

**GUIDELINE PROGRAM
FOR STRUCTURAL TESTING
AND SPECIAL INSPECTION**

Fourth Edition

Prepared by

**COUNCIL OF AMERICAN STRUCTURAL ENGINEERS OF MINNESOTA
(CASE/MN)**

GUIDELINE PROGRAM
FOR
STRUCTURAL TESTING AND SPECIAL INSPECTION©

Fourth Edition

Prepared by:
CASE/MN Education Committee
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CASE/MN represents the majority of structural engineering firms throughout the state and is under the overall organization of the American Council of Engineering Companies of Minnesota. Our mission is to provide a forum for effective actions to improve the quality and practice of Structural Engineering.

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INTRODUCTION

Over the past 30 years, structural integrity and the role of the Structural Engineer of Record (SER) have been topics of increasing controversy, and some confusion. As early as 1961 the Uniform Building Code (UBC) mentioned "Special Inspection" but the scope was not clear. The Minnesota State Building Code (MBC) has long adopted the UBC but it was not until the late 1980's that some jurisdictions began partial enforcement.

Through the 1970's and 1980's, a number of major structural failures occurred throughout the United States. Some of the notable failures which resulted in personal tragedies and tremendous property damage costs are as follows:

1970	Commonwealth Avenue Building	4 killed, 20 injured
1971	Brockport Ice Arena	No casualties
1973	Bailey's Crossroads Building	14 killed
1976	Teton Dam	11 killed
1978	Hartford Coliseum	No casualties
1979	Kemper Arena	No casualties
1981	Cocoa Beach Building	11 killed, 23 injured
1981	Hyatt Regency Walkways	113 killed, 188 injured

These events focused national attention on the issue of structural integrity and in August of 1982, the U.S. House of Representatives, Committee on Science and Technology began an investigation. The resulting report, (U.S. Congressional House Report No. 98-621) "Report on Structural Failures in Public Facilities", released in 1984, indicated that the two most critical items out of 20 factors identified were:

1. A need for better communication/organization within the design and construction team.
2. More involvement in the construction phase, by the SER. The report urged that code organizations, "should make every effort to ensure that provisions are written into building codes...which make the on-site presence of the structural engineer mandatory during the construction of structural components....".

Recent efforts by governmental agencies, model code organizations and professional engineering associations have addressed this issue by attempting to clarify and enforce "Special Inspection" requirements.

In 1989, the Minnesota Division of Building Codes and Standards stressed the importance of "Special Inspection" with a series of seminars. In 1990, the Minnesota Division of Building Codes and Standards collaborated with the Consulting Engineers Council of Minnesota/Geotechnical Committee and the Council of American Structural Engineers/Minnesota (CASE/MN) to produce a voluntary-use document bound in the informational section of the Minnesota State Building Code.

In early 1992, continued confusion throughout the design and construction community over interpretation and enforcement of "Special Inspection" requirements, prompted the Education

Committee of CASE/MN to develop the first edition of this document titled "Guideline Specification for Structural Testing and Special Inspection".

The document was intended to clarify the responsibilities of each member of the project team as related to this issue. The document was reviewed with representatives of the Minnesota Division of Building Codes and Standards, the Consulting Engineers Council of Minnesota/Geotechnical Committee and several other organizations. Appropriate review comments were incorporated into the second edition published in 1995, which also incorporated 1994 UBC requirements.

The third edition of this document was based on the 1997 Uniform Building Code as amended by the 1998 Minnesota Building Code. The most notable change from earlier editions involves its accepted use as a "stand-alone program" or as a "specification". The document's title and format have been revised to reflect this difference. However, the technical content is relatively unchanged from earlier editions.

The fourth edition incorporates changes based on the 2000 International Building Code as amended by the 2002 Minnesota State Building Code.

PURPOSE

This document is intended to serve as a guideline program to identify the items critical to the structural integrity of buildings and clearly outline the responsibilities of the parties involved in design, construction, testing and inspection.

The term used in this document, "Structural Testing and Special Inspection" (STSI) is used to denote the actual intent of "Special Inspection" when enforced in the Minnesota construction environment.

This document includes provisions to satisfy the intent of "Special Inspections" (Chapter 17 of the 2000 International Building Code) and other pertinent testing required to satisfy the project's structural design. However, including them in a single-source document may minimize oversight, misunderstanding and improve coordination.

