolts, threaded rod anchors, and reinforcing bars to be installed in hardened concrete and masonry. Anchor bolts, adhesive anchors, and threaded rod anchors are covered in Section 05 5000, Miscellaneous Metals.

1.02 SUBMITTALS

A. Submit Certificate of Compliance of products with these specifications.

B. Submit the following in accordance with the requirements as specified in Section 01 3300, SUBMITTAL PROCEDURES.
   1. Manufacturer's printed data and literature for all specified materials and locations where materials are to be used.
   2. Manufacturer's installation/application instructions.

1.03 QUALITY ASSURANCE

A. Provide in accordance with the requirements as specified in Section 01 4500, QUALITY CONTROL.

B. Ensure surfaces to be grouted are clean and sound and are not feathered at edges.

C. Handle grout as concrete with regard to temperature and curing as specified in Section 03 3000, Cast-in-Place Concrete.

D. Observe safety precautions as outlined in the manufacturer's literature and as printed on containers and labels.

PART 2 - PRODUCTS

2.01 NON-SHRINK CEMENT

A. Provide non-shrink, non-metallic cement-based grout requiring only addition of water with a minimum 28-day compressive strength of 6000 psi.

B. Provide shrinkage and compensation characteristics in both the plastic and hardened states, conforming to ASTM C-1107, Grade C.

C. Grout shall exhibit small but predictable amount of expansion sufficient to counteract the normal shrinkage of cement.

D. The expansion shall occur after initial set to insure maximum contact between grout and base plates, beams, masonry, or other surfaces.

E. Manufactured by:

1. "Five Star Grout" by U.S. Grout Corp.
2. "Sika Grout 212" as manufactured by Sika Corporation.
3. Masterflow 928 Grout by Master Builders, Inc.
4. Or approved equal.

2.02 EPOXY GROUT FOR REINFORCING BARS AND THREADED ROD ANCHORS

A. Epoxy bonding/grouting adhesive shall be a multi-purpose 2 component, 100% solids, moisture tolerant structural epoxy adhesive conforming to the current ASTM C881 specifications.

B. Manufactured by:

1. "Concresive 1420" as manufactured by Master Builders, Inc.
2. "Sikadur 32, Hi Mod" by Sika Corporation
3. "Resi-Bond (J-58)" by Danton Superior
4. Or approved equal.

PART 3 - EXECUTION

3.01 NON-SHRINKING GROUT

A. Non-shrinking grout shall be furnished factory premixed so that only water is added at the jobsite. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout.

B. Preparation

1. The concrete or masonry surfaces to receive nonshrinking grout shall be saturated with water for at least 12 hours preceding grouting unless additional time is required by the grout manufacturer. Remove all standing water or puddles prior to application of grout.
2. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles and disintegrated materials by mechanical abrasion methods such as sandblasting. Sandblast structural and reinforcing steel to remove loose material and expose sound metal.
3. Construct appropriate sturdy forms to contain grout at the fluidity level at which it will be used.

C. Placement

1. Unless otherwise specified or indicated on the drawings, grout under base plates shall be ¾-inches thick.
2. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the top of base plates and bedplates are completely filled, without voids.
3. Forms shall be provided where structural components of base plates or bedplates will not confine the grout.
4. Place grout only from one side of base plates to avoid entrapping air. Provide adequate air vent holes in large base plates. Work or flow into place, filling all cavities.
5. Reinforce grout pads or applications three inches or more in thickness with wire mesh or reinforce bars.
6. Excessive means of vibration may cause segregation of aggregates and will not be permitted.

D. Edge Finishing

1. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the base plates, bedplates, members, or pieces of equipment.

E. Curing

1. Nonshrinking grout shall be protected against rapid loss of moisture by covering with wet clothes or polyethylene sheets. After edge finishing is completed, the gout shall be wet cured for at least 3 days and then an acceptable membrane-curing compound shall be applied.

3.02 EPOXY GROUT

A. Epoxy grout shall consist of a two-component liquid epoxy adhesive of viscosity appropriate to the location and application, and an inert aggregate filler component, if recommended by the adhesive manufacturer. Components shall be packaged separately at the factory and shall be mixed immediately before use. Proportioning and mixing of the components shall be done in accordance with the manufacturer's recommendations.

