

**ORLANDO EVENTS CENTER
REQUEST FOR QUALIFICATIONS
FOR
PROFESSIONAL SERVICE FIRMS
MARCH 10, 2008**

1.0 GENERAL INFORMATION:

- .1 **AGREEMENT:** Per the New Orlando Events Center Agreement dated Monday, 21-May 2007, between the City of Orlando ("City") and the Orlando Magic, Ltd. ("Team"), an affiliate of the Team, Events Center Development, LLC ("Developer"), will develop the design and construction of a new Orlando Events Center in downtown Orlando.
- .2 **LIST OF SERVICES:** In accordance with the Agreement, Events Center Development, LLC will retain through an open competitive procurement process the following Professional Services on the Events Center Project ("Project").

- .1 Threshold Inspection Firm
- .2 Construction Materials Testing and Inspection Firm

The [Professional Service Firms](#) shall provide professional services customary for a Project of this size and scope.

- .3 **EVENTS CENTER SITE:** The Project will be developed on the property generally located to the south of Church Street, north of South Street, west of South Hughey Avenue and east of South Division Street (the "Site").

2.0 DEFINITIONS AND INTERPRETATION

- .1 **RFQ DEFINITIONS:** Unless otherwise defined herein, the following words and phrases will have the following meanings:
- .1 **"City"** means the City of Orlando, Florida, a municipal corporation created and existing under the laws of the State of Florida.
- .2 **"City Construction Representative"** (CCR) means the representative appointed by the City to oversee its interests with respect to the Project.
- .3 **"Civil Engineer"** ("**Civil**") means a person or firm who designs and executes structural works that serve the general public; from one (1) foot inside the building line to the Project Limits, or greater if the utility connection points fall outside of the Project Limits.
- .4 **"Design Consultants"** means those consultants under contract to the Design Professional Team.
- .5 **"Design Professional"** means HOK SVE, a nationally recognized sports architecture firm leading the Design Team.
- .6 **"Design Professional Team"** means a nationally recognized sports architecture firm, a structural engineering firm, and a mechanical / electrical / plumbing / fire protection engineering firm.
- .7 **"Developer"** means Events Center Development, LLC.
- .8 **"Contractor"** means the Construction Manager at Risk (CM@R) and/or its subcontractors.
- .9 **"Events Center"** means a community sports and entertainment arena able to host events of local, regional, and national importance; concerts; family shows; professional and amateur

sports events, such as NCAA competitions, NBA and/or NHL, and AFL games; and other civic, political, community and not-for-profit events.

- .10 **“Project”** means the design, development, construction, and operation of a new Orlando Events Center in Orlando, Florida.
- .11 **“Team”** means the Orlando Magic, Ltd., the owner of the NBA team known as the Orlando Magic.
- .12 **“Professional Service Firms”** means a person or firm who is qualified to perform any or all of the services contained in section 1.2.
- .13 **“Special Inspector”** means a person or firm who performs the services as described in Attachment A – Threshold Inspection Firm Scope of Services.
- .14 **“Construction Materials Testing and Inspection Firm”** means a person or firm who performs the services as described in Attachment C – Construction Materials Testing and Inspection Scope of Services.

.2 SUBMISSION INSTRUCTION DEFINITIONS:

- .1 **Shall, Will, Must:** Indicates a mandatory requirement. Failure to meet these mandatory requirements may result in the rejection of the response to the RFQ as non-responsive.
- .2 **Should:** Indicates something that is recommended, but not mandatory. If the response fails to provide recommended information, developer may, at its sole option, ask the responder to provide the information or evaluate the response without the information.
- .3 **May:** Indicates something that is not mandatory, but permissible.

3.0 REQUEST FOR QUALIFICATIONS (“RFQ”) SPECIFICS:

- .1 **PROFESSIONAL SERVICE FIRMS RFQ:** A complete copy of the RFQ, and all amendments thereto, is posted and available on the Orlando Events Center website at www.OrlandoEventsCenter.com.
- .2 **POINT OF CONTACT:** Developer’s contact, address, voice/fax numbers, and email address are:

Events Center Development, LLC.
Attn: Bryan Burless
Project Engineer
8701 Maitland Summit Blvd.
Orlando, FL 32810
Phone: (407) 916-2615, Fax: (407) 916-2792
BBurless@TCCo.com

- .3 **INQUIRIES AND COMMUNICATION:** All inquiries, questions, or other correspondence by the responding firms must be submitted, in writing, via fax, mail, or email, to the Point of Contact no later than the close of business on March 21, 2008. Phone calls regarding this RFQ, other than to the Point of Contact are prohibited during this RFQ response period.
- .4 **AMENDMENTS:** This RFQ shall be modified only by a written amendment issued by the developer. It is the responsibility of the proposers to verify in their cover letters that they have received and incorporated into their responses, all changes due to amendments issued to this RFQ.

4.0 INTRODUCTION:

- .1 **Program Description:** The Events Center will include (i) capacity of approximately 18,500 seats (including all premium seats) expandable to, and with services for, 20,000; (ii) premium seating initially consisting of suites, loges and club and other premium seats; (iii) amenities and facilities that may include, among other things, retail spaces (both internal and with street access), restaurants, concessions facilities, internal and external message, video and score boards, Team and City administrative offices, broadcast facilities, meeting and club spaces for the Team, locker rooms, signage, maintenance and storage areas, and walkways around the Project; (iv) media-related facilities; (v) a practice basketball court and related facilities; (vi) ice-making plants and facilities; (vii) the Team and NBA visiting team locker rooms, feature talent dressing rooms, officials rooms, and at least two (2) additional auxiliary locker rooms; (viii) an events center reduction curtain system; (ix) other traditional back of house elements; and (x) on-site development, including landscaping, streetscaping and all utility connections for the Events Center. The Project will contain such fixed elements as are reasonably necessary to host arena football, indoor soccer, indoor lacrosse, national events, and touring shows, that are booked at other Events Centers.

The Events Center will be constructed to accommodate events of local, regional or national importance; concerts; family shows; professional and amateur sports events, such as NCAA competitions; the home games of the Orlando Magic NBA team; the home games of the Orlando Predators AFL team; and other civic, political, community and not-for-profit events.

- .2 **COMPARABLE FACILITIES:** Developer and City intend to construct, within a pre-established cost/budget limitation, an Events Center that is comparable in size, scope and quality, taken as a whole, to the first-class Events Centers recently constructed in Charlotte, Indianapolis, Memphis and San Antonio ("Comparable Facilities").
- .3 **BLUEPRINT:** The Team and the Developer embrace the goals of offering business opportunities to all segments of the community, and will work with the City to accomplish the goals contained within the Blueprint for Using Community Venues to Create a Sustainable Economic Impact (the "Blueprint"), approved by the City Council on 21 May 2007, and which can be located at <http://www.cityoforlando.net/elected/venues/> and clicking on the link at the bottom right of the web page. Applicable portions of the Blueprint will be incorporated into the [Professional Service Firm's](#) contractual agreements with the Developer.
- .4 **MBE/WBE:** The Developer will require the entities awarded contracts as a result of the RFQ process to agree to comply with the minority business enterprise and women-owned business enterprise requirements of Chapter 57 of the City of Orlando Code, make good faith efforts to meet the participation goals, and cooperate with the City and Developer in their local business economic development efforts. It is the responsibility of the proposers to read and become familiar with the requirements of Chapter 57 of the City of Orlando Code, which can be located at www.cityoforlando.net/admin/mbe/chapter57.html. Developer will use the participation goals of 18% MBE and 6% WBE. Only City of Orlando or Orange County, Florida's (pursuant to a certification process acceptable to the City) certified / recognized MBE/WBE firms will count towards the achievement of the participation goals.
- .5 **EQUAL OPPORTUNITY EMPLOYER:** Developer is an Equal Opportunity Employer. The firms awarded agreements as a result of this RFQ agree to adhere to a policy of equal employment opportunity and demonstrate an affirmative effort to recruit, hire, promote, and upgrade the position of employees regardless of race, color, religion, ancestry, sex, age, disability, national origin, sexual orientation, gender identity, or marital status.
- .6 **LIVING WAGE:** The firms awarded agreements as a result of this RFQ, as well as its sub-consultants (first tier only), shall pay to all of their employees providing services pursuant to an agreement with Developer, a living wage for the time spent providing services to Developer. (This provision does not include general administrative personnel unless they are assigned to the Project.) "Living wage" means compensation for employment of not less than \$8.50 per hour for straight time, exclusive of FICA, unemployment taxes, and workers compensation insurance and employee benefits. Necessary payroll documentation shall be provided to confirm compliance with this provision or the firms awarded agreements shall allow Developer to audit (at the firms'

place of business) its payroll records to determine if compliance has been achieved. Failure to comply with the provision may result in termination of the agreement.

5.0 **PROPOSED PROJECT TIME TABLE:**

- .1 REQUEST FOR QUALIFICATIONS RESPONSES:** Responses to this RFQ must be submitted not later than **3:00 p.m. EDST, on March 27, 2008** ("RFQ Response Date"). Failure to comply with any of the requirements of this RFQ may result in the proposal not being considered.
- .2 PROFESSIONAL SERVICE FIRMS SELECTION:**
- | | | |
|---|-----------------------|-----------|
| .1 Issue Professional Service Firms RFQ | | 10-Mar-08 |
| .2 Professional Service Firms RFQ Questions Due | 5:00 p.m. EDST | 21-Mar-08 |
| .3 Professional Service Firms RFQ Responses Due | 3:00 p.m. EDST | 27-Mar-08 |
| .4 "Short-List" Interview Date | | 10-Apr-08 |
| .5 Selected Firm Notified | | 14-Apr-08 |
- .3 DESIGN MILESTONES: (Dates are Approximate and Subject to Change)**
- | | | |
|--|--|-----------|
| .1 Design Development Complete/iGMP Documents Issued | | 25-Apr-08 |
| .2 Construction Documents Completed | | 31-Oct-08 |
- .4 CONSTRUCTION MILESTONES: (Dates Subject to Change)**
- | | | |
|--|--|-----------|
| .1 Construction Start | | 01-Aug-08 |
| .2 Construction Substantially Complete | | 31-Aug-10 |
| .3 Construction Duration | | 25 months |

6.0 **SCOPE OF SERVICES:**

Scopes of services are contained in the attachments to this RFQ.

7.0 **INSTRUCTIONS FOR SUBMISSION OF QUALIFICATIONS:**

- .1** It is the responsibility of the Professional Services Firms to examine the entire RFQ, seek clarification of any requirement that may not be clear, and check responses for accuracy before submitting a response.
- .2** Proposals submitted in response to the RFQ should be bound as a single submittal and organized into sections to facilitate review in a sequence consistent with the criteria listed in Section 8.0. Submittals should include one (1) original and nine (9) copies in a sealed envelope (and / or package) containing the proposing company's name and address on the outside of the package. The words "Sealed Response to the Orlando Events Center Professional Service Firms Request for Qualifications" shall be written on the package next to the proposing company's name and address.

8.0 **EACH SUBMITTAL MUST INCLUDE:**

- .1 COVER LETTER:** A cover letter that lists the lead contact person with contact information. The cover letter shall be submitted with an original ink signature by the person authorized to commit the firm to the information contained within the response to the RFQ. Please acknowledge the receipt and dates of all Addenda issued following the release of the RFQ.
- .2 GENERAL FIRM INFORMATION:** Please provide the following information, required within this section:
- .1 Firm:** Include a description of the firm's history and experience, and if the firm is a joint venture.

- .2 **Prior Experience:** Provide the proposing firm's prior experience with Long Span Structures, Events Centers, and/or Sports facilities and experience within the City of Orlando/Orange County/State of Florida.
- .3 **Insurance:** Provide a copy of a Certificate of Insurance with current limits of liability for commercial general liability, business automobile liability and professional liability insurance. If not disclosed in the Certificate of Insurance, include a statement as to all deductible amounts or self-insured retention amounts.
- .4 **Business Licenses:** Provide a statement warranting that all federal, state, and local registrations, licenses, and permits required for the operation of business conducted by the Professional Services Firms, as would be required to execute the commission contemplated by this RFQ, are current. Include state of Florida licenses for the Special Inspector all Special Inspector's Representatives.
- .5 **MBE/WBE:** If attempting to qualify as a MBE/WBE firm, provide documentation that verifies the firm is officially certified or recognized as a Minority Business Enterprise in the City of Orlando or Orange County, Florida.
- .6 **Resumes/Qualifications:** Firms shall submit resumes for all key staff that indicate their experience level, qualifications and a list of similar project performed.
- .7 **Proposer References:** Provide a list of at least three (3) references with contact names, phone numbers, and email addresses. The reference list should include contacts from the three (3) most recent, significant and completed (or under construction). References may be checked at the discretion of the Developer at any time.
- .8 **Firm's Approach:** Please describe the firm's understanding of the project and approach to performing the anticipated services, including the following:
 - Internal Quality Control Process
 - Plan for Controlling Costs
 - Labor Projections
 - Reporting Process
 - Communication Process
 - Plan for Staffing Redundancy (such as for night work, when primary assigned staff is sick or on vacation)
 - Invoicing Process
- .9 **Laboratory:** For scopes of work that require Laboratory Testing, the office that will perform the required Laboratory Testing Services shall be accredited (such as CMEC, AMRL, CCRL) for the work they perform. A copy of the accreditation and the location of the laboratory shall be included in the response to this RFQ.
- .10 **Sample Reports:** Firms interested in the Threshold Inspection Firm scope of services should submit sample threshold reports for structural steel and concrete work.