USE OF THE DOCUMENT

CASE/MN desired a format which would be most useful to all parties involved. Therefore, the document is written in C.S.I. specification format, with commentary. Appropriate sections of this document should be edited by the project's design professionals. **The 2000 IBC does not require the Special Inspection Program to be included in the project's Contract Documents. Therefore, the Program can be prepared as a separate submittal document or incorporated into the project drawings/specifications.**

The following apply when the Program is included in the project specifications:

- PART 1 should be edited by the prime professional and the Structural Engineer of Record (SER) and inserted into the "front end" specifications.

- PART 3 (the technical sections) should be edited by the SER and inserted into standard technical specifications for each respective material. Note: Part 2 is not used as it is the Materials section following C.S.I. format.
- The architect or prime professional should define items needing conventional testing and inspection, and insert these where appropriate.

Special Inspections of exterior insulation and finish systems (EIFS) and the smoke-control system are not structural related. Therefore, these types of inspections are not included in this Guideline. The design professionals with these responsibilities should include proper inspection requirements within the contract documents or as a separate program submitted to the Building Official.

Questions or comments related to this document should be directed to CASE/MN. Copies of this document, including electronic files, may be obtained through the American Council of Engineering Companies of Minnesota.

GUIDELINE PROGRAM FOR SPECIAL STRUCTURAL TESTING AND INSPECTION

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GUIDELINE PROGRAM FOR SPECIAL STRUCTURAL TESTING AND INSPECTION

COMMENTARY

PART 1 GENERAL

1.01 Intent and Conditions

A. Intent

1. Define and coordinate structural testing and special inspection services.
2. Define and coordinate conventional testing and inspection services.
3. Provide greater confidence that the specified work is constructed in compliance with the contract documents and Chapter 17 of the 2000 International Building Code as adopted by the current Minnesota State Building Code.
4. Testing and Inspection services are intended to assist in determining probable compliance of the work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the contract documents.

If this Program will be issued as a submittal document separate from the Contract Documents, the Prime Professional should coordinate contractor requirements with the specifications.

Conventional items are generally non-structural and involve material quality or aesthetic properties.

B. Conditions

1. If inspection of fabricator's work is required, the Owner's representative may require testing and inspection of the work at the plant, before shipment. Owner, Architect and Structural Engineer of Record (SER) reserve the right to reject material not complying with the contract documents.
2. Testing and inspection shall be performed in accordance with the industry standard used as the reference for the specific material or procedure unless other criteria are specified. In the absence of a referenced standard, tests shall be accomplished in accordance with generally accepted industry standards.
3. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection if defective work or materials are discovered, nor shall it obligate Owner to accept such work.

1.02 Related Requirements

- A. Refer to PART 2 for technical scope sections regarding specific qualifications, inspections, tests, frequency and standards required.

If this Program will be incorporated into the project specifications, the General and Supplemental Conditions should also be referenced

1.03 Definitions

- A. Testing – Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.
- B. Inspection – Evaluation of systems, primarily requiring observation and engineering judgment.
- C. Structural Testing and Special Inspection – Structural Testing and Special Inspection Services herein include items required by the 2000 IBC as adopted by the current Minnesota State Building Code, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.
- D. Conventional Testing and Inspection – Conventional Testing and Inspection Services herein describe those items not specially required by Code but may be considered essential to the proper performance of the building systems.
- E. Architect of Record – The prime consultant in charge of overall design and coordination of the project.
- F. Structural Engineer of Record (SER) – The Licensed Engineer in responsible charge of the structural design for the project.
- G. Licensed Structural Engineer: – A professional engineer with education and experience in the design of structures similar to this project licensed to practice in the state in which the project is located.
- H. Testing Agency (TA) – The properly qualified firm performing testing services.
- I. Special Inspector (SI) – A properly qualified individual or firm performing special inspections.
- J. Building Official – The Officer or his duly authorized representative charged with the administration and enforcement of the Minnesota State Building Code.
- K. Continuous – The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

Delete Architect of Record if not applicable.