B. Preparation

1. Where indicated on the drawings, anchor bolts, threaded rod anchors, and reinforcing bars shall be epoxy grouted in holes drilled into hardened concrete. Diameters of holes shall be as follows:

Item	Diameter of Hole
Reinforcing Bars and Threaded Rod Anchors	1/8 inch larger than the outside diameter of the bar of the rod
Headed Anchor Bolts	Bolt diameter plus 2 inches

2. The embedment depth for epoxy grouted anchor bolts, threaded rod anchors, and reinforcing bars shall be at least 15 bolt, rod, or bar diameters, unless otherwise indicated on the drawings.
3. Holes shall be prepared for grouting as recommended by the grout manufacturer.

C. Installation

1. Anchor bolts, threaded rod anchors, and reinforcing bars shall be clean, dry, and free of grease and other foreign matter when installed.
2. The bolts, rods, and bars shall be set and positioned and the epoxy grout shall be placed and finished in accordance with the recommendations of the grout manufacturer.
3. Care shall be taken to ensure that all spaces and cavities are filled with epoxy grout, without voids.
4. During assembly of all threaded stainless steel components, anti-seize thread lubricant shall be liberally applied to the threaded portion not embedded in concrete.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions apply to the Work of this Section.

1.02 SCOPE

A. Provide structural steel and related appurtenances as indicated and specified. The term "Structural Steel" is used as defined in accordance with the AISC Code of Standard Practice. For steel decking systems, refer to the steel decking specification.

1.03 REFERENCES

A. American Institute of Steel Construction AISC:

1. Specification for Structural Steel Buildings
2. AISC Manual of Steel Construction, Allowable Stress Design, 13th Ed.
3. AISC Code of Standard Practice for Steel Buildings and Bridges
4. AISC Specification for Structural Joints using ASTM A 325 or A 490 Bolts approved by the Research Council on Structural Connections.
5. AISC Structural Steel Detailing Manual

B. American Welding Society AWS.

1. AWS D1.1: Structural Welding Code - Steel

C. Steel Structures Painting Council (SSPC) Surface Preparation Specifications

D. American Society for Testing and Materials (ASTM) Publications:

1. A 6/A 6M: Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
2. A 36/A36M: Specification for Carbon Structural Steel.
3. A 194/A 194M: Specification for Carbon and Alloy-Steel Nuts for Bolts for High-Pressure and High-Temperature Service
4. A 307: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
5. A 325: Specification for Structural Bolts, Steel Heat Treated, 120/105 ksi Minimum Tensile Strength
6. A 449: Specification for Quenched and Tempered Steel Bolts and Studs
7. A 563: Specification for Carbon and Alloy Steel Nuts
8. F 436: Specification for Hardened Steel Washers

1.04 DESIGN REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer registered in the State of Rhode Island to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.05 SUBMITTALS

A. Submit the following shop drawings:

1. Manufacturer's Literature: Provide manufacturer's literature describing standard items.
2. Shop drawings prepared under the supervision of a licensed Structural Engineer registered in Rhode Island, showing materials, sizes, finishes, locations, attached hardware and fittings, designs of connections not specifically shown on the drawings, and details for manufactured items and fabricated metalwork, including field erection details showing cuts, copes, connections, holes, thread fasteners and welds. Indicate welds, both shop and field, by symbols conforming to AWS standards. Indicate coatings or other protection against corrosion.
3. Setting diagrams, erection plans, templates, and directions for installation of backing plates, anchors, and other similar items.
4. Material compliance certification with standards designated.
5. Samples of materials proposed for use.
6. Test reports conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.
7. Certified copy of each survey conducted by a licensed Land Surveyor showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations of major structural elements. Indicate discrepancies between actual installation and contract drawings.
8. Mill Certificates: Provide certificates signed by manufacturers certifying compliance of materials with standards designated.
9. Welding Certificates: Submit copies of certificates for welding personnel and procedure for each type of weld prior to welding.
10. The Contractor shall maintain records of test results of welding procedures and records of welders employed, date of qualification, and identification symbol or mark. Such records shall be available for examination by the Structural Engineer of Record and testing agency or submit certified copies.

1.06 QUALITY ASSURANCE

A. Tolerances:

1. Maintain tolerances conforming to AISC Code of Standard Practice.
2. Permissible variation tolerances conforming to ASTM A 6.