9.0 INTERVIEWS:

- .1 Interviews may be scheduled during the dates set forth in Section 5.2.4. A representative of Developer will call to confirm an exact time slot. Interviews will be held at the RDV Sportsplex, 8701 Maitland Summit Blvd., Orlando, FL 32810.

10.0 MISCELLANEOUS CONDITIONS:

- .1 **CONTACT WITH DECISION MAKERS:** Upon receipt of the RFQ, any contact and questions shall be directed through the Point of Contact identified in Section 3.2.

- .2 COST OF PREPARING RESPONSES AND ATTENDING INTERVIEWS:** Respondents to this RFQ, and those subsequently preparing for and participating in interviews, do so at their sole expense and risk.
- .3 DEVELOPER'S RESERVED RIGHTS:**
 - .1 Subsequent to the issuance of the RFQ, Developer reserves the right to: i) issue amendments / modifications to the RFQ; ii) request clarifications to any response by any firm / individual / organization; iii) waive any informality or irregularity; iv) negotiate modifications to proposals; and / or v) reject any and all qualifications, or portions thereof, received. No proposer is guaranteed the award of any of the Professional Services Firm Agreements.
 - .2 By responding to the RFQ and subsequent interview, the Professional Services Firms acknowledge the Developer's right to undergo this process with no commitment on its behalf that an Agreement will be offered to any respondent. The Developer reserves the right to request a Competitive Fee Compensation Proposal from the selected firm, to negotiate the proposed compensation and terms of the Agreement.
- .4 DEVELOPER'S RIGHT TO NEGOTIATE ANY AND ALL TERMS:** Nothing contained within the response to the RFQ or stated / asked in the interview is a concurrence by the Developer that such item will be considered or is inclusive within the eventual Agreement entered into with the selected firm, unless such item is specifically addressed / included in the respective Agreement.
- .5 PROPERTY RIGHTS:** All responses and materials submitted in response to this RFQ shall become the property of Developer.

11.0 ATTACHMENTS:

- .1 Attachment A:** Threshold Inspection Scope of Services dated 10-March-2008.
- .2 Attachment B:** Threshold Inspection Plan (Preliminary) dated 10-March-2008.
- .3 Attachment C:** Construction Materials Testing and Inspection Scope of Services dated 10-March-2008
- .4 Attachment D:** Testing Laboratory Services dated 10-March-2008

END OF REQUEST FOR QUALIFICATIONS

**ATTACHMENT A
THRESHOLD INSPECTION SCOPE OF SERVICES
ISSUED MARCH 10, 2008**

The Threshold Inspection Services will be based on the project's Threshold Inspection Plan. They are anticipated to include inspections of the following components:

A. GENERAL SCOPE OF SERVICES NARRATIVE:

- .2 Program Description:** The Events Center will include (i) capacity of approximately 18,500 seats (including all premium seats) expandable to, and with services for, 20,000; (ii) premium seating initially consisting of suites, loges and club and other premium seats; (iii) amenities and facilities that may include, among other things, retail spaces (both internal and with street access), restaurants, concessions facilities, internal and external message, video and score boards, Team and City administrative offices, broadcast facilities, meeting and club spaces for the Team, locker rooms, signage, maintenance and storage areas, and walkways around the Project; (iv) media-related facilities; (v) a practice basketball court and related facilities; (vi) ice-making plants and facilities; (vii) the Team and NBA visiting team locker rooms, feature talent dressing rooms, officials rooms, and at least two (2) additional auxiliary locker rooms; (viii) an events center reduction curtain system; (ix) other traditional back of house elements; and (x) on-site development, including landscaping, streetscaping and all utility connections for the Events Center. The Project will contain such fixed elements as are reasonably necessary to host arena football, indoor soccer, indoor lacrosse, national events, and touring shows, that are booked at other Events Centers.

The Events Center will be constructed to accommodate events of local, regional or national importance; concerts; family shows; professional and amateur sports events, such as NCAA competitions; the home games of the Orlando Magic NBA team; the home games of the Orlando Predators AFL team; and other civic, political, community and not-for-profit events.

- .3 Building Components Description:** It is anticipated that the structure will be supported on deep foundations, most likely consisting of auger-cast concrete displacement piles as well as driven piles, with concrete pile caps as well as spread footings at lower seating bowl and other areas of lighter loads. A conventional concrete slab-on-grade is anticipated for the ground floor (event level).

Typical elevated floor framing for the other levels (lower suite level, main concourse, club/loge, upper concourse, disabled seating mezzanine, and hockey press box) is currently designed as pan-formed, conventionally reinforced, cast-in-place concrete beams and girders supported by cast-in-place concrete columns. Floor slabs will be cast-in-place concrete.

The seating bowl structure is expected to be precast, prestressed, concrete tread and riser units supported on concrete raker beams. Raker beams at the lower portion of the lower bowl are precast concrete. Raker beams for the upper portion of the lower bowl and the upper bowl are cast-in-place concrete.

Design compressive strengths of cast-in-place concrete members are expected to range from 3,500 psi to 6,000 psi.

Framing at low roofs will consist of galvanized steel roof deck supported by steel beams and/or open web steel joists spanning between wide flange girders.

The long-span high roof structure consists of a system of one-way steel trusses, bracing trusses, and wide flange steel beams and/or open web steel joists supporting a galvanized steel roof deck. Truss connections are anticipated to be conventional shop-welded and field-bolted gussets. Rigging grid members and catwalk framing are located at the truss bottom chord level.

Miscellaneous composite floors and CMU walls are also expected.

Exterior curtainwalls and precast concrete panels are expected for the perimeter of the building.

A steel framed pedestrian bridge will span from the south edge of the Events Center over South Street and connect to the parking garage being developed by the City of Orlando. The bridge is expected to be fully enclosed and conditioned.

A steel framed, oval shaped, tower is located at the northeast corner of the Events Center. The tower is primarily surrounded by curtainwall and is approximately 120' tall.

Civil site work includes installation and backfilling of utility lines, hardscape work with cast-in-place concrete and a small asphalt pavement parking lot.



B. INCLUSIONS TO SCOPE OF WORK:

- .1 **Threshold Inspection Basic Services:** The Special Inspector (Threshold Inspector), or his authorized representatives, shall perform structural inspections on the building's structure load bearing components pursuant to a Structural Inspection Plan prepared by the Engineer of Record. The Special Inspector may not serve as a surrogate in carrying out the responsibilities of the Building Official, the Architect, or the Engineer of Record. The Contractor's contractual or statutory obligations are not relieved by any action of the Special Inspector. If required, the Special Inspector shall determine that a Professional Engineer who specializes in shoring design has inspected the shoring and re-shoring for conformance with the shoring and re-shoring plans submitted to the enforcing agency.

The Special Inspector shall submit daily reports on-site, as well as formal weekly reports describing the threshold inspection results. The formal weekly reports shall include a log of items found to be not in conformance with the project requirements and their status. The weekly reports shall be submitted to the building official as well as the CCR, Project's Developer, Structural Engineer, Architect, and CM@R. At the completion of the Project, after all noted non-conformance items have been addressed, the Special Inspector shall submit a signed and sealed letter in accordance with Section 553.79(7)a of the Florida Statutes stating the construction is in general conformance with the project documents.

- .2 **License to Practice Architecture or Engineering:** Any firm or individual desiring to provide Services must be certified or licensed as required by the City of Orlando and the State of Florida. A detailed list of appropriate licenses of the proposers must be included in the RFQ submission. This list shall include the jurisdiction, licensed person and license number.

Only Architects or Engineers certified by the State of Florida as Special Inspectors of Threshold Buildings can assume the responsibilities of a Special Inspector.

In addition to the certification by the State of Florida, the Special Inspector shall have a minimum of five years of experience in the inspection of the noted structural components.

.3 Inspections: The Threshold Inspection firm will provide Threshold Inspection Services during construction, as required by the project's Threshold Inspection Plan. The preliminary Threshold Inspection Plan has been included as Attachment B to this RFQ. The work may include, but is not limited to, inspections of the following:

- Auger Cast and/or Displacement Piles
- Driven Piles
- Reinforcing Steel
- Welded Wire Fabric
- Cast-In-Place Concrete
- Post-Tensioned Tendons
- Masonry Block
- Masonry Grout
- Masonry Mortar
- Mortar Joint Reinforcing
- Structural Steel
- Metal Decking/Studs
- Composite Floor Decks
- Precast Concrete
- Prestressed Concrete
- Drilled & Epoxied Anchors
- Periodic Off-Site Fabrication Shop Visits (if required)
- Materials Testing Reports Review

.4 Other potential Threshold Inspection Items: The following items may also be added at to this scope of work. Firms should include information on their ability to provide inspection services for the following items:

- .1 Secondary Structures, not a part of Walter P. Moore's design scope; such as beams, tubes, girts, intel angles, and inter-connecting bent plate connectors referred to as "spacers" (these may be welded and bolted)
- .2 Door Systems; fasteners sizes and spacing, strengths, tightness, etc
- .3 Pre-cast concrete panels; supports, sizes, spacing, welds, embeds, tolerances, thickness, etc.
- .4 Canopies, covered walkways, etc
- .5 Roof copings; such as fasteners, cleats, gage of metals, etc.
- .6 Curtain wall and storefront systems; such as fasteners sizes and strengths, embedded depth of fasteners and sizes, spacing, tightness, etc.
- .7 Punched opening window system fasteners, materials, etc.
- .8 Louvers

.5 Threshold Inspection Reports: The Threshold Inspection Firm shall furnish all labor, materials, equipment, etc. and perform the work for threshold inspection reports in accordance with the project's Threshold Inspection Plan. Work shall be performed under the supervision of a registered Threshold Inspector; and the reports shall be signed by a professional registered Threshold Inspector licensed in the State of Florida.

C. EXCLUSIONS FROM SCOPE OF WORK:

.1 Geotechnical Engineering

- .1 During the installation of foundation piles the Geotechnical Engineer will be employed and paid by the Developer to monitor load tests, drilling, and concrete placement; verify pile diameter and depth; and provide all other inspection of the piles. This scope of work will not be required from the Threshold Inspection Firm.
- .2 The Geotechnical Engineer shall be employed and paid by the Developer to monitor the sub-surface densification prior to the installation of any spread footings. This scope of work will not be required from the Threshold Inspection Firm.

.2 Materials Testing and Inspection

- .1 Construction Materials Testing and Inspection services, as detailed in Attachments C & D, will not be required from the Threshold Inspection Firm.

.3 Other Excluded Services

- .1 Inspection or testing of fireproofing.
- .2 HVAC Testing and Balancing.

D. Special Considerations:

- .1 The Threshold Inspection Firm will be required to comply with the requirements of the Construction Manager at Risk's safety plan at all times while on site.
- .2 The Developer will be implementing an Owner Controlled Insurance Program (OCIP). Participation in this program will be required.
- .3 The Threshold Inspection Firm will need to provide its own facilities on site.

END OF THRESHOLD INSPECTION SCOPE OF SERVICES

**ATTACHMENT B
THRESHOLD INSPECTION PLAN (PRELIMINARY)
ISSUED MARCH 10, 2008**

SECTION LIST

- I. GENERAL
- II. PROCEDURES AND SCHEDULES
- III. REPORTING
- IV. FOUNDATION – AUGERCAST/DISPLACEMENT PILES
- V. FOUNDATION – SPREAD FOOTINGS
- VI. FOUNDATION WALLS AND PITS
- VII. SLAB-ON-GRADE
- VIII. CONCRETE
- IX. REINFORCING STEEL
- X. STEEL STRUCTURE AND COMPOSITE METAL DECK
- XI. METAL ROOF DECK, BAR JOISTS, AND STEEL BEAMS
- XII. STEEL TRUSSES
- XIII. PRECAST CLADDING
- XIV. PRECAST STRUCTURE
- XV. REINFORCED CONCRETE MASONRY (CMU)

**THRESHOLD INSPECTION
SPECIAL INSPECTOR'S INSPECTION PLAN (PRELIMINARY)**

PROJECT: Orlando Events Center
DEVELOPER: Events Center Development, LLC.
ARCHITECT: HOK, SVE.
DATE: 03/03/08

I. GENERAL

- A. The Special Inspection Services as described herein will be retained by the Developer. The Contractor shall be familiar with the scope of the inspections that will be performed and also the requirements of the Contractor as described below, particularly regarding formwork design and inspections. The Developer will pay all costs of employing a special inspector, but the Special Inspector shall be responsible to the enforcement agency.
- B. The purpose of this Special Inspection Plan, as required by Chapters 471 and 553 of the Florida Statutes, is to provide specific inspection procedures and schedules so that the building can be adequately inspected for compliance with the permitted documents.
- C. The Special (Threshold) Inspector may not serve as a surrogate in carrying out the responsibilities of the Building Official, Architect, or Engineer of Record.
- D. This inspection does not relieve the Contractor of his responsibilities to carry out his own quality control inspections and testing. The Contractor's contractual or statutory obligations are not relieved by any action of the Special Inspector.
- E. Only Architects and Engineers certified by the State of Florida as Special Inspectors of Threshold Buildings can assume the responsibilities of a Special Inspector. The Special Inspector shall be permitted to send his or her duly authorized representative to the job site to perform the necessary inspections provided all required written reports are prepared by and bear the seal of the Special Inspector and are submitted to the enforcement agency
- F. In addition to the requirements of the Board of Building Codes and Standards, the Special Inspector shall have a minimum of five years of experience in inspection and actual design of similar structures (long span, concrete frame or arenas). The Special Inspector's Representative shall have a minimum of three years of experience in inspection of similar structures and shall be qualified by education or licensure to perform the duties assigned by the Special Inspector. The qualifications shall include licensure as a professional engineer or architect, graduation from an engineering education program in structural engineering, successful completion of the NCEES Fundamentals Examination, or registration as building inspector or general contractor.
- G. The Special Inspector's Representative must dedicate his time on-site to the inspection requirements of this plan. He shall not be required to perform other work on the project, including materials testing services.
- H. The Contractor shall cooperate with and assist the Special Inspector in performing his inspection duties as specified below. The Special Inspector and his Representative shall have free access to the Project at all times. The Contractor shall review this Plan and coordinate the schedule of work to accommodate the required inspections. The Contractor shall provide a minimum of twenty-four (24) hours notice to the Special Inspector for all inspections.