- L. Periodic –The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

1.04 References

- A. ASTM E329-02 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
- B. ASTM E43-02 - Standard Practice for Agencies Performing Nondestructive Testing.
- C. ASTM C1077-02 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- D. ASTM C1093-95 - Practice for Accreditation of Testing Agencies for Unit Masonry.
- E. ASTM D3740-01 - Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. International Building Code (2000)
- G. Minnesota State Building Code (2003).
- H. See technical sections of PART 2 for specific references.

1.05 Qualifications

- A. Testing Agency (TA) – The testing agency shall be an approved independent testing agency acceptable to the Owner, Architect, SER and as noted below:
 - 1. Authorized to operate in the state in which the project is located and experienced with the requirements and testing methods specified in the technical scope sections of PART 2.
 - 2. Meeting applicable requirements of Section 1.04 "References".
 - 3. Testing equipment shall be calibrated at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards, or to accepted values of natural physical constants.
- B. Special Inspector (SI) – The special inspector shall be under the direct supervision of a registered civil/structural engineer, experienced with the type of work requiring structural testing and special inspection.
 - 1. The categories of special inspector are:

- a. Special Inspector - Technical I, II, and III: Usually an employee of a testing agency.
 - b. Special Inspector - Structural I and II: Preferably an employee of the SER's firm.
2. Unique special inspector requirements, for specific materials and system, are noted in related technical specification sections.

Specific and unique qualifications for each type of special inspector are established in each technical section of PART 2.

The reviewer should consider requiring additional experience and specific liability insurance requirements for the special inspector firm, commensurate with the level of project complexity and risk.

1.06 Responsibilities

A. Structural Testing and Special Inspection

1. Special Inspectors:

- a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.
- b. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.
- c. Use the approved design drawings and specifications, supplemented by the approved shop drawings for review of the work.
- d. Test and/or inspect the work assigned for conformance with the building department approved design drawings, specifications and applicable material and workmanship provisions of the Code. Perform testing and inspection in a timely manner to avoid delay of work.
- e. Bring discrepancies to the immediate attention of the contractor for correction, confirm that they are corrected and, if uncorrected after a reasonable period of time, bring to the attention of the Structural Engineer of Record, the Building Official, and to the Architect.
- f. Submit test and/or inspection reports to the Building Official, Contractor, the Structural Engineer of Record, and other designated persons in accordance with the Structural Testing and Special Inspection Summary Schedule.
- g. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the Code.

Reviewer may wish to specifically define "reasonable period of time".

Reviewer should indicate who gets on going versus summary reports.

Verify with Building Official as to frequency of reports required.

2. Testing Agency:

- a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.
 - b. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.
 - c. When engaged as a special inspector, provide structural testing and special inspection services as previously described.
3. Architect of Record (or other prime consultant):
- a. Complete and sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction. Provide a completed copy of the schedule to all signed parties including Building Official.
 - b. If appropriate, arrange and attend a pre-construction meeting to review the scope of structural testing and special inspection. Include Contractor, Building Official, SER, Testing Agency and other parties concerned.
 - c. Coordinate the flow of reports and related information to expedite resolution of construction issues.
4. Structural Engineer of Record (SER):
- a. Identify items requiring structural testing and special inspection including special cases.
 - b. Define "type" of special inspector required for "description" of work indicated on the structural testing and special inspection schedule.
 - c. Complete and sign the Structural Testing and Special Inspection Summary Schedule prior to commencement of construction.
 - d. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.
 - e. Review reports submitted by special inspectors.
 - f. If engaged as a special inspector, provide structural testing and special inspection services as previously described.

Special cases may include such items as precast connections, wood construction, light gauge metal framing, etc.

5. Contractor:

- a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.
- b. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.
- c. Post or make available the Structural Testing and Special Inspection Summary Schedule within its office at the job site. Also, provide adequate notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
- d. Provide the special inspectors access to the approved design drawings, approved shop drawings and specifications at the job site.
- e. Review reports submitted by special inspectors.
- f. Retain at the job site all reports submitted by the special inspectors for review by the building official upon request.
- g. Correct in a timely manner, deficiencies identified in inspection and/or testing reports.
- h. Provide the special inspector safe access to the work requiring inspection and/or testing.
- i. Provide labor and facilities to provide access to the work and to obtain, handle and deliver samples, to facilitate testing and inspection and for storage and curing of test samples.
- j. Verification of conformance of the work within specified construction tolerances is solely the Contractor's responsibility.