B. Tension Calibrator:

1. Employ an independent testing laboratory to calibrate and confirm the accuracy of the tension-measuring device when slip-critical connections and connections subject to direct tension are being used.
2. The calibrating device for setting calibrated torque wrenches shall be checked for accuracy by quality personnel not more than 30 days prior to its first use on the project, and at intervals not more than six months thereafter.
3. If the Engineer has reason to question the accuracy of the calibrating device, he may require that it be returned to the manufacturer for certification of its accuracy.
4. Provide tension calibrator measuring device at the job site when high-strength bolts in slip-critical connections and connections subject to direct tension are being installed and tightened.
5. Frequency and number of confirmation tests to be performed and the test procedure to be employed to conform to the AISC Specification for Structural Joints.
6. Return tension calibrator measuring device to the independent laboratory for certification if the Engineer questions its accuracy.
7. Use the tension calibrator-measuring device to tighten high-strength bolts in slip-critical connections and connections subject to direct tension in conformance with Table 051200-1 (Section 8(d). AISC Specification for Structural Joints using ASTM A325 or A490 bolts).

Table 051200-1.
Fastener Tension Required for Slip-Critical Connections and Connections Subject to Direct Tension

Nominal Bolt Size (inches)	Minimum Tension	
	A 325 Bolts (kips)	A 490 Bolts (kips)
½	12	15
5/8	19	24
¾	28	35
7/8	39	49
1	51	64
1 1/8	56	80
1 ¼	71	102
1 3/8	85	121
1 ½	103	148

C. Fabricator Qualifications:

1. Engage a firm experienced in fabricating structural steel similar to that indicated for this project and with a record of successful in-service performance, as well as, sufficient production capacity to fabricate structural steel without delaying the work.
2. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
   a. Category: Standard for Steel Building Structures (STD).

b. Fabricator shall be registered with and approved by authorities having jurisdiction.

D. Welding Qualification and Certification

1. Furnish written welding procedure for all welds in conformance with AWS Structural Welding Code.
2. Each welder, tacker and welding operator shall be certified by test within the past six months to perform type of work required in conformance with AWS Structural Welding Code. Testing shall be conducted and witnessed by an independent testing laboratory.
3. Maintain duplicate qualification and certifications records at the job site readily available for examination.

E. Test and Inspection

1. Inspection, Testing and Quality Control: A state of special inspections will be established by the Registered design professional in responsible charge who will direct the implementation of tests as carried out by an independent testing agency. All costs for inspection and testing shall be borne by the Owner.
2. The materials and workmanship to be finished under this Section shall be subject to inspection and testing in the mill, shop, and field by the Registered design professional in responsible charge and/or Testing Agency. Such inspection and testing shall not relieve the contractor of his responsibility to project his own inspection and quality control and to furnish materials and workmanship in accordance with the requirements of the contract documents.
3. The Contractor and Testing Agency shall examine the contract documents and become thoroughly acquainted with detailed inspection and testing requirements as outlined by the Registered design professional in responsible charge.
4. The Contractor shall cooperate with and facilitate inspection and testing by the Registered design professional in responsible charge and/or Testing Agency. The Contractor shall, at his own expense, furnish the registered design professional in responsible charge and/or the Testing Agency upon request, with the following:

    a. A complete set of reviewed erection drawings, detailed shop drawings, schedules, and corrective work procedures at the fabricating shop or shops in the field.
    b. Cutting list, order lists, material bills, and shipping lists.
    c. Information as to time and place of all rollings and shipment of material to shops.
    d. Representative sample pieces requested for testing.
    e. Assistance for testing materials and proper facilities for inspection of the work, in the mill, shop, and field.

5. The Testing Agency shall inspect and test, as required by the registered design professional in responsible charge, all welded and bolted work.

a. Shop-Bolted Connections: Inspect or test in accordance with AISC Specifications.
b. Shop Welding: Inspect and test during fabrication of structural steel assembled, as follows:
   1) Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2) Perform visual inspections of all welds.
   3) perform test welds as follows. Inspection procedures listed are to be used at Contractor's option.
      a) Liquid Penetrate Inspection: ASTM E 165
      b) Magnetic particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
      c) Radiographic Inspection: ASTM E94 and ASTM E 142; minimum qualify level "2-2T."
      d) Ultrasonic Inspection ASTM E 164.