- I. The Special Inspector shall determine that a Professional Engineer, registered in the State of Florida, who specializes in shoring design inspects the shoring and reshoring during construction for conformance with plans submitted to the enforcing agency.
- II. PROCEDURES AND SCHEDULE
 - A. The Special Inspector shall perform site visits at a frequency determined by him to satisfy himself that the inspections are being performed by his on-site representative(s) in accordance with this plan.
 - B. The following minimum daily on-site inspection schedule shall be adhered to by the Special Inspector's Representative:
 1. Deep Foundations: A representative must be present a minimum of 2 hours per day to be generally familiar with the installation of the deep foundation that is being monitored by the geotechnical engineer.
 2. Cast-in-Place Concrete:
 - a. A representative must be present for a sufficient time prior to concrete placement to review reinforcement and shoring for conformance with the drawings.
 - b. Pile Caps, Spread Footings, and Grade Beams: A representative must be present full time during the placement of the first two major pours to be confident that the remaining pours will be executed properly, and then at the start of all other concrete placement.
 - c. Walls, Shearwalls, and Concrete Columns: A representative must check all reinforcement before vertical forms are placed and must periodically inspect 25% of the concrete placement as it occurs.
 - d. Concrete on Metal Deck: A representative must check the reinforcement before all concrete pours and must periodically inspect 25% of the concrete placement as it occurs.
 - e. Concrete on Horizontal Framework: A representative must check the reinforcement before all concrete pours and must be present during all concrete placement.
 3. Structural Steel: A representative must periodically inspect the work as described herein.
 4. Other Inspections: A representative must spend adequate time to thoroughly inspect the work as described herein.
 - C. The Contractor shall advise the Special Inspector in advance of construction schedules and planned operations in order to assure timely and appropriate inspection.
 - D. The Special Inspector shall cooperate with the Contractor and shall refrain from directing work, as this is expressly not part of the Special Inspection function.
 - E. The Special Inspector shall immediately alert the Contractor of all discrepancies and deviations from the Contract Documents. The Contractor shall, upon being informed by the Special Inspector, immediately cause to eliminate such discrepancies and deviations.
 - F. The Special Inspector shall call the Engineer once a week to discuss details on the project and to confirm he has reviewed all approved RFI's, FCR's, sketches, etc.

III. REPORTING

- A. The Special Inspector shall submit written reports to the enforcing agency having jurisdiction for the project each week during construction. In addition, the Special Inspector shall submit copies of his report to the Developer, Architect, Engineer and Contractor. The Report will describe construction progress for the week and all conditions that were not in compliance as described above. The report shall also state whether any measures were taken by the Contractor to correct these conditions. The report shall include an exceptions and corrections log with a required corrective action column for each non-conformance item.
- B. The Special Inspector shall keep an exceptions and corrections file for follow-up. The exceptions log shall be submitted with the weekly report. This file shall be reviewed on a daily basis and updated as exceptions are rectified.
- C. Identify working conditions including weather, temperature, time of day, type and location of work being performed.
- D. Note changes in working sequence or materials and any unusual circumstances affecting the performance of work.
- E. In accordance with Section 553.79 (7)a of the Florida Statutes, the Special Inspector shall, upon completion of the building and prior to the issuance of a Certificate of Occupancy, file a signed and sealed statement with the enforcement agency in substantially the following form: To the best of my knowledge and belief, the construction of all structural load bearing components described in the Threshold Inspection Plan complies with the permitted documents, and the specialty shoring design professional engineer has ascertained that the shoring and reshoring conformed with the shoring and reshoring plans submitted to the enforcement agency.

IV. FOUNDATION – AUGERCAST/DISPLACEMENT PILES

- A. Review placement of pile cap reinforcement for compliance with the Contract Documents as outlined in the Reinforcing Steel section of this Inspection Plan.
- B. Review dowel and lap splice lengths for compliance with the Contract Documents.
- C. Observe concrete placement as outlined in the Concrete section of this Inspection Plan.
- D. The Geotechnical Engineer shall be employed and paid by the Developer to monitor load tests, drilling, and concrete placement; verify pile diameter and depth; and provide all other inspection of the augercast/displacement piles. The Special Inspector shall periodically monitor the pile drilling and placement of concrete.

V. FOUNDATION – SPREAD FOOTINGS

- A. The Geotechnical Engineer shall be employed and paid by the Developer to monitor the sub-surface densification.
- B. The Special Inspector shall review placement of reinforcement in the spread footings for compliance with the Contract Documents as outlined in the Reinforcing Steel section of this Inspection Plan.
- C. The Special Inspector shall review dowels and lap splices for compliance with the Contract Documents.

VI. FOUNDATION WALLS AND PITS

- A. Observe and verify proper size, grade, and number of reinforcing bars as outlined in the Reinforcing Steel section of this Inspection Plan.
- B. Observe concreting operations and verify proper concrete type and strength as outlined in the Concrete section of this Inspection Plan.
- C. Verify that walls are not backfilled until floor construction at top of wall is complete, or temporary bracing is provided in accordance with the Contract Documents.

VII. SLAB-ON-GRADE

- A. Observe subgrade preparation including backfilling, compaction, and performance of compaction tests by the Testing Laboratory prior to concrete placement.
- B. Note any alteration and subsequent replacement of subgrade materials required by mechanical or other trades.
- C. Observe placement of screeds to obtain proper level and thickness of slabs. Observe location of slab depressions and steps in slab while maintaining required slab thickness.
- D. Check size and lap lengths of welded wire and other reinforcing for compliance with the Contract Documents.
- E. Check that the location and type of slab control joints and construction joints conform to the Contract Documents.

VIII. CONCRETE

- A. Forms, Shoring, and Reshoring:
 - 1. Obtain detailed drawings and design calculations signed and sealed by a Professional Engineer registered in the State of Florida for formwork, shoring, and reshoring showing assumed live loads, construction loads, and safety factors.
 - 2. Review the general arrangement of forms for compliance with the formwork shop drawings, and check that the forms are visually aligned, level, and plumb.
 - 3. The Special Inspector shall determine that a Professional Engineer registered in the State of Florida who specializes in shoring design has inspected the shoring and reshoring for conformance with the shoring and reshoring plans submitted to the enforcing agency and has submitted a report of the inspection before each pour (if any).
 - 4. Review the time sequence of form removal and reshoring procedures for compliance with the formwork, shoring, and reshoring shop drawings.
 - 5. Review results of field cured concrete test cylinders with the Testing Laboratory to check timing of stripping of forms.
 - 6. Check that the Contractor is observing forms during concrete placement to detect abnormal deflections or signs of imminent failure which could be corrected.

7. Check that all debris and foreign material has been removed before concrete is placed.
- B. Joints:
1. Verify the location of construction joints in beams and slabs for compliance with the construction joint location plan submitted by the Contractor to the Architect/Engineer.
 2. Verify that dowels, keys, and bulkheads at construction joints are in conformance with the Contract Documents.
- C. Openings:
1. Report all slab openings larger than 12" that are not shown on the Contract Documents.
 2. Check placement of additional reinforcement around openings. No sleeves or openings will be permitted in beams without the prior approval of the Engineer of Record.
- D. Embedded Items:
1. Verify that conduits placed in the slab are reasonably spaced to ensure integrity of the slab.
 2. Review load carrying embedded items as placed for compliance with the Contract Documents. Relocation of embedded items in conflict with reinforcing shall not be permitted without the prior approval of the Engineer.
- E. Concrete Placement:
1. Verify that the Testing Laboratory support staff has been informed and will be available to make tests as required.
 2. Periodically inspect transit mix delivery slips to review the correct mix and elapsed time between batching and depositing of concrete.
 3. Verify that slump is measured at the point of discharge for each day's pour.
 4. Verify that concrete test cylinders have been taken in accordance with the Contract Documents.
 5. Observe concrete placement to check that embedded items and reinforcing steel are not adversely altered during placement.
 6. Verify that curing methods have been executed in accordance with the Contract Documents.
- F. Reinforcement Doweling and Expansion/Chemical Anchors:
1. Verify depth and diameter of all drilled holes used for structural fastening. Verify preparation of hole in accordance with the manufacturer's directions prior to fastener installation. Verify that the proper type of epoxy is used for each

application (i.e. epoxy paste for horizontal doweling). Verify proper mixing and installation of all structural epoxy.

2. Verify that the testing laboratory has inspected expansion bolts for proper torque.

IX. REINFORCING STEEL

- A. Verify grade, size, quantity, and spacing of reinforcing bars for compliance with Contract Documents as well as approved shop drawings. Report any noted conflict before concrete is poured so that corrections may be made.
- B. Verify minimum clearance requirements from concrete surfaces.
- C. Verify that reinforcing is adequately supported to resist displacement or shifting during pour. Review spacing of high chairs and slab bolsters to ensure proper support of reinforcing.
- D. Verify that rebar surfaces are free of excess rust or other coatings that may adversely affect bonding capacity. If oiling of forms is required, verify that it is applied before reinforcing is placed.
- E. Verify rebar splice locations and required length of lap. Report any noted splice locations not in conformance with the Contract Documents before concrete is poured so that corrections may be made. Verify installation of hooked bars for compliance with the Contract Documents.
- F. Verify that debris and foreign materials have been removed before concrete is placed.

X. STEEL STRUCTURE AND COMPOSITE METAL DECK

- A. Review the installation of column base plates for proper leveling, grout type, and grout application.
- B. Review steel as it is received for possible damage in shipping; check workmanship and piece marking.
- C. Review that the camber of steel beams complies with the Contract Documents.
- D. In cooperation with the Testing Laboratory, observe that proper welding procedures are utilized on the job site.
- E. Visually spot check that bolts are being tightened properly. Verify that impact wrenches are being calibrated.
- F. Visually check that all connections are completed in accordance with the Contract Documents and the approved shop drawings.
- G. Inspect metal deck welding to support beams.
- H. Observe welding of shear connectors. Check that the proper number of connectors are being installed.
- I. Verify that shear connectors are being tested by the Testing Laboratory.
- J. Inspect welded wire reinforcing for proper size and laps in metal deck slab.

- K. Verify that steel is erected in accordance with the submitted erection plan. Visually check plumbness and frame alignment as erection proceeds.
- XI. METAL ROOF DECK, BAR JOISTS, AND STEEL BEAMS
- A. Metal Roof Deck:
1. Verify that deck of proper size, type, gauge, and finish is being erected.
 2. Verify proper deck attachment, including sizes, locations, and procedures of welds, screws, and other fasteners.
 3. Verify that proper deck reinforcement is used around openings.
 4. Verify that deck accessories are being installed.
 5. Verify roof pitch and proper placement of drains and scuppers.
- B. Bar joists:
1. Verify size and spacing of joists as they are installed.
 2. Visually review adequacy of welding of joists to support beams.
 3. Verify that proper joist bridging is being installed.
 4. Visually spot check joists for proper welding at web and chord connections.
 5. Inspect joists for possible damage during shipping.
- C. Steel Beams:
1. Verify beam size and steel grade.
 2. Verify size, type, washers, and method of tightening for high strength bolts.
 3. Visually verify that beam connections are completed and bolts are installed and tightened.
 4. Review proper welding of welded beam connections.
 5. Verify that the camber in steel beams complies with the Contract Documents.
 6. Review steel members for possible damage in shipping; check workmanship and piece marking.
- XII. STEEL TRUSSES
- A. Review shop drawings and erection plan. Verify that trusses are erected in accordance with the erection plan prepared and sealed by the Contractor's Professional Engineer.
- B. Verify that trusses have been preassembled in the shop to ensure proper fit-up in the field, if required by the Contract Documents.
- C. Verify proper size, type, washers, and method of tightening for high strength bolts.
- D. Verify that trusses are picked up by the crane at the approved points. Verify that temporary bracing is in conformance with the approved signed and sealed erection drawings.
- E. Verify that erection proceeds in the sequence and method as shown on the approved erection plan. Report any discrepancies to the Engineer.
- F. Inspect field splices to ensure that trusses are properly connected before removal of temporary bracing.