If this program will not be incorporated into the project specifications, the responsibilities assigned to bidders must still be written into the project specifications if associated costs are to be included in the base bid by the Contractor.

6. Fabricator:

- a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencing construction.
- b. Submit a Certificate of Compliance to the Building Official, Special Inspector, and Structural Engineer of Record that the work was performed in accordance with the approved plans and specifications.

See notes as for Contractor responsibilities.

7. Building Official (Typical responsibilities noted for information only):

Reviewer should coordinate with the local Building Official prior to issue of contract documents.

- a. Determine work, which in the Building Officials opinion, involves unusual hazards or conditions in accordance with the IBC.
- b. Review special inspector qualifications.
- c. Accept and sign the completed Structural Testing and Special Inspection Summary Schedule.
- d. Review all fabricators who perform work in their shop, which requires special inspection.
- e. Review reports and recommendations submitted by the special inspectors.
- f. Review the "final signed reports" submitted by the special inspector(s). These documents should be accepted and approved by the building department prior to issuance of a Certificate of Occupancy.

8. Owner:

- a. Establish direct funding to provide for cost of structural testing and special inspection services.
- b. Provide special inspector with approved design drawings, specifications and approved shop drawings.
- c. Provide special inspectors and testing agencies with full access to site at all times.
- d. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.

B. Conventional Testing and Inspection

1. Testing Agency:

- a. Test or inspect the work assigned, for conformance with building department approved plans, specifications and applicable workmanship provisions of the IBC.
- b. Bring non-conforming items to the immediate attention of the Contractor, and if uncorrected to the Architect of Record.
- c. Submit test and/or inspection reports to the Architect of Record, the Contractor and other designated persons.

2. Contractor:

- a. Provide adequate notification to testing agency so they may properly prepare for and schedule their work.
- b. Provide testing agency with access to the approved design drawings, approved shop drawings and specifications at the job site.
- c. Correct in a timely manner, deficiencies identified in test and/or inspection reports.
- d. Provide testing agency with safe access to the work requiring testing and inspection.
- e. Provide labor and facilities to provide access to the work and to obtain and handle samples, to facilitate testing and inspection and for storage and curing of test samples.
- f. Verification of conformance of the work within specified construction tolerances is solely the Contractor's responsibility.

3. Architect of Record (or other prime consultant):

- a. Coordinate the flow of reporting and related information to expedite resolution of construction issues.

C. Inspections by Building Official

1. Contractor shall provide adequate notice for inspections performed by the Building Official, as required by the 2000 IBC, the Minnesota State Building Code, and local ordinance.

D. Periodic Site Observations by Design Consultant

1. Special structural testing and inspection, conventional testing and inspection, and periodic inspections by the Building Official do not preclude the normal field involvement and site observations by Architect or Structural Engineer of Record, nor shall it relieve the Contractor of any responsibility to complete the work in accordance with the approved drawings and specifications.

E. Limits of Authority

1. Testing agents and/or special inspectors may not waive or alter contract requirements, or approve or accept any portion of the work unless specifically authorized by the Architect or Structural Engineer of Record. They may not assume any duties of the Contractor, and they have no authority to stop or reject "Work".

1.07 Payment

- A. Owner or Architect/Structural Engineer of Record acting as the Owner's Agent shall directly employ and pay for services of the special inspectors to perform required Structural Testing and Special Inspection.
- B. Owner shall employ and pay for services of the testing agency to perform required Conventional Testing and Inspection.
- C. Unless noted otherwise, the Contractor shall provide and pay for all materials, samples, mock-ups, and assemblies required for testing and inspection and shall pay for all shipping costs related to delivery of this work. Testing agency will pay for shipping costs of samples transported from site to lab.
- D. If exploratory work is required to determine the cause of defects, the cost of such work shall be paid by the Contractor, if the work is found to be defective, in the judgment of the Architect/Engineer. Contractor shall reimburse the Owner for all costs incurred in this event.
- E. Any tests required to qualify the Contractor, or the workmen for any phase of the work, shall be performed at no additional cost to the Owner.