6. Weldments and bolted connections that are required by the registered design professional in responsible charge and/or the Testing Agency to be corrected shall be corrected without delay at the Contractor's expense and to the satisfaction of the registered design professional in responsible charge of the Testing Agency shall require drawings showing proposed corrective work to be submitted for review.
7. Any material or workmanship which is rejected by the registered design professional in responsible charge and/or the Testing Agency either in the mill, shop, or field shall be replaced promptly by the Contractor to the satisfaction of the registered design professional in responsible charge and/or the Testing Agency.
8. The fact that steel work has been accepted at the shop shall not prevent its final rejection at the job site, even after it has been erected, if found to be defective in any way.

1.07 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with the general equipment stipulations section and as specified herein.

B. The General Contractor, Sub-Contractors, and suppliers are all individually to furnish their own staging, scaffolding, and hoisting equipment necessary to get workers, materials, and equipment from the point of delivery at the project site to the point of use or installation within the building and project site. All crane and rigging services are the responsibility of each individual trade.

C. Identify and match-mark, materials, items and fabrications, for installation and field assembly.

D. Deliver items to job site as complete units, wherever practicable, ready for installation or erection, with anchors, hangers, fasteners and miscellaneous metal items required for installation. Items shall be delivered at such intervals to ensure uninterrupted progress of work.

E. Carefully handle and store materials, protected from weather, high heat, rusting corrosion and other damage.

F. Store material off the ground by using pallets, platforms, or other useable supports with webs of flanged shapes vertical. Materials shall be stored to allow easy access for inspection and identification. Cover and protect steel from erosion and deterioration from snow, rain, and ground splatter.

G. Ship small parts, such as rivets, bolts, nuts, washers, pins, fillers, and small connecting plates and anchors, in boxes crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark and itemized list and description of the contents on the outside of each container. If bolts and nuts become dry and rusty, clean and relubricate before use.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural Steel Shapes:

1. High-Strength, Low-Alloy Steel: ASTM A 992 (ASTM A992M), Grade 50.

B. Miscellaneous Plates and Bars:

1. Carbon Steel: ASTM A 36 (ASTM A36M).

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

1. Items to be galvanized shall be hot-dip galvanized after fabrication in accordance with ASTM A123 or ASTM A153 as applicable.

2.02 FASTENERS

A. Carbon Steel Bolts, Nuts and Washers: ASTM A 307, Grade A.

B. High-Strength Carbon Steel Bolts, Nuts and Washers: ASTM A 325, Type 1.

C. Hot-Dipped Galvanized Bolts, Nuts, and Washers in conformance with ASTM A 153 and A 385.

1. High-strength carbon steel bolts, Type 1.
2. Grade DH, ASTM A 563 or Grade 2H, ASTM A 194 nuts.
3. Hardened washers in conformance with ASTM F 436.
4. Bees wax lubrication for threaded parts of bolts and nuts.
5. Purchase bolts, nuts and washers from a single supplier.

D. Do not use high-strength tension control bolts when bolts are galvanized.

2.03 WELDING

A. Class E70XX electrodes.

B. Provide equipment for welding, electrodes, welding wire and fluxes capable of producing indicated welds when used by certified welders under AWS welding procedures. Provide welding materials that comply with requirements of AWS Structural Welding Code.

2.04 PRIMERS

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another. GC shall submit certification demonstrating compatibility.

B. Primer: Comply with Division 9 painting Sections. Apply in accordance with manufacturer's written instructions and recommendations.

PART 3 - EXECUTION

3.01 FABRICATION

A. Fabricate each element and connection as indicated on the fabrication shop drawings approved by the Engineer. Fabricate and shop assemble work to the greatest extent practical in conformance with the following publications:

1. AISC Manual
2. AISC Specification for Structural Joints
3. AISC Detailing Manual
4. AWS Structural Welding Code

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings burrs, and other defects.

D. Insure that shearing, manual flame cutting with mechanically guided torch and chipping will not induce residual stress in metal being cut the Radii of re-entrant corners shall not be less than ¾ inch and perform flame cutting so that metal being cut is not carrying stress. Finish exposed edges.

E. Fabricate bearing stiffeners and stiffeners intended as supports for concentrated loads as indicated. Mill or grind bearing surfaces at stiffener ends.

F. Insure full cross section bearing on milled ends of columns, crane rails, monorails and bearing stiffeners.

G. Connections: Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated.
   1. Provide high strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
   2. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

H. Connect all members with ASTM A 325 high strength bolts unless otherwise indicated or specified. Install in accordance with AISC "Specifications for structural Joints using ASTM A325 or ASTM A490 Bolts". Provide clean-out holes without torn or ragged edges and remove all outside burrs.