XIII. PRECAST CLADDING

- A. Visually inspect precast for damage in shipping.
- B. Verify proper installation of precast panels to support structure. Verify that bolts and welds are in conformance with the approved shop drawings and erection drawings.
- C. Verify that the precast erector is maintaining the proper erection joint tolerances.
- D. Visit precast plant to inspect typical reinforcing steel placement and proper concreting operations. Review embedded items in panel for connection to structure.

XIV. PRECAST CONCRETE STRUCTURE

- A. Review signed and sealed precast erection drawings and report any deviations from the specified and approved procedures.
- B. Review bearing pads to ensure correct thickness and location.
- C. Review connections of precast members to precast members and report any deviations from the signed, sealed, and approved shop drawings.
- D. Review all fabricated components delivered to the site for damage.
- E. Review dry pack grout installations.
- F. Connections with embedded reinforcement, epoxy grout, and threaded couplers shall be visually observed by the Special Inspector's Representative. Dry packing of column and wall bearing areas, epoxy installation at match cast joints, and duct grouting operations shall be visually observed.

XV. REINFORCED CONCRETE MASONRY (CMU)

- A. Observe mortar mix and placement.
- B. Verify that grout inspection and testing is in accordance with Contract Documents.
- C. Verify placement of joint reinforcing and wall vertical steel where specified.
- D. Verify that control joints are placed in walls as specified.
- E. Verify proper connection to support structure.
- F. Verify proper placement of CMU lintels, door jambs and window jambs.
- G. Verify that materials are stored properly before placement in the structure.
- H. Notify the Engineer of Record when placement of conduit or piping interferes with cell grouting and vertical reinforcing steel.
- I. Verify that placement and consolidation of grout is in accordance with the project specifications.

END OF THRESHOLD INSPECTION PLAN (PRELIMINARY)

ATTACHMENT C
CONSTRUCTION MATERIALS TESTING AND INSPECTION SCOPE OF SERVICES
ISSUED MARCH 10, 2008

The Construction Materials Testing and Inspection Services will be based on the project's plans, specifications and construction schedule. They are anticipated to include, but are not limited to, the testing and inspection of the following components:

A. GENERAL SCOPE OF SERVICES NARRATIVE:

- .1 Building Description:** The Events Center will include (i) capacity of approximately 18,500 seats (including all premium seats) expandable to, and with services for, 20,000; (ii) premium seating initially consisting of suites, loges and club and other premium seats; (iii) amenities and facilities that may include, among other things, retail spaces (both internal and with street access), restaurants, concessions facilities, internal and external message, video and score boards, Team and City administrative offices, broadcast facilities, meeting and club spaces for the Team, locker rooms, signage, maintenance and storage areas, and walkways around the Project; (iv) media-related facilities; (v) a practice basketball court and related facilities; (vi) ice-making plants and facilities; (vii) the Team and NBA visiting team locker rooms, feature talent dressing rooms, officials rooms, and at least two (2) additional auxiliary locker rooms; (viii) an events center reduction curtain system; (ix) other traditional back of house elements; and (x) on-site development, including landscaping, streetscaping and all utility connections for the Events Center. The Project will contain such fixed elements as are reasonably necessary to host arena football, indoor soccer, indoor lacrosse, national events, and touring shows, that are booked at other Events Centers.

The Events Center will be constructed to accommodate events of local, regional or national importance; concerts; family shows; professional and amateur sports events, such as NCAA competitions; the home games of the Orlando Magic NBA team; the home games of the Orlando Predators AFL team; and other civic, political, community and not-for-profit events.

- .2 Building Components Description:** It is anticipated that the structure will be supported on deep foundations, most likely consisting of auger-cast concrete displacement piles as well as driven piles, with concrete pile caps as well as spread footings at lower seating bowl and other areas of lighter loads. A conventional concrete slab-on-grade is anticipated for the ground floor (event level).

Typical elevated floor framing for the other levels (lower suite level, main concourse, club/loge, upper concourse, disabled seating mezzanine, and hockey press box) is currently designed as pan-formed, conventionally reinforced, cast-in-place concrete beams and girders supported by cast-in-place concrete columns. Floor slabs will be cast-in-place concrete.

The seating bowl structure is expected to be precast, prestressed, concrete tread and riser units supported on concrete raker beams. Raker beams at the lower portion of the lower bowl are precast concrete. Raker beams for the upper portion of the lower bowl and the upper bowl are cast-in-place concrete.

Design compressive strengths of cast-in-place concrete members are expected to range from 3,500 psi to 6,000 psi.

Framing at low roofs will consist of galvanized steel roof deck supported by steel beams and/or open web steel joists spanning between wide flange girders.

The long-span high roof structure consists of a system of one-way steel trusses, bracing trusses, and wide flange steel beams and/or open web steel joists supporting a galvanized steel roof deck. Truss connections are anticipated to be conventional shop-welded and field-bolted gussets. Rigging grid members and catwalk framing are located at the truss bottom chord level.

Miscellaneous composite floors and CMU walls are also expected.

Exterior curtainwalls and precast concrete panels are expected for the perimeter of the building.

A steel framed pedestrian bridge will span from the south edge of the Events Center over South Street and connect to the parking garage being developed by the City of Orlando. The bridge is expected to be fully enclosed and conditioned.

A steel framed, oval shaped, tower is located at the northeast corner of the Events Center. The tower is primarily surrounded by curtainwall and is approximately 120' tall.

Civil site work includes installation and backfilling of utility lines, hardscape work with cast-in-place concrete and a small asphalt pavement parking lot.



B. INCLUSIONS TO SCOPE OF WORK:

.1 Tests and Inspections: The Construction Materials Testing and Inspection firm will perform on-site observations and tests, as well as related laboratory tests during construction, as required by the construction documents. The observations and tests may include, but are not limited to:

- Materials Sampling
- In-Place Density Tests
- Standard or Modified Proctor Tests
- Atterberg Limits Tests
- Soil Gradation Tests
- Organic Content Tests
- Minus 200 Sieve Tests
- Soil Moisture Content Tests
- Thickness Tests
- Soil Stability (FBV or LBR) Tests
- Soil-Cement Base Specimen Molding and Compressive Strength Tests
- Asphalt, Soil-Cement, Concrete Coring
- Asphalt Extraction, Gradation, Stability Tests
- Asphalt Core Density Tests
- Asphalt Placement Observations and Temperature Tests
- Concrete Cylinder Molding & Compressive Strength Tests
- Concrete Slump Tests and Air Content Tests
- Concrete Unit Weight Tests
- Concrete Non-Destructive Tests (Schmidt Hammer, Windsor Probe)
- Concrete Floor Flatness & Levelness Tests (F_F / F_L)
- Concrete Maturity Meter Testing (if required)

- Concrete Moisture Emission Tests
- Concrete Batch Plant Inspections
- Concrete Precast and Prestressed Plant Inspections
- Lightweight Insulating Concrete Unit Weight, Dry Density & Compressive Strength Tests
- Structural Steel Welding and Bolting Visual Inspections & Tests
- Welding Non-Destructive Tests (UT, MT, PT, RT)
- Auger Cast/Displacement Pile Installation Inspections
- Driven Pile Installation Inspections
- Pile PDA and PIT Tests
- Pile Load Tests
- Masonry Grout Prism Molding & Compressive Strength Tests
- Sprayed-On Fireproofing Inspections & Thickness Tests
- Sprayed-On Fireproofing Cohesion/Adhesion & Density Tests
- Concrete Post-Tensioning Cable Elongation Measurements
- Off-Site Fabrication Shop Inspections & Tests
- Other tests as required by Specification Section 01410, Testing Laboratory Services to be issued by Design Professional Team (See Sample document in Attachment D)

- .2 Construction Materials Testing and Inspection Reports:** The Construction Materials Testing and Inspection firm shall furnish all labor, materials, equipment, etc. and perform the work for construction materials testing and inspection services reports in accordance with the Project specifications. Work shall be performed under the supervision of a registered Professional Engineer, and the reports shall be signed by a Professional Engineer registered in the State of Florida.

C. EXCLUSIONS TO SCOPE OF WORK:

- .1** Threshold Inspection Services, as detailed in Attachments A & B, are excluded from this scope of work.
- .2** Subgrade inspections, test pile monitoring and augercast/displacement pile installation monitoring and other services being provided by the Geotechnical Engineer.
- .3** Inspection or testing of fireproofing.
- .4** HVAC Testing and Balancing.

D. SPECIAL CONSIDERATIONS:

- .1** The Construction Materials Testing and Inspection Firm will be required to comply with the requirements of the Construction Manager at Risk's safety plan at all times while on site.
- .2** The Developer will be implementing an Owner Controlled Insurance Program (OCIP). Participation in this program will be required.
- .3** The Construction Materials Testing and Inspection Firm will need to provide its own facilities on site.
- .4** Please note that the sample document contained in Attachment D refers to separate scopes of work to be provided for the owner and contractor. This separation is not applicable to the Events Center project, as all contracted services will be directly with the developer.

END OF THRESHOLD CONSTRUCTION MATERIALS TESTING AND INSPECTION SCOPE OF SERVICES

SECTION 01410

TESTING LABORATORY SERVICES (Sample)

NOT FOR CONSTRUCTION**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections apply to work specified in this Section.

1.2 STANDARDS

- A. The following Standards are listed in this specification:

ASTM A6	Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A416	Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A490	Standard Specification for Heat-Treated Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A568	Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled
ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C25	Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C40	Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate

PROJECT NAME

TESTING LABORATORY SERVICES

WALTER P. MOORE PROJECT NO.

01410-1

Professional Service Firms RFQ - Attachment D

ASTM C128	Standard Test Method for Specific Gravity and Absorption of Fine Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C140	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C157	Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C330	Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C332	Standard Specification for Lightweight Aggregates for Insulating Concrete
ASTM C495	Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
ASTM C1314	Standard Test Method for Compressive Strength of Masonry Prisms
ASTM D75	Standard Practice for Sampling Aggregate
ASTM D422	Standard Test Method for Particle Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1143	Standard Test Method for Piles Under Static Axial Compressive Load
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil by the Sand Cone Method
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D2922	Standard Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method

ASTM D4253	Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	Standard Test Method for Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM E605	Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM F710	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM E736	Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.3 SCOPE OF WORK

- A. Services Provided for the Contractor: An independent testing laboratory will sample and test materials that are components of the final work product of the Contractor and provide certification that the materials meet the required specifications. The laboratory shall oversee the certification process of construction personnel to ensure their qualifications to perform the specified duties. The presence of a testing laboratory shall in no way relieve the Contractor of his obligation to perform the work in accordance with the Contract Documents. The contractor shall be responsible for paying the testing laboratory for these services.
- B. Services Provided for the Owner: An independent testing laboratory will sample and test materials as they are being installed for compliance with specified requirements and report and interpret the results. The laboratory shall monitor the installation of all constructed work and shall perform tests on the completed construction as required to indicate compliance with the various material specifications governing this work. The owner shall be responsible for paying the testing laboratory for these services.

1.4 SPECIAL INSPECTIONS (THRESHOLD INSPECTION)

- A. Threshold Inspection Services shall be provided as required by Chapter 471 and 553 of the Florida Statutes. The scope of these services is not included in this section and are to be provided separately as outlined in the Threshold Inspection Plan. These inspections are mandatory for conformance to the legal requirements of the building code and shall be in addition to the inspections and tests otherwise defined in this specification.

1.5 QUALIFICATIONS OF TESTING LABORATORY

- A. The Testing Laboratory selected shall meet the basic requirements of ASTM E329 “Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction”, and shall submit to the Owner, Architect, and

Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASHTO Accreditation Program or the National Voluntary Laboratory Accreditation Program.

- B. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.
- C. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.

1.6 AUTHORITIES AND DUTIES OF THE LABORATORY

- A. **Attending Preconstruction Conferences:** The Testing Laboratory providing services for the Contractor and the Testing Laboratory providing services for the Owner shall obtain and review the project plans and specifications with the Architect and Engineer as soon as possible prior to the start of construction. All Laboratories shall attend preconstruction conferences with the Architect, Engineer, Project Manager, General Contractor, and Material Suppliers as required to coordinate materials inspection and testing requirements with the planned construction schedule. The Laboratory providing services for the Owner shall participate in such conferences throughout the course of the project.
- B. **Outline Testing Program:** The Testing Laboratory providing services for the Owner shall be responsible for outlining a written detailed testing and inspection program conforming to the requirements as specified in the Contract Documents and in consultation with the Owner, Architect, and Engineer. The testing and inspection program shall contain an outline of inspections and tests to be performed with reference to applicable sections of the specifications or drawings and a list of personnel assigned to each portion of the work. Such testing program shall be submitted to the Owner, Architect, and Engineer two weeks in advance of the start of construction so as not to delay the start of construction. It shall be the Testing Laboratory's responsibility that such program conforms to the requirements of the Specifications and falls within the Owner's budget for testing laboratory services. If the allocated budget is not sufficient to cover the services as outlined in the Specifications, it shall be the responsibility of the Laboratory to notify the Architect, Engineer, and Owner so that the Laboratory services can be modified accordingly prior to the start of construction. Furthermore, the Testing Laboratory shall monitor its expenditures throughout the course of the job and notify immediately the Owner, Architect, and Engineer, of any significant deviation from the planned testing program and budget.
- C. **Cost Proposal:** The Testing Laboratory's proposal to the Owner shall contain the outlined testing and inspection program based on a unit price basis for tests and inspections and on an hourly basis for personnel. A total estimated price shall also be submitted.
- D. **Cooperation with Design Team:** The Laboratory shall cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.
- E. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.
- F. **Inspections Required by Government Agencies:** The Testing Laboratory shall perform all inspections and submit all reports and certifications as required by all government agencies.