1.08 Inspection Notice

- A. Contractor shall provide minimum of 24 hours notice for all items requiring testing or inspection. Items requiring testing and inspection services prior to or during placement shall not be placed until testing and inspection services are available. Items requiring testing and inspection services after placement shall not be enclosed or obscured until testing and inspection services are performed.

1.09 Reports

- A. Testing agency and/or special inspectors shall submit reports in accordance with the Structural Testing and Special Inspection Summary Schedule and shall conduct and interpret tests and inspections and state in each report whether; (1) test specimens and observations comply with Contract Documents, and specifically state any deviations, (2) record types and locations of defects found in work, (3) record work required and performed, to correct deficiencies.
- B. Reports for structural testing and special inspection, shall be submitted in timely manner to the Contractor, Building Official, SER, and Architect of Record.

1. Submit reports for ongoing work, to provide the information noted below:
 - a. Date issued.
 - b. Project title and number.
 - c. Firm name and address.
 - d. Name and signature of tester or inspector.
 - e. Date and time of sampling.
 - f. Date of test or inspection.
 - g. Identification of product and specification section.
 - h. Location in project, including elevations, grid location and detail.
 - i. Type of test or inspections.
 - j. Results of tests or inspections and interpretation of same.
 - k. Observations regarding compliance with Contract Documents or deviations there from.
2. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.

C. Reports for conventional testing and inspection shall be submitted in a timely manner to the Contractor and the Architect of Record.

1.10 Frequency of Testing and Inspection

A. For detailed requirements see technical sections of PART 2.

Prime Professional to determine if other parties should also be copied.

1.11 Protection and Repair

A. Upon completion of testing, sample-taking, or inspection, the Contractor shall repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect/Engineer of Record. Protect work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

1.12 Tests to Demonstrate Qualification

- A. If the Contractor proposes a product material, method, or other system that has not been pre-qualified, the Architect may require applicable tests, to establish a basis for acceptance or rejection. These tests will be paid for by the Contractor.
- B. The Architect/Engineer of Record reserves the right to require certification or other proof that the system proposed, is in compliance with any tests, criteria or standards called for. The certificate shall be signed by a representative of an independent testing agency.

PART 2 MATERIALS (NOT USED)

PART 3 SCOPE OF TESTING AND INSPECTION

3.01 Structural Testing and Special Inspection Program Summary

- A. The parties involved shall complete and sign the Structural Testing and Special Inspection Summary Schedule. The Program, including Summary Schedule, shall be submitted to the building official for approval prior to issuance of a building permit. The completed schedule includes the following:
 - 1. A specific listing of the items requiring inspection and testing.
 - 2. The associated technical scope sections that define the applicable standards by which to judge conformance with the approved plans and specifications in accordance with the IBC, as adopted by the Minnesota State Building Code. The technical scope sections should also include the degree or basis of inspection and testing; i.e., intermittent/will-call or full-time/continuous.
 - 3. The frequency of reporting, i.e., weekly, monthly, per test/inspection, per floor, etc.
 - 4. The parties responsible for performing the inspection and testing work.
 - 5. The required acknowledgments by each designated party.

3.02 Conventional Testing and Inspection

- A. (Not Used)

CSI format has Materials as Part 2 of the specification. The Structural Testing and Special Inspection section should be in Part 3 – Execution.

Reviewer's option to insert a list of materials and related specification sections including conventional testing and inspection

3.03 Technical Sections

A. Section 02200 - Earthwork - Grading, Excavation Filling

1. (Not Used)
2. Definitions
 - a. Refer to PART 1 for standard definitions.
 - b. Special Inspector - Technical
 - 1) Technical I
Technician shall be under the direct supervision of a Technical III. Work shall be performed in a qualified geotechnical/testing laboratory.
 - 2) Technical II
Technical with a minimum of 2 years experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/testing laboratory, under the direct supervision of a Technical III.
 - 3) Technical III
A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved geotechnical/testing laboratory. This licensed engineer shall review and approve all final field reports.
3. Structural Testing and Special Inspection Requirements

Technician qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for projects that are more complex.