I. Welded Connections:

   1. Connections indicated or specified shall be welded in accordance with AWS D1.1.
   2. Provide complete weather seal weldments made with 1/16-inch minimum continuous fillets to all members having Type S and E service and to all welded connections that will be galvanized.

J. Weld or bolt shop connections in conformance with specified AWS Structural Welding Code and AISC publications.

K. Provide ASTM A 36 anchor bolts with washer and heavy hex nuts. Provide hot-dip galvanized anchor bolts, washers and heavy hex nuts with galvanized steel.

L. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

M. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

N. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes for bearing plates.

O. Corrective Work: Structural steel members or assemblages having fabrication errors, which exceed permissible tolerances, shall be corrected only if permitted by the SER. All corrective work shall be in accordance with AISC and AWS requirements. When requested by the SER or Testing Agency, the Contractor shall submit to the Architect and/or SER for approval, drawings showing details of proposed corrective work and shall receive approved drawing prior to performing the corrective work. All corrective work shall be solely at the Contractor's expense.

3.02 ERECTION

A. Survey: GC shall employ a licensed Land Surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and

locations of anchor bolts and similar devices, before erection work proceed. Report any discrepancies to the Architect and do no proceed with erection until corrections have been made or until adjustments to the structural steel work has been agreed upon the Architect.

B. Prior to setting column bases and bearing plates, clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates. Align column bases and bearing plates for beams and similar structural members with steel wedges or shims. Tighten anchor bolts after alignment and positioning members and fill entire area under bearing plates with non-shrink, non-metallic grout in accordance with grout section. Do not remove steel wedges or shims but if protruding, cut off flush with edge of base or bearing plate prior to grounding voids solids.

C. Provide anchor bolts and anchors with templates for correct placement into concrete, masonry or other supporting materials.

D. Hold steelwork securely in place with temporary bracing and stays to resist all vertical and lateral loads, until members are permanently fastened and floors and roofs completed. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Provide temporary planking or working platforms as necessary to effectively complete the work.

E. Use only calibrated wrenches for tensioning high-strength bolts for slip-critical joints and connections subjected to direct tension.

F. Inspect and torque test field-assembled bolted construction in conformance with AISC Specification for Structural Joints.

G. High-strength tension control bolting may be substituted for calibrated wrench bolting of slip-critical joints and connections subject to direct tension. Do not use high-strength tension control bolts when bolts are galvanized.

H. Set structural frames accurately to lines and elevations indicated. Align and adjust members forming parts of a complete assembly before permanent fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

I. Fasten splices (only where indicated and accepted on shop drawings) of compression members and members having milled ends after the abutting surfaces have been brought completely into contact.

J. Report errors in shop fabrication or deformation resulting from handling or transpiration immediately to Engineer. Replace and remove from job site incorrect fabricated or deformed material at no additional cost to the Owner.

K. Perform temporary bracing and bolting of work to support construction live load and combined dead, wind, earthquake and erection loads as erection progresses. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds. Leave bracing in place as long as necessary to provide safety.

L. Insure that holes are not enlarged and that metal in vicinity of holes is not damaged by drift pins during assembly.

M. Enlarge holes to admit bolts for connections only if approved in writing by the Engineer. Make enlargements only by drilling, avoid burning or hand reaming. Refinish enlarged holes with paint to match the shop coat. Use specific galvanize touch-up for galvanized members.

N. Flame cut bolt holes are not permitted.

O. Where erection bolts are abandoned in place, remove bolts, completely plug weld holes, grind smooth with adjacent surfaces and paint to match shop coat.

3.03 HIGH STRENGTH BOLTING

A. Provide workmanship and techniques for bolted construction in conformance with requirements of AISC Specification for Structural Joints and as indicated or specified.

B. Install ASTM A 325 bolts with hardened washer under element being turned in tightening. Install plate washers in both outer plies when using oversize and slotted holes. Install galvanized washer under bolt head and nut when using galvanized bolts.

C. Do not reuse high-strength bolts, nuts and washers.

3.04 WELDING

A. Provide workmanship and techniques for welded construction to conform to requirements of AWS Structural Welding Code and as indicated or specified.