- G. Notification of Deficiencies in the Work: The Laboratory shall notify the Architect, Engineer, and Contractor within 24 hours of discovery by telephone or e-mail, and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.
- H. Reports:
1. Information on Reports: The Laboratory shall submit copies of all reports of inspections and tests promptly and directly to the parties named below. All reports shall contain at least the following information:
 - a. Project Name
 - b. Date report issued
 - c. Testing Laboratory name and address
 - d. Name and signature of inspector
 - e. Date of inspection and sampling
 - f. Date of test
 - g. Identification of product and Specification section
 - h. Location in the project
 - i. Identification of inspection or test
 - j. Record of weather conditions and temperature (if applicable)
 - k. Results of test regarding compliance with Contract Documents
 2. Copies: The Laboratory shall send certified copies of test and inspection reports to the following parties:
 - a. 2 copies to the Owner or his representative
 - b. 2 copies to the General Contractor
 - c. 1 copy to the Architect
 - d. 1 copy to the Engineer of responsibility
 - e. 1 copy to the Supplier of the material tested
 3. Certification: Upon completion of the job, the Testing Laboratory providing services to the Owner shall furnish to the Owner, Architect, and Engineer of Record, a statement signed by a licensed professional engineer that, to the best of their knowledge, all required tests and inspections were made in accordance with the requirements of the Contract Documents.
- I. Accounting: The Testing Laboratory shall be responsible for separating and billing costs attributed to the Owner and costs attributed to the Contractor.
- J. Obtaining Product and Material Certifications: The Testing Laboratory shall be responsible for obtaining all product and material certifications from manufacturers and suppliers as specified in the Specifications.
- K. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

1.7 CONTRACTOR'S RESPONSIBILITY

- A. Cooperation with Design Team: The Contractor shall cooperate with laboratory personnel, provide access to the work, and to manufacturer's operations.

- B. **Furnishing Samples:** The Contractor shall provide to the laboratory representative, samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
- C. **Furnishing Casual Labor, Equipment and Facilities:** The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate all required inspections and tests.
- D. **Advance Notice:** The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
- E. **Payment for Substitution Testing:** The Contractor shall arrange with the Testing Laboratory providing services for the Contractor and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.
- F. **Payment for Retesting:** The Contractor shall be liable to the Owner for the cost for any additional inspections, sampling, testing, and retesting done by the Testing Laboratory providing services for the Owner as required when initial tests indicate work does not comply with the requirements of the Contract Documents.
- G. **Payment by Contractor:** The Contractor shall furnish and pay for the following items:
 - 1. Soil survey of the location of borrow soil materials, samples of existing soil materials, and delivery to the Testing Laboratory providing services for the Contractor.
 - 2. Samples of concrete aggregates and delivery to the Testing Laboratory providing services for the Contractor.
 - 3. Concrete mix designs as prepared by his concrete supplier or by the Testing Laboratory providing services for the Contractor.
 - 4. Concrete coring, tests of below strength concrete, and load tests, if ordered by the Owner, Architect, or Engineer.
 - 5. Certification of reinforcing steel and prestressing steel mill order.
 - 6. Certification of structural steel mill order.
 - 7. Certification of portland cement, lime, fly ash.
 - 8. Certification of welders and preparation of Welding Procedure Specifications.
 - 9. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Owner, Architect or Engineer to establish equality with specified items.
 - 10. Concrete cylinders for the purpose of evaluating strength at time of form stripping or for post-tensioning.
 - 11. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.

- H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and Testing Laboratory providing services for the Owner when the source of any material is changed after the original tests or inspections have been made.
- I. Tests for Suspected Deficient Work: If in the opinion of the Owner, Architect, or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect, or Engineer deem advisable to determine its proper construction. The Owner shall pay all costs if the tests prove the questioned work to be satisfactory.

1.8 PAYMENT OF TESTING LABORATORY

- A. The Owner will pay for the initial Laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will be liable to the Owner for the cost for testing and retesting of materials that do not comply with the requirements of the Contract Documents and shall furnish and pay for the testing and inspection of all other items as specified in these Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCOPE OF WORK

- A. The work to be performed by the Testing Laboratory shall be as specified in this Section of the Specification and as determined in meetings with the Owner, Architect, and Engineer.

3.2 EARTHWORK

- A. Tests of Proposed Fill Material: The Testing Laboratory providing services for the Contractor shall conduct a survey of the Contractor's proposed location of borrow soil materials and shall establish the suitability of any proposed fill material by determining the required engineering properties. Soil tests shall include soil classification by the Atterberg Limit Tests ASTM D4318, and grain size determination by ASTM D422.
- B. Tests of Subgrade to Determine Suitability for Chemical Stabilization: If chemical stabilization is suggested or recommended in the Geotechnical Report, the Testing Laboratory providing services for the Contractor shall sample and evaluate the subgrade in accordance with established criteria to determine if hydrated lime or cement can be successfully used as a chemical stabilizing agent. These tests will include Atterberg Limit determinations of the raw soil and evaluations of Plasticity Index and/or strength with varying amounts of stabilizing additive according to ASTM D4318. The hydrated lime and lime slurry mixtures shall be sampled to establish their quality and compliance with ASTM C25.
- C. Moisture - Density Relationship for Natural and Fill Materials: The Testing Laboratory providing services for the Contractor shall provide one moisture - density curve for each type of soil, natural, imported fill, or on-site fill, encountered in subgrade and fills under building slabs and paved areas. Curves shall be generated in accordance with (i) ASTM

D698 (ii) ASTM D1557 for cohesive soils and ASTM 4253 plus ASTM 4254 for cohesionless soils.

D. Quality Control Testing Required During Construction:

1. Inspection of Subgrade and Fill: The Testing Laboratory providing services for the Owner shall inspect and approve the following subgrades and fill layers before further construction work is performed thereon:
 - a. Paved Areas and Building Slab Subgrade: Make at least one field density test of the natural subgrade for every 2500 square feet of paved area or building slab but in no case less than three tests. In each compacted fill layer or lift, make one field density test for every 2500 square feet of building slab or paved area but in no case less than three tests.
 - b. Foundation Wall Backfill: Make at least one field density test for each 200 lineal feet of wall with a minimum of 4 tests for the basement walls around the perimeter of each building and a minimum of one test for every other type of foundation wall on the site. Tests shall be at random locations and elevations for each wall.
 - c. Subgrade Beneath Column and Wall Footings: Make at least one field density test for each column footing and one for each twenty-five lineal feet of wall or fraction thereof.
2. Field Density Tests: Field Density Tests shall be run according to ASTM D1556, ASTM D2937, or ASTM D2922 as applicable.
3. Acceptance Criteria: The results of field density tests by the Testing Laboratory providing services for the Owner will be considered satisfactory if the average of any three consecutive tests has a value not less than the required density with no single test falling more than 2 percent below the required density.
4. Report Copies: All moisture-density curves and results of field density tests shall be submitted to the parties specified earlier in this section.
5. Additional Testing: If reports by the Testing Laboratory providing services for the Owner indicate field densities lower than specified, additional tests will be run by the Testing Laboratory providing services for the Owner with at least the frequencies scheduled above on recompacted fill and/or natural subgrade. The Testing Laboratory shall notify the Contractor on a timely basis for any required retesting so as not to delay the work. The costs of such tests shall be borne by the Contractor.

E. Foundation Inspection by the Testing Laboratory:

1. Material Testing: The Testing Laboratory providing services for the Owner shall provide testing and inspection of materials used in foundation elements as described below.
2. Augercast Piles:
 - a. Grout Tests: Make and test one set of 6 2-inch cubes according to the requirements of ASTM C109. Each strength test shall be the average of two 28 day strengths. Test two cubes at 3 days, two at 7 days, and two cubes at 28 days. Make an additional set of two cubes and test them at

90 days if a special pozzolan is used in the grout mix. Make one set of cubes for each day's operation but not less than one set for each 25 cubic yards or one set for each pile cap.

3. Pressure Injected Footings (PIF):
 - a. Concrete Cylinders: Make and test concrete cylinders as specified under Poured-in-Place Concrete. When zero-slump concrete is specified sufficient water shall be added to the sample to bring the concrete to a consistency of 2-3 inch slump permitting cylinders to be cast as per ASTM C31.
 4. Spread (Dug) Footings
 - a. Concrete Cylinders: Make and test concrete cylinders as specified for Poured-in-Place Concrete.
 - b. Reinforcing Steel: Inspect reinforcing steel size, number of bars, and placement and confirm dowel or anchor bolt placement into footing.
- F. Foundation Inspection by the Geotechnical Engineer: The Geotechnical Engineer of Record shall provide inspection service for the following items before and during foundation installation as appropriate for the foundation type. The Geotechnical Engineer shall submit written field inspection reports promptly after inspection to all parties listed above and report his findings after each inspection by telephone or e-mail to the Engineer.
1. Spread (Dug) Footing:
 - a. Subgrade: Verify that foundation bearing conditions are consistent with soil report tests and that the footing is being installed in the proper soil strata at the proper elevation. Make recommendations regarding adjustment to subgrade or bearing elevation if subgrade is not adequate to support footing.
 2. Mat Footing:
 - a. Subgrade: Verify that foundation bearing conditions are consistent with soil report tests and that the footing is being installed in the proper soil strata at the proper elevation. Make recommendations regarding adjustment to subgrade or bearing elevation if subgrade is not adequate to support footing.
 3. Augercast Piles:
 - a. Monitoring Grout Quantity: Record for each pile inspected quantity of grout placed compared to the actual quantity required. Report discrepancies to Engineer.
 - b. Monitor the grouting operation to verify that the grout head is maintained at least 5 feet above the injection point at all times.
 - c. Grout Level: Monitor and record top of pile elevation as grout sets over a 24 hour period. Immediately report any drop in pile elevation to Engineer.
 - d. Report: For each pile installed, prepare and submit a report the lists the following information: pile location, pile number, pile diameter, actual tip

elevation, actual top of grout elevation, pile length, theoretical volume of grout, actual volume of grout placed, reinforcing steel size and actual depth actually placed, drilling start and finish time, amount of drop of grout level in the first 24 hours after placing, and a list of any unusual occurrences that may affect pile performance. The report shall include the name of the project, the name of the piling contractor and the name of the drilling superintendent. The report shall be signed by a licensed engineer in the state where the project is located.

- G. Pile Load Test: The Geotechnical Engineer shall supervise a pile load test(s) as specified on the drawings according to ASTM D1143-74. He shall submit a written report of his findings to all parties listed above and report by telephone or e-mail to the Engineer, the results of all pile load tests. Refer to the Pile Specification for additional requirements of the test.

3.3 REINFORCING STEEL

- A. Visual Inspection: When the Contractor or reinforcing steel Fabricator notifies the Testing Laboratory providing services for the Contractor that a shipment of reinforcing steel is in the final stages of fabrication and ready for shipment, the Testing Laboratory providing services for the Contractor shall inspect the shipment to determine the following:
1. The bars should be free from injurious defects and shall have a workman-like finish.
 2. Deformations shall be of the proper sizes, shapes, and spacing as detailed in ASTM A615.
 3. The bars shall not have excessive rust and/or pelting.
 4. The bars shall not have any unusual twists or bends.
- B. Identified Stock: Where job material is taken from bundles as delivered from the mill, is properly identified as to heat number and is accompanied by mill and analysis test reports, such material shall be used without further local tests provided an affidavit is given from the Supplier to the Testing Laboratory providing services for the Contractor that the materials conform with the requirements of the ASTM specification as listed on the structural drawings. In case of controversy, the procedure as stipulated below for unidentified stock shall be followed.
- C. Unidentified Stock: For all unidentified stock, the Testing Laboratory providing services for the Contractor shall secure samples of the reinforcing steel bars at the time of inspection. The samples shall conform to the following:
1. The sample shall include 2 bars for each ten tons or fraction thereof, of each bar size, heat number, and manufacturer being shipped.
 2. The sample bars shall be a minimum of 24 inches in length and should be identical to the material being shipped.

The Testing Laboratory providing services for the Contractor shall tag each of the steel bundles with the Laboratory identification tag and appropriately mark the samples corresponding to the steel being inspected and shipped. The fabricator will supply shipping lists showing the weight of each bar size in the shipment. The sample reinforcing bars shall be returned to the Testing Laboratory providing services for the

Contractor for tensile strength tests and bend tests according to ASTM A615. Bend tests will not be required for #14 and #18 bars.