<u>Item and Frequency</u>	<u>Qualifications</u>
---------------------------	-----------------------

- | | |
|--|--------------------|
| a. Classification of materials used and encountered during construction per ASTM:D2488 and ASTM:D2487. | <u>Technical I</u> |
| b. Performance of laboratory testing of materials, as needed (Proctor, Sieve Analysis, Atterberg Limits, Consolidation Test, etc.). | <u>Technical I</u> |
| c. Field Density Tests: | <u>Technical I</u> |
| d. Provide periodic results of field compaction and laboratory work for general compliance with Contract Documents and Geotechnical Reports. | <u>Technical I</u> |

SER and geotechnical engineer to determine frequency.

- e. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved.
Technical II
- f. Document presence of groundwater within excavations.
Technical I
- g. Provide reports of subgrade observations for general compliance with Contract Documents and Geotechnical Report.
Technical II
- h. Verify cut and fill slopes as specified in the contract documents.
Technical III

Architect/Engineer to include other items such as site fill compaction, topsoil depth verification, etc.

4. Conventional Testing and Inspections Requirements

- a. Contractor shall verify that footings comply with frost depth requirements and shall report any variances to the SER in a timely manner.

B. Section 02350 - Drilled Piers/Caissons

1. General

- a. Cast-in-Place concrete and concrete reinforcing required by this section shall have structural testing and special inspection as required by sections:

03210	Concrete Reinforcement
03300	Cast-in-Place Concrete

Insert reference to the appropriate technical sections as required for related work. Or insert the item(s) needed for this work from other technical sections (when not used) into paragraph 3.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical
 - 1) Technical I
Technician shall be under the direct supervision of a Technical III.
 - 2) Technical II
Technician with a minimum of 2 years experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/testing laboratory, under the direct supervision of a Technical III.
 - 3) Technical III
A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved geotechnical/ testing

Special Inspector qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for projects that are more complex.

laboratory. This licensed engineer shall review and approve all final field reports.

c. Special Inspector - Structural

1) Structural I

Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

2) Structural II

Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in the state in which the project is located. The licensed engineer shall review and approved all inspection reports.

3) Special Inspector - Structural may be an employee of the SER.

Qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for projects that are more complex.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform Special Inspector - Structural work.

The SER is the only party intimately familiar with the original structural design criteria and rationale. The SER is also the party most familiar with the structural details. Thus the SER is the most qualified to observe the on-going work and to make proper judgements as to the effect of site conditions and field modifications on the critical structural members and overall building frame integrity.

3. Structural Testing and Special Inspection Requirements

<u>Item and Frequency</u>	<u>Qualifications</u>
a. Observe all drilling operations and maintain records for all drilled piers/caissons.	<u>Technical II</u>
1) Pier location	
2) Pier size and bell diameter, if required	
3) Top and bottom elevation	
4) Rock elevation, if any	
5) Final centerline location and variation from plan location (eccentricity), based on contractor's staking	
6) Variation of shaft from plumb	
7) Depth of socket	
8) Levelness of bottom	
9) Top and bottom of casings left in place	
10) Variation of bell dimensions from original design	

Add or delete as required.

- 11) Check contractor drilled probe holes to specified depth and verify bearing capacity
- 12) Water in-flow
- 13) Obstructions
- 14) Observe probe hole and rock grouting and document grout quantities, if applicable

- b. Provide reports of pier observations for general compliance with Contract Documents and Geotechnical Report.

Technical II

- c. Test and inspect placement of concrete and reinforcement. (See Sections 03210 and 03300.)

4. Conventional Testing and Inspection Requirements

- a. Contractor shall verify final pier location, identify variance from plan location and shall inform SER of any variance in a timely manner.

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but are not critical to the structural integrity.

C. Section 02360 - Driven Piles

1. General

- a. Cast-in-place concrete for concrete filled steel pipe piles required by this section shall have structural testing and special inspection as required by Section 03300 Cast-in-Place Concrete.

Insert reference to the appropriate technical sections as required for related work. Or insert the item(s) needed for this work from other technical sections (when not used) into paragraph 3.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical

1) Technical I

Technician shall be under the direct supervision of a Technical III. Work shall be performed in a qualified geotechnical/testing laboratory.

Technician qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for projects that are more complex.

2) Technical II

Technician with a minimum of 2 years experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/testing laboratory, under the direct supervision of a Technical III.

3) Technical III

A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved geotechnical/testing laboratory.

Qualifications and supervising engineers' involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for more complex projects.