B. No field welding permitted unless indicated on Engineer approved fabrication shop drawings.

C. No field welding permitted on galvanized steel.

3.05 REPAIRS AND PROTECTION

A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION

SECTION 10 7313

SHADE AWNINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes exterior surface mounted aluminum framed awning systems and fabric structures.

B. All work and materials must conform to applicable performance standards where referenced in the specifications.

1.02 SUBMITTALS

A. The following submittals shall be required by the awning supplier: Shop Drawings showing awnings in elevation, plan and section. Drawings shall include the following details:
   1. All frame dimensions including overall dimensions, module dimensions and fabric panel dimensions.
   2. Frame module labels
   3. Frame module connection details.
   4. Connection details.
   5. Material information.
   6. All other applicable information.

B. Samples: Furnish 12” x 12” of fabric and 12” sample of tubing with indicated color & finish.

C. Include engineering calculations showing wind load calculations when required by the building codes.

D. Shade Awning to have a logo or print determined by the Owner. The Contractor shall coordinate with the Architect and Owner for submittal requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer to have greater than 10 years’ experience.

B. The personnel manufacturing the metal awning frames must be certified welders.

1.04 WARRANTY

A. Awning System including installation shall be warranted for ten years. Aluminum frames and fabric attachment shall be warranted against defective material and workmanship for a period of five years by awning manufacturer. Fabrics shall be warranted by the fabric manufacturer for a minimum of ten years. Labor to replace defective fabric shall be guaranteed for one year.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Framework & Frame Components:
   1. Metal to be 6063-T5 aluminum or equivalent.
      a. Aluminum framing profiles shall be sized to withstand all live loads, dead loads, superimposed loads and transportation loads. Frame design shall also be subject to regional code restrictions.
      b. Fasteners shall be non-corrosive and non-staining. This includes all anchors, bolts, shims and accessory items.
   2. Style: Frame mounted, Flat panel per plan dimensions.
   3. Finish: Frame is to be painted to match awning fabric color.

B. FABRIC: Fabric to be Sunbrella 100% Acrylic fabric, as manufactured by Glen Raven Mills, Inc.
   1. Description: Woven fabric made of 100% acrylic fibers. These are solution-dyed fibers with a fluorocarbon finish.
   2. Typical Weight: Approximately 9.25 oz. per square yard.
   3. Width: per plans.
   4. Color: To be selected.
   5. Underside: Same as top surface - both sides alike.
   6. Excellent. Fabric will not support growth of mildew. Mildew growing on foreign matter attached to fabric is easily removed.
   7. Durability/Average Life Span: 10 years. (Depending on climate and proper care of fabric.)
   8. Water Repellence: Excellent.
   9. Sewability: Excellent.
   10. Heat Sealing: Can be heat sealed using equipment in accordance with manufacturer's specifications.

PART 3 - EXECUTION

3.01 SUBSTRATE PREPARATION

A. Awning fabricator shall furnish General Contractor with template of proposed mounting points to match shade structures frames.

3.02 AWNING FRAME FABRICATION

A. All framing members are to be joined by welding.

B. Each member is to be cut to an appropriate miter that provides a tight, clean fit.

C. Junctions are to receive no less than three welds per member. Welds are to be 1/4-inch fillet type, welded with 3/32-inch diameter 4043 aluminum welding rod. TIG (Tungsten Inert Gas) welding equipment is to be used to provide a cleaner, more penetrating weld.

D. Welds that interface with fabric panels are to be ground smooth and deburred so that no sharp edges come in contact with the fabric.

E. Finished frame modules shall be sized so that they can be transported in accordance with all national and regional transportation regulations.

3.03 FABRIC APPLICATION

A. Fabric is to be applied tight and is to be free of wrinkles, sagging, puckers, and punctures. All panels are to be equal in tension and quality.

3.04 INSTALLATION

A. Installations shall be structurally sound, and leak free. Awnings are to have no blemishes and are to meet local codes.

B. Fasteners are to be appropriate for the mounting substrate.

C. Fasteners shall be designed to resist the loads as per plans and attached to “c-channels” located on top of frames (See Plans).

D. Upon installation, awnings are to be clean and free of any substance that might discolor or damage surfaces. Written cleaning instructions are to be made available from the fabric manufacturer. Damaged fabric panels should be replaceable individually on the job-site.

END OF SECTION