3.4 CONCRETE MATERIALS AND POURED IN PLACE CONCRETE

- A. Tests of Portland Cement: Portland Cement shall be tested by the Testing Laboratory providing services for the Contractor for compliance with the requirements of ASTM C150.
1. Mill Certificates: Mill certificates certifying that the cement has been tested and meets the requirements of the Specifications will be acceptable as test results, provided the cement proposed for use can be identified with test lots. Mill certificates shall be submitted by the Contractor prior to use of any such material.
 2. Retesting: Retesting of cement will be required if:
 - a. In the opinion of the Owner, Architect, or Engineer, the cement has been damaged in storage or transit or is in any way defective.
 - b. The cement has been in storage at the mixing site for over 30 days.
 3. Cube Tests: Compressive strength cube specimens shall be made by the Testing Laboratory providing services for the Contractor at the start of the job and at a frequency of one set per 250 tons of cement or whenever the source or brand of cement changes so that the quality of cement can be observed throughout the project. Each set of 2 inch cubes shall consist of three cubes for each test age as specified in ASTM C150 for the type of cement being tested. The cubes shall be tested according to ASTM C109.
- B. Tests of Aggregates:
1. The Testing Laboratory providing services for the Contractor shall verify that concrete aggregates proposed for use conform to one of the following specifications:
 - a. ASTM C33
 - b. ASTM C330
 2. Tests of aggregates by the Testing Laboratory providing services for the Contractor shall be made before the concrete mix is established and thereafter as the character of the aggregate changes and whenever the source of materials is changed. The following tests will be required:
 - a. Sampling: The Testing Laboratory providing services for the Contractor shall secure samples of aggregate in accordance with ASTM D75 from the concrete Supplier. The proposed aggregate shall not be used until the Laboratory has approved the pit source and the plant capacity and ability to produce uniform products has been verified.
 - b. Sieve analysis: ASTM C136
 - c. Organic impurities: ASTM C40
 - d. Soundness: ASTM C88
 - e. Abrasion of Concrete Aggregate: ASTM C131
 - f. Specific gravity: ASTM C127 (coarse aggregate), ASTM C128 (fine aggregate)
 - g. Deleterious materials: ASTM C33

h. Materials Passing No. 200 Sieve: ASTM C117

Suppliers record of such tests run on the proposed material will be adequate provided a written affidavit is furnished as a shop drawing submittal.

C. Concrete Mix Designs:

1. The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Concrete Supplier shall provide testing services as required to assist the Contractor in submitting mix designs in accordance with the Specifications for each class of concrete indicated on the structural drawings. Refer to the Cast-in-Place Concrete Specifications for mix design requirements.
2. The Testing Laboratory providing services for the Owner shall review the submitted mix designs for conformance to the specifications and for suitability for use in the project. The Testing Laboratory shall attend the Mix Design Conference and the Pre-Concrete Conference as noted in the Cast-in-Place Concrete Specification.

D. Concrete Test Cylinders by the Testing Laboratory providing services for the Owner:

1. Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C31 and tested in accordance with ASTM C39.
2. Field Samples: Field samples for strength tests shall be taken in accordance with ASTM C172.
3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according to the following minimum frequency guidelines:
 - a. One set for each class of concrete taken not less than once a day.
 - b. Piles: One set for each 50 cubic yards or fraction thereof but not less than one set for each pile group under each column or wall.
 - c. Spread Footings and Pile Caps: One set for each 50 cubic yards or fraction thereof.
 - d. Floors: One set for each 150 cubic yards or fraction thereof but not less than one set for each 5000 square foot of floor area.
 - e. Columns: One set for each 50 cubic yards or fraction thereof with a minimum of 2 sets per floor.
 - f. Shear Walls: One set for each 50 cubic yards but not less than 2 sets per floor.
 - g. All Other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof.
 - h. No more than one set of cylinders at a time shall be made from any single truck.
 - i. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

- j. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.

The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded.

For concrete specified on the drawings to reach the required strength at 28 days, break one of the four cylinders of the set at seven days, two at 28 days, and one at 56 days.

4. **Additional Cylinder for Floor Form Stripping:** One additional cylinder per set will be required for formed slab and pan joist floors for the purpose of evaluating the concrete strength at the time of form stripping. This cylinder shall be stored on the floor where form removal is to occur under the same exposure conditions as the floor concrete. The cylinder shall be cured under field conditions in accordance with ASTM C31. Field cured test cylinders shall be molded at the same time and from the same samples as Laboratory cured test specimens. The cylinder shall be broken at the time of form removal as directed by the Contractor.
5. **Cylinder Storage Box:** The Contractor shall be responsible for providing a protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory. The box shall be equipped to maintain the internal temperature of the box to between 60°F and 80°F while storing the cylinders.
6. **Transporting Cylinders:** The Testing Laboratory providing services for the Owner shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders including loss of moisture, freezing temperatures or jarring.
7. **Information on Concrete Test Reports:** The Testing Laboratory providing services for the Owner shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:
 - a. Truck number and ticket number
 - b. Concrete Batch Plant
 - c. Mix design number
 - d. Accurate location of pour in the structure
 - e. Strength requirement
 - f. Date cylinders made and broken
 - g. Technician making cylinders
 - h. Concrete temperature at placing
 - i. Air temperature at point of placement in the structure
 - j. Amount of water added to the truck at the batch plant and at the site and whether it exceeds the amount allowed by the mix design
 - k. Slump
 - l. Unit weight
 - m. Air content
 - n. Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven day breaks are to be flagged if

they are less than 60% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.

- E. Other Required Tests of Concrete by the Testing Laboratory providing services for the Owner (unless noted otherwise):
1. Slump Tests: Slump Tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders made. The slump test shall be made from concrete taken from the end of the concrete truck chute. The concrete shall be considered acceptable if the slump is within plus or minus 1 inch of the slump noted on the mix design submittal form for that class of concrete.
 2. Air Entrainment: Air entrainment tests (ASTM C231 or C173, C173 only for lightweight concrete) shall be made at the same time slump tests are made as cited above.
 3. Concrete Temperature: Concrete temperature at placement shall be measured (ASTM C1064) at the same time slump tests are made as cited above.
 4. Shrinkage Tests: Three 4" x 4" x 11 1/4" samples shall be made and tested according to ASTM C157 for each proposed mix design for each class of concrete.
 5. Chloride Ions: The Contractor shall have the Testing Laboratory providing services for the Contractor verify in a written submittal with the mix designs that the chloride ion concentration will not exceed the limits specified.

Tests shall be run for each class of concrete according to AASHTO Designation T 260-82 Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials to determine that the maximum chloride ion content does not exceed the limits stated in the concrete section of the specifications. One test shall be run for each mix design for each class of concrete at the start of the project and each time a change is made to the mix design (such as a change in aggregate type or source).

- F. Evaluation and Acceptance of Concrete:
1. Strength Test: A strength test shall be defined as the average strength of two cylinder breaks from each set of cylinders tested at the time indicated above.
 2. Quality Control Charts and Logs: The Testing Laboratory providing services for the Owner shall keep the following quality control logs and charts for each class of concrete containing more than 2,000 cubic yards. The records shall be kept for each batch plant and submitted on a weekly basis with cylinder test reports:
 - a. Number of strength tests made to date.
 - b. Strength test results containing the average of all strength tests to date, the high test result, the low test result, the standard deviation, and the coefficient of variation.
 - c. Number of tests under specified strength.

- d. A histogram plotting the number of strength test cylinders versus compressive strength.
 - e. Quality control chart plotting compressive strength test results for each test.
 - f. Quality control chart plotting moving average for strength where each point plotted is the average strength of three previous test results.
 - g. Quality control chart plotting moving average for range where each point plotted is the average of 10 previous ranges.
3. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
- a. The average of all sets of three consecutive strength tests equal or exceed the required $f'c$.
 - b. No individual strength test falls below the required $f'c$ by more than 500 PSI.

If either of the above requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be taken to increase the average of subsequent strength tests.

G. Investigation of Low Strength Concrete Test Results:

1. Cost of Investigations for Low Strength Concrete: The costs of all investigations of low strength concrete, as defined by any individual strength test falling more the 500 psi below the required $f'c$, shall be borne by the Contractor.
2. Scope of Investigations: See Specification Section 3300, Cast-In-Place Concrete, for the investigations that may be required by the Engineer. The Testing Laboratory providing services for the Owner will conduct these investigations.

H. Concrete Batch Plant Inspection: The following types of concrete inspection shall be provided by the Testing Laboratory providing services for the Owner for the classes of concrete described in each type of inspection below:

1. Continuous Concrete Inspection. Continuous concrete inspection at the batch plant and point of discharge at the job site shall be followed for the following classes of concrete:
 - a. Multi-Column Foundation Support. Mat Foundations or any other foundation types such as core mats, continuous strip footings, or pile caps where more than two columns are supported on a common foundation unit.
 - b. Columns and Shearwalls. Columns and shearwalls containing 5,000 PSI or greater strength concrete.
 - c. Lightweight Concrete. All structural lightweight concrete.
 - d. Architectural Concrete. All architectural concrete.

The Testing Laboratory providing services for the Owner shall assign the required number of technicians with the necessary equipment for each scheduled concrete placement to provide continuous concrete inspection at both the batch plant and the point of discharge at the job site.

2. Initial Concrete Inspection at the Batch Plant: Initial concrete inspection at the batch plant for each pour and travel to the jobsite with the first truckloadings to inspect concrete placement at the point of discharge shall be followed for all structural concrete not specified above.

The Testing Laboratory providing services for the Owner will assign a technician with the necessary equipment to each scheduled concrete placement. The technician will initiate concrete mix inspection at the batch plant, then will proceed to the project site with the first truck loadings to continue to inspect the mix at the point of discharge. He will remain at the jobsite to inspect the mix for the required consistency for the duration of the concrete placement.

- I. Scope of Batch Plant Inspection: The scope of batch plant inspection by the Testing Laboratory providing services for the Owner shall include the following:
 1. Inspection of Batch Plant Facilities: Prior to the start of concrete work, the Testing Laboratory providing services for the Owner shall inspect batch plant facilities proposed for use in the work and report in writing inspection results to the Architect, Engineer, and Owner for approval before the start of the work. The inspection shall follow that outline in ASTM C94 and as recommended by the National Concrete Ready Mix Association. Inspection shall include:
 - a. Batch Plant operations and equipment
 - b. Truck mixers
 - c. Scales
 - d. Stockpile placement
 - e. Material storage
 - f. Admixture dispensers
 2. Duties of Inspector: The duties of the batch plant inspector shall include the following:
 - a. Perform initial inspection of batch plant facilities as specified above.
 - b. Secure samples of aggregates for testing.
 - c. Perform visual inspection of aggregates stockpiles to determine uniformity, cleanliness, and moisture variation to be performed each visit to the plant facility.
 - d. Adjust design weights for moisture in aggregates to be performed each visit if required.
 - e. Inspect aggregate conveying system for possible segregation to be performed at each visit.
 - f. Observe batching procedure at each visit. Verify that concrete mix design number is being batched and randomly monitor weighing operation for correct weights of each mix ingredient, including admixture dosages.
 - g. Prior to loading the truck at the batch plant verify that the drum is free of water, fresh concrete, or aggregates. Check conditions and cleanliness of drum, fins, and blades.
 - h. During loading, observe loading procedures.
 - i. After loading, hold the truck for proper mix time and inspect concrete for thorough mix and consistency prior to leaving the batch plant.

- j. Check size of batch for rated truck capacity.
- J. Job Site Inspection: The scope of the work to be performed by the inspector on the jobsite shall be as follows:
- 1. On-Site Concrete Material Testing and Inspection
 - a. Verify that the Contractor is following appropriate concreting practices consistent with any extreme environmental conditions at the point of placement in the structure as defined below.
 - b. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
 - c. Inspect plastic concrete upon arrival at the jobsite to verify proper batching. Observe mix consistency and adding of water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.
 - d. Obtain concrete test cylinders.
 - e. Perform tests to determine slump, concrete temperature, and air entrainment. The slump tests shall be made on concrete taken from the same location from which the concrete for the test cylinders is obtained.
 - f. Record information for concrete test reports.
 - g. Verify that all concrete being placed meets job Specifications. Report concrete not meeting the specified requirements and immediately notify the Contractor, Batch Plant Inspector, Architect, Engineer, and Owner.
 - h. Pick up and transport to Laboratory, cylinders cast the previous day.
 - 2. During Concrete Placing
 - a. Verify that the concrete is not over 90 minutes old at the time of placement.
 - b. Verify that Hot-Weather or Cold-Weather techniques are being applied as required.
 - c. Verify that concrete deposited is uniform and that vertical drop does not exceed six feet and is not permitted to drop freely over reinforcement causing segregation.
 - d. Verify that there are no cold joints.
 - e. Verify that the concrete is properly vibrated.
 - f. Verify that the finishing of the concrete surface is done according to specifications.
 - g. Verify that the curing process is according to specifications and that any curing compound used is applied in accordance with manufacturer's recommendations.
 - h. Verify that sawcut control joints on slab-on-grades are cut within 12 hours of placement.
 - i. Verify that the formwork has remained stable during the concreting operation.

3. The job site inspector shall report any irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.
- K. Causes for Rejection of Concrete: The Contractor shall reject all concrete delivered to the site for any of the following reasons:
1. Wrong class of concrete (incorrect mix design number).
 2. Environmental Conditions: Environmental condition limits shall be as follows unless appropriate provisions in concreting practices have been made for cold or hot weather:
 - a. Cold Weather: Air temperature must be 40°F and rising or the average daily temperature cannot have been lower than 40°F for 3 consecutive days unless the temperature rose above 50°F for at least one-half of any of those 24 hour periods.
 - b. Hot Weather: Environmental conditions must be such that cause an evaporation rate from the concrete surface of 0.2 lb./sq. ft./hr. or less as determined by Figure 2.1.5 in ACI 305R-91.