This licensed engineer shall review and approve all final field reports.

c. Special Inspector - Structural

- 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in the state in which the project is located. The licensed engineer shall review and approved all inspection reports.
- 3) Special Inspector - Structural may be an employee of the SER.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform Special Inspector - Structural work.

The SER is the only party intimately familiar with the original structural design criteria and rationale. The SER is also the party most familiar with the structural details. Thus the SER is the most qualified to observe the on-going work and to make proper judgments as to the effect of site conditions and field modifications on the critical structural members and overall building frame integrity.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|--|-----------------------|
| a. Observe all pile driving operations and maintain piling records for all piles driven. | <u>Technical I</u> |
| 1) Pile location (grid) and variance from plan. | |
| 2) Type and size of hammer used. | |
| 3) Continuous record of number of blows/foot for each foot of penetration. | |
| 4) Pile dimensions (diameters and wall thickness). | |
| 5) Tip elevation/depth. | |
| 6) Elevation of butt before and after cut-off. | |
| 7) Pile plumbness, if applicable. | |
| 8) Documentation of pile damage. | |
| b. Review field data, judge pile capacity for general compliance with Contract Documents and Geotechnical Report; and submit report. | <u>Technical III</u> |

4. Conventional Testing and Inspections Requirements

- a. (Not Used)

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but which are not critical to the structural integrity.

D. Section 03100 - Concrete Form Work

1. General

- a. (Not Used)

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
 - 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the State in which the project is located. The licensed engineer shall review and approve all inspection reports.
 - 3) Special Inspector - Structural may be an employee of the SER.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform the Special Inspections - Structural Services. The SER is the only party intimately familiar with the original design criteria and intent. The SER is the most qualified to observe the work and make proper judgments related to site conditions and field modifications for critical elements and their effect on overall building structural integrity.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|--|---|
| <ul style="list-style-type: none"> a. Verify formwork dimensions for all concrete, excluding: <ul style="list-style-type: none"> 1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock 2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed in accordance with Table 1805.4.2, or the footing structural design is based on a f'_c no greater than 2500 psi. 3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch. 4) Concrete foundation walls constructed in accordance with Table 1805.5(2), Table 1805.5(3) or Table 1805.5(4). 5) Concrete patios, driveways and sidewalks on grade. | |
| | <p>This inspection is not specifically required by IBC. However, it is included in the ICBO Model Program for Special Inspections, and is judged to be appropriate.</p> <p>The SER shall modify the exclusions as appropriate. The exclusion for strip footings without transverse reinforcement is justified by considering them as non-reinforced concrete. Include additional items as deemed necessary, which serve to verify material qualities or appearance, but are not critical to the structural integrity.</p> |
| | <p>Minnesota State Building Code Amendments to the IBC exclude Table 1805.5(1) from the exceptions.</p> |

4. Conventional Testing and Inspection Requirements

- a. (Not Used)

E. Section 03210 - Concrete Reinforcement

1. General

- a. Refer to Section 05100 - Structural Steel for inspections involving welding reinforcing steel.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical
 - 1) (Not Used)
- c. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
 - 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the State in which the project is located. The licensed engineer shall review and approve all inspection reports.
 - 3) Special Inspector - Structural may be an employee of the SER.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform the Special Inspections - Structural Services. The SER is the only party intimately familiar with the original design criteria and intent. The SER is the most qualified to observe the work and make proper judgments related to site conditions and field modifications for critical elements and their effect on overall building structural integrity.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|--|-----------------------|
| a. Inspect reinforcement in all cast in place concrete, excluding: <ol style="list-style-type: none">1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed in accordance with Table 1805.4.2, or the footing structural design is based on a f'_c no greater than 2500 psi.3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch. | |

The SER shall modify the exclusions as appropriate. The exclusion for strip footings without transverse reinforcement is justified by considering them as non-reinforced concrete.

- 4) Concrete foundation walls constructed in accordance with Table 1805.5(2), Table 1805.5(3) or Table 1805.5(4).

Minnesota State Building Code Amendments to the IBC exclude Table 1805.5(1) from the exceptions.

b. Verify the following:

- 1) Verify reinforcing bar grade.
- 2) Verify reinforcing bars are free of dirt, excessive rust, and damage.
- 3) Verify reinforcing bars are adequately tied, chaired, and supported to prevent displacement during