Concrete may be placed at other environmental condition ranges only with approval of the job inspector for the Testing Laboratory providing services for the Owner or other duly appointed representative.

3. Concrete with temperatures exceeding 95°F shall not be placed in the structure.
4. Air contents outside the limits specified in the mix designs.
5. Slumps outside the limits specified.
6. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory job inspector or other duly appointed representative.

The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

- L. Testing of Concrete Floor Slabs for Acceptability to Receive an Adhesive-Applied, Low-Permeable Floor Covering
1. The following tests shall be made prior to installing adhesive-applied, low-permeability floor coverings such as vinyl composition tile (VCT), linoleum, sheet vinyl, vinyl-backed carpet, rubber, athletic flooring, synthetic turf, wood, acrylic terrazzo, thin-set tile, epoxy overlays and adhesives, et.al.
 2. Moisture Vapor Emission Rate: Perform testing according to ASTM F 1869 to determine if the moisture emission rate from the floor is below the flooring manufacturer's maximum recommended value but not greater than 5lbs/1000sq.ft./24h.
 3. Alkalinity Testing: Perform testing in accordance with ASTM F 710-98, paragraph 5.3, to determine if the pH level of the concrete slab surface is below the flooring manufacturer's maximum recommended value but not greater than 10. Perform three tests per 1000 sq. ft.

- M. Concrete Batch Trip Tickets: All concrete batch trip tickets shall be collected and retained by the Contractor. Compressive strength, slump, air, and temperature tests shall be identified by reference to a particular trip ticket. All tickets shall contain the information specified in ASTM C94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Contractor and Testing Laboratory providing services for the Owner shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

3.5 ARCHITECTURAL AND STRUCTURAL PRECAST CONCRETE

- A. The Testing Laboratory providing services for the Owner shall furnish the necessary technicians and equipment to perform the following tests and inspection at the Precast Concrete Plant and at the jobsite after erection:

1. Preliminary plant inspection prior to the start of fabrication.
2. Inspection prior to placing concrete.
3. Inspection during the concreting operation.
4. For prestressed members, inspection during the transfer of stress load to the concrete.
5. Inspection after form stripping.
6. Inspection of members and connections after erection.

The number and scheduling of visits to the precast plant shall be determined for the job in consultation with the Owner, Architect, and Engineer. Inspections shall be performed by a qualified technician with a minimum of two years of experience in precast concrete testing and inspection. The Testing Laboratory shall write an inspection report promptly after each plant and site visit for distribution to the parties specified. Any irregularities in the work shall be immediately reported by telephone to the Engineer and Architect.

- B. Preliminary Plant Inspection: Preliminary plant inspection prior to the start of fabrication shall include the following:

1. Inspection of the batching facilities including aggregate stock piles, material handling facilities, concrete batching and mixing facilities, and in plant concrete handling, placing, and consolidating procedures and equipment.
2. Inspection of the in-plant testing and curing facilities.
3. Inspection of the casting beds shall be made to check for cleanliness, alignment, and surface condition of the bed.
4. Inspection of the stressing blocks and stressing procedures including verification of the calibration of the stressing jacks to be used in the work.
5. A review of the concrete mix designs proposed for use in the work.

- C. Inspection Prior to Placing Concrete: Inspection prior to placing concrete shall include the following:

1. Inspect formwork for finish condition, dimensions, and dimensional tolerances.
 2. Verify reinforcing steel placement and concrete cover.
 3. Inspect all hardware and embedded items for proper size, location, and finish.
 4. For prestressed members, observe and inspect the stressing operation recording the following information:
 - a. Initial and final gauge load reading during tendon stressing.
 - b. Tendon elongation measurement.
 - c. Obvious irregularities or stress loss during anchoring procedures.
- D. Inspection During the Concreting Operation: Inspection during the concreting operation shall include the following:
1. Verify that environmental conditions and concrete temperatures are within the limits stipulated.
 2. Verify that the proper class of concrete is being used for the members being poured.
 3. Inspect plastic concrete to verify proper batching and mix consistency.
 4. Obtain concrete test cylinders as specified in this Specification. Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according to the following frequency:
 - a. One set for each class of concrete taken not less than once a day.
 - b. One set for each 50 cubic yards or fraction thereof.

Break one cylinder at seven days or for prestressed members, at the time of stress transfer, two at 28 days, and one at 56 days.
 5. Record information for concrete test reports as specified.
 6. Review curing procedures.
- E. Inspection During Stress Transfer: Inspection during the transfer of stress load to the concrete shall include the following:
1. Verify minimum concrete strength at time of stress transfer.
 2. Witness transfer of stress to concrete and report procedures used including release sequence of multitendon transfer.
- F. Inspection After Form Stripping: Inspection after form stripping shall include the following:
1. Check dimensions of precast units.
 2. Verify required cambers.

3. Visually inspect the precast units for proper finish, cracks, and other surface defects and imperfections.
- G. Inspection After Erection: Inspection of members and connections after erection shall include the following:
1. Inspect anchor bolt layout, embedment, and bolt tightening to base plates.
 2. Check base plates for proper grouting.
 3. Check connection of bearing walls to foundation for proper bolting and grouting. For welded connections, check for proper location of embedded plates or angles and check the quality and completeness of field welds.
 4. For precast beams, both interior and spandrel, check the following:
 - a. Proper length and width of bearing at each support end.
 - b. Proper width, length, thickness, and type of bearing pads.
 - c. Proper connection of beams to columns at each end and to intersecting floor members.
 5. Verify proper finish (painted or galvanized) of all steel connection plates and angles including touch-up of welds.
 6. For precast structures with expansion joints, verify:
 - a. Proper expansion joint material.
 - b. Proper expansion joint width.
 - c. Proper installation of plates, angles, epoxy nosings and other components of the expansion joint type.
 7. For architectural precast panels, verify:
 - a. Proper bolting and/or welding of panel connection to the structure.
 - b. Proper panel position with specified panel joint thickness.
 - c. Proper sealant materials and methods at joints.
 - d. Report any cracked panels or panels with improper finish to the Architect and Engineer.

3.6 STRUCTURAL STEEL

- A. Contract Obligations:
1. Owner Responsibility: The Owner shall pay for all initial shop and field inspections and tests as required during the fabrication and erection of the structural steel.
 2. Contractor Responsibility: The Contractor shall pay for and arrange with the Testing Laboratory providing services for the Contractor for the certification of all shop and field welders. The Testing Laboratory providing services for the Contractor shall provide the qualification testing required by AWS D1.1 Chapter 4, Part B to qualify any non-prequalified Welding Procedure Specification (WPS) needed for the project. The Testing Laboratory shall prepare Procedure Qualification Records (PQR) documenting the successful qualification of each

WPS. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person or crew performing the work. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Laboratory inspector with access to all places where work is being done. A minimum of 24 hours notification shall be given prior to commencement of work. The Contractor shall provide the Testing Laboratory providing services for the Owner with the following:

- a. A complete set of Architect/Engineer reviewed shop and erection drawings including all revisions and addenda.
 - b. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
 - c. Information as to time and place of all rollings and shipment of material to shops.
 - d. Representative sample pieces requested for testing.
 - e. Full and ample means and assistance for testing all material.
 - f. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.
3. Testing Laboratory Responsibility: The inspection by the Testing Laboratory providing services for the Owner of the Fabricator's work done in the shop shall be performed in the Fabricator's shop to the fullest extent possible. Such inspections shall be in sequence, timely, and performed in such a manner as to minimize disruptions in operations and to permit the repair of all nonconforming work while the material is in process in the fabricating shop. Inspection of field work shall be completed promptly so that corrections can be made without delaying the progress of the work. Inspections shall be performed by qualified technicians with a minimum of two years experience in structural steel testing and inspection. All inspection personnel shall be certified in accordance with AWS QC-1. The Testing Laboratory shall provide test reports of all shop and field inspections. Shop test reports shall include shop welders certifications. All test reports shall indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. In addition to the parties listed in this Specification the Fabricator and Erector shall receive copies of all test reports.
4. Rejection of Material or Workmanship: The Owner, Architect, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

B. Mill Tests of Structural Steel:

1. Mill Order Steel: The Fabricator shall furnish certified mill test reports and an affidavit stating that the structural steel furnished meets the requirements of the grade specified on the structural drawings for all mill order steel. In case of controversy, tests of the material according to ASTM A6 or A568 as applicable made by the Testing Laboratory providing services for the Contractor with certified test reports paid for by the Contractor shall be made to verify conformity

with ASTM standards. Tests shall be made for each 10 tons of material used unless approved otherwise by the Engineer.

2. Requirements for Heavy Tension Members Used In Welded Connections: The Fabricator shall furnish certified reports and an affidavit stating that structural shapes in ASTM A6, Groups 4 and 5 and Plates exceeding 2 inches thick subject to primary tensile stresses and that are spliced using complete-joint penetration welds or that are used in connections that utilize complete-joint or partial-joint penetrations welds conform to the requirements of the specifications.
 3. Local Stock Steel: Materials taken from stock by a Fabricator for use for structural purposes must be of a quality at least equal to that required by the ASTM specifications applicable to the classification covering the intended use. Certified mill test reports shall be accepted as sufficient record of the quality of materials carried in stock by the fabricator provided the stock steel can be identified by heat or melt numbers. In case of controversy, tests by the Testing Laboratory providing services for the Contractor with certified reports as specified for mill order steel shall be required.
 4. If tests are required, test specimens shall be taken by the Contractor under the direction of the Testing Laboratory providing services for the Contractor and shall be machined by the Testing Laboratory to dimensions as required by the applicable ASTM standards.
- C. Shop Inspections and Tests: The Testing Laboratory providing services for the Owner shall provide inspection at the designated fabrication shops for the designated periods of time to perform shop inspection and tests. The designated fabrication shops and time periods of inspection shall be determined in consultation with the Architect, Owner, and Engineer prior to the start of fabrication in a timely manner so as to not delay the fabrication process. The following tests and inspections shall be performed:
1. Review shop drawings and shop procedures with Fabricator's supervisory personnel.
 2. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
 3. Approve Welding Procedure Specifications submitted by the Contractor. Approve any changes submitted by the Contractor to any WPS that has already been approved. Obtain the Welding Procedure Qualification Record (WPQR) for each successful WPS qualification.
 4. Verify welder qualifications either by certification and/or by retesting. Obtain welder certificates.
 5. Check layout and dimensions of jigs and fixtures for multiple fabrication, joint preparation, and fit up of members.
 6. Verify welding electrodes to be used and other welding consumables as the job progresses.
 7. Check preheating procedures for uniformity and thoroughness through the full thickness of the material. Inspect preheating and interpass temperatures for conformance to AWS D1.1, Table 4.2. Verify procedure for control of distortion and shrinkage stresses.

8. Verify procedures for welding in accordance with applicable portions of Section 4, "Technique", AWS D1.1.
9. Inspect welding equipment for capacity, maintenance, and working condition.
10. Perform random dimensional checks of completed members.
11. Check camber of beams immediately after cambering.
12. Provide inspection of surface preparation for coating and coating operations.
13. Check shipping preparation schedules and obtain copies of shipping lists.
14. Inspect bolting operations according to inspection procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts".
15. Perform Arbitration Testing and Inspection according to procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph above.
16. Make visual inspection of welding in progress for size, length, and quality.
17. Perform non-destructive examination services for various weldments of shop fabrication determined in consultation with the Structural Engineer prior to the start of fabrication. The testing agency shall submit recommendations to the Structural Engineer for approval as to the type of nondestructive inspection methods best suited to the member being tested. Specifically, the Laboratory shall provide a qualified technician with the necessary equipment to perform the following:
 - a. Nondestructive examination conducted in accordance with the specific requirements for the item being examined including radiographic, ultrasonic, magnetic particle, or dye penetrant inspection. All nondestructive inspection procedures shall conform to AWS D1.1.
 - b. Interpret, record, and report all results of the nondestructive tests.
 - c. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with AWS D1.1.
 - d. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.
 - e. Verify that quality of welds meet the requirements of AWS D1.1.
18. Unless otherwise specified, test all partial and complete penetration welds in connections of beams, girders, columns, trusses, and braces. Test a minimum of 10% of connections with fillet welds. Increase the testing rate for welders having a high rejection rate as required to ensure acceptable welds. Visual inspection is required for all welds. The costs of repairing all defective welds and the costs of retesting by the Testing Laboratory providing services for the Owner shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory to investigate a suspected weld defect, such cost shall be borne by the Contractor.

- D. Field Inspections and Tests: The Testing Laboratory providing services for the Owner shall provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The following tests and inspections shall be made:
1. Obtain the planned erection procedure, and review with the Erectors supervisory personnel.
 2. Check the installation of base plates for proper leveling, grout type, and grout application.
 3. Verify field welding procedures and obtain welder certificates.
 4. Check steel as received in the field for possible shipping damage, workmanship, and piece marking.
 5. Check plumbness and frame alignment as erection progresses.
 6. Check camber of a representative sample of floor beams in an unstressed state immediately after steel is delivered to the site to determine the difference between the camber applied in the shop and the remaining camber in the field prior to erection.
 7. Check camber of a representative sample of floor beams with similar loads and spans after erection but before concrete floor slab placement. Check the same beams for residual camber left after the slab is placed.
 8. Submit a report on camber to the Engineer listing the results of the checks made on camber in the shop, in the field before erection, and in the field after erection both before and after slab placement.
 9. Check joint preparation and fit up, backing strips, and runout plates for welded moment connections and column splices.
 10. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
 11. Review welding sequence.
 12. Visually inspect all field welding for size, length, and quality.
 13. Perform nondestructive examination services for various weldments of field erection determined in consultation with the Structural Engineer prior to the start of erection. The Laboratory shall furnish a qualified technician with the necessary equipment to perform radiographic, ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested and other duties as outlined for shop inspection in the previous Section. Unless specified otherwise, check all partial and complete penetration welds in connections of beams, girders, columns, trusses, and braces. Check 10% of connections with fillet welds. Visual inspection is required for all welds.
 14. Perform preinstallation verification testing of the pretensioning method to be used in the field in accordance with the requirements of the "Specification for Structural Joints Using ASTM A325 and A490 Bolts". Daily check calibration of impact wrenches used in field bolted connections.

15. Inspect bolting operations for all high strengthfield bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
16. Perform Arbitration Testing and Inspection according to procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts" when a disagreement exists between the Testing Laboratory and the Fabricator as to the minimum tension of installed bolts that have been inspected according to paragraph above.
17. Visually inspect the welding or other attachment method of metal deck to the structure.
18. Visually inspect 100% of completed shear connectors in each beam and perform bend tests as required according to inspection procedures outlined in AWS D1.1. In addition, perform field bend tests on an additional 2% of completed shear connectors in each beam but not less that one connector per beam.

The costs of repairing all defective welds and the costs of retesting by the Testing Laboratory providing services for the Owner shall be borne by the Contractor. If removal of a backing strip is required by the Testing Laboratory providing services for the Owner to investigate a suspected weld defect, such cost shall be borne by the Contractor.

E. Tests and Inspection of Sprayed-On Fireproofing:

1. The Testing Laboratory providing services for the Owner shall confirm that sprayed-on fireproofing conforms to all performance criteria as specified in the project specifications by obtaining and reviewing manufacturer's certification or test reports.
2. The Testing Laboratory providing services for the Owner shall sample sprayed-on fireproofing at each floor for each day's operation and verify oven-dry density (ASTM E605) and adhesion/cohesion (ASTM E736) as specified on the drawings.
3. The Testing Laboratory providing services for the Owner shall verify proper installation method, proper material, and proper material thickness (ASTM E605) for each day's operation. The thickness of fireproofing shall be as specified in the UL designation numbers on the Architectural Drawings.

3.7 NON-SHRINK GROUT FOR BASE PLATES, BEARING PLATES AND PRECAST WALL PANELS

- A. Compressive Strength Tests (by the Testing Laboratory providing services for the Owner): Compressive strength of grout shall be determined by testing grout cubes according to the requirements of ASTM C109 - Modified. Test one set of three cubes at 1 day, and one set of three cubes at 28 days.
- B. Frequency of Testing: One set of cubes (6 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.

3.8 MASONRY

A. Prism Tests:

1. Prism Preparation: The Masonry Subcontractor shall make all prisms for the tests in the presence of the Testing Laboratory for each class of masonry (hollow masonry, grouted masonry, or composite masonry) on the project using an assembly of actual masonry units, mortar, and grout (if specified) as planned in the work.
2. Compressive Strength Test Method: Tests shall be run according to the requirements of ASTM C1314. Each strength test shall be defined as the average of three test prisms from the same class of masonry.
3. Frequency of Testing:
 - a. The Testing Laboratory providing services for the Contractor shall, in conjunction with the Contractor and the Masonry Supplier, verify that the materials proposed for use in the masonry construction comply with the contract documents. This will include verifying the strength (f'm) of the masonry assembly using prism tests prior to construction according to the specifications.
 - b. The Testing Laboratory providing services for the Owner shall conduct prism tests during construction at the frequency specified below.
 - (1) Interior Non-Load Bearing Walls: One strength test shall be run for each 5,000 square feet of wall or fraction thereof.
 - (2) Exterior Walls and All Loadbearing Walls: One strength test shall be run for each 5,000 square feet of wall area but not less than one strength test for each day's operation for each class of wall. An additional test should be run whenever there is a change in mortar or grout proportions.

B. Mortar:

1. The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Masonry Subcontractor, shall provide testing services as required to assist the Contractor in submitting mix designs in accordance with the Specifications for each class of mortar indicated on the structural drawings. Refer to the Unit Masonry Specifications for mix design requirements.
2. The Testing Laboratory providing services for the Owner shall review the submitted mix designs for conformance to the specifications and for suitability for use in the project.
3. Field Inspection and Testing: The Testing Laboratory providing services for the Owner shall verify that the proportions of the mortar comply with the submitted mix design and the specifications. This verification shall be done at the beginning of each day of masonry construction. for each batch of mortar from the beginning and continuously during masonry construction.

C. Grout:

1. The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Masonry Subcontractor, shall provide testing services as required to assist the Contractor in submitting mix designs in accordance with the Specifications for each class of grout indicated on the

structural drawings. Refer to the Unit Masonry Specifications for mix design requirements.

2. The Testing Laboratory providing services for the Owner shall review the submitted mix designs for conformance to the specifications and for suitability for use in the project.
3. Field Inspection and Testing The Testing Laboratory providing services for the Owner shall verify that the proportions of the grout comply with the submitted mix design and the specifications. This verification shall be done for each batch of grout from the beginning and continuously during masonry construction.

D. Hollow Concrete Masonry Units:

1. The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Masonry Subcontractor, shall provide testing services as required to assist the Contractor in verifying the compressive strength of hollow concrete masonry units prior to construction in accordance with the Specifications for each size of unit indicated on the drawings. Refer to the Unit Masonry Specifications for design requirements.
2. Compressive Strength Test Method: Tests shall be run according to the requirements of ASTM C140.
3. Field Testing: The Testing Laboratory providing services for the Owner shall perform a compressive strength test on hollow concrete masonry units continuously during construction for each 5000 square feet of wall. whenever masonry of a different production lot is used on the project. A strength test shall be defined as the average strength of three tested units.

E. Experience Requirement: Field inspection of masonry construction by the Testing Laboratory providing services for the Owner as herein described shall be performed by qualified technicians with a minimum of ten years experience in masonry testing and inspection.

F. Field Inspection Requirements: The duties and responsibilities of the Testing Laboratory Inspector in the field shall be as follows:

1. All Masonry Work
 - a. Review and become familiar with project drawings and specifications.
 - b. Review methods of storing and handling of masonry materials and accessories for conformance to project specifications.
 - c. Review the foundation to verify proper foundation construction tolerances, location, size and spacing of reinforcing dowels, and that foundation surfaces are properly prepared to accept the masonry.
 - d. Review all masonry materials used in the field for conformance to project specifications. This shall include masonry units, mortar, grout, portland cement, masonry cement, sand, lime, horizontal joint reinforcement, vertical reinforcement, ties, masonry anchoring devices to the structure, flashing, and control and expansion joint strips.
2. Periodic Inspection: For Masonry work not specified on the drawings or in the local building code as requiring continuous inspection, the field inspection shall additionally include the following:

- a. At the beginning of construction, verify that the workmanship of masonry construction including the mortar joints is in accordance with specifications.
 - b. At the beginning of construction, review proper horizontal joint reinforcement, bond-beam and lintel reinforcement, and vertical reinforcement size and spacing and size and spacing of wall ties.
 - c. At the beginning of each day of construction, verify proper mortar batching proportions and procedures as prescribed above.
 - d. Prior to each grouting operation, verify that the following are in compliance with specifications:
 - (1) grout space and clean-outs
 - (2) construction of mortar joints, lintels, and bond-beams.
 - (3) placement and size of reinforcement and connectors
 - (4) proportions of site-prepared grout mix
 - (5) installed flashing, weep holes, construction joints, control joints and wall vents
 - e. During grouting operation, provide continuous inspection to verify that grouting is proceeding according to specifications.
 - f. Gather specimens and perform tests on prisms and masonry units as specified above.
3. Continuous Inspection: For Masonry work specified on the drawings or in the local building code as requiring continuous inspection, the field inspector shall continuously inspect the construction procedures of the following items for compliance with specifications:
- a. Mortar proportions and batching.
 - b. Placing of Masonry units and construction of mortar joints.
 - c. Placing of horizontal joint reinforcement, lintel and bond-beam reinforcement, and vertical reinforcement.
 - d. Installation of flashing, weep holes, anchors, ties, construction joints, control joints, and wall vents.
 - e. Grout space.
 - f. Grout proportions and batching.
 - g. Grouting operations.
 - h. Gather specimens and perform tests on prisms and masonry units as specified above.

3.9 OPEN WEB STEEL JOISTS

- A. Scope: The Testing Laboratory providing services for the Owner shall perform inspection of open web steel joists in the fabricating plant and in the field as herein described.
- B. Obtaining Manufacturer's Product Certification: The Testing Laboratory providing services for the Contractor shall obtain product certification for open web steel joists and joist girders as required by the Specifications.
- C. Inspection in the Fabrication Plant: Duties of Plant Inspector shall be as follows:
 1. Review Contract Drawings and Specifications for joist requirements.
 2. Verify welder certifications.
 3. Verify all welding operations with SJL requirements.

4. Verify fabrication with Steel Joist Institute (SJI) requirements.
5. Confirm proper welding of splices and location of splices in joist chord members as specified on the drawings.
6. Verify camber of joists for dead load.
7. Check size and length of joists.
8. Review painting operations for conformance with project specifications.
9. Monitor and report on the results of all joist load tests required by the Specifications.

D. Inspection in the Field: The duties of the Field Inspector shall be as follows:

1. Inspect joists for damage during shipment.
2. Verify proper bearing of joist supports.
3. Verify camber requirements of joists arriving in the field.
4. Confirm bridging size and location.
5. Confirm attachment of joists to supports (welding or bolting).
6. Confirm bolting of joists to supports at column lines as required by OSHA requirements.
7. Verify that no joists have been damaged during erection.

3.10 LIGHTWEIGHT INSULATING CONCRETE

A. Tests of Portland Cement: Portland cement shall be tested for compliance with the requirements of ASTM C150.

1. Mill Certificates: Mill certificates certifying that the cement has been tested and meets the requirements of the Specifications will be acceptable as test results, provided the cement proposed for use can be identified with test lots. Mill certificates shall be submitted by the Contractor prior to use of any such material.
2. Retesting: Retesting of cement will be required by the Testing Laboratory providing services for the Contractor if:
 - a. In the opinion of the Owner, Architect, or Engineer, the cement has been damaged in storage or transit or is in any way defective.
 - b. The cement has been in storage at the mixing site for over 30 days.

B. Tests for Aggregates: The Testing Laboratory providing services for the Contractor shall verify that concrete aggregates proposed for use conform to ASTM C332 Group I. Submit a written affidavit from supplier that aggregates furnished meet this specification.

C. Insulating Concrete Mix Designs: The Testing Laboratory providing services for the Contractor, acting in conjunction with the Contractor and his Concrete Supplier shall

provide testing services as required to assist the Contractor in submitting mix designs in accordance with the Specifications for each class of concrete indicated on the structural drawings. Refer to the Lightweight Insulating Concrete Specifications for mix design requirements.

- D. Test Samples (by the Testing Laboratory providing services for the Owner):
1. Samples: Make samples (3" x 6" cylinders) of insulating concrete in accordance with ASTM C172 except as modified by ASTM C495.
 2. Wet Density: Determine wet density in accordance with ASTM C138.
 3. Compressive Strength and Density: Determine compressive strength and oven dry density in accordance with ASTM C495.
 4. Frequency of Tests: Make a minimum set of nine test cylinders (3" x 6") during each placement but not less than one set for each 5000 square feet of placement. Density shall be calculated using three cylinders. Compressive strength shall be determined by testing six cylinders and averaging four test results after excluding the high and low tested values.
- E. Insulating Concrete Test Reports: Test reports shall be distributed immediately after completion of each test and shall contain the following information:
1. Truck number and ticket number.
 2. Batch Plant.
 3. Mix design number.
 4. Accurate location of pour in structure.
 5. Strength requirement.
 6. Date of tests.
 7. Technician making tests.
 8. Air temperature at placement.
 9. Sample size.
 10. Wet and oven dry density (average of three tests).
 11. Air content.
 12. Type of cap.
 13. Compressive strength (average of four tests) with cross-sectional area and test load.
- F. Evaluation and Acceptance of Concrete:

1. Compressive Strength: A strength test shall be defined as the average of four 28 day breaks. The strength level of the concrete shall be considered satisfactory if both of the following requirements are met:
 - a. The average of all sets of three consecutive strength tests shall equal or exceed the specified strength.
 - b. No individual strength test shall fall below its required strength by more than 30 psi.
2. Wet Density: Plus or minus 2.0 PCF at point of placement when tested according to ASTM C138.
3. Oven Dry Density: Plus or minus 2.0 PCF when tested according to ASTM C495.

If any of the above requirements are not met, the Testing Laboratory providing services for the Owner shall immediately notify the Architect/Engineer by telephone. Steps shall immediately be taken to correct the deficiencies.

END OF SECTION 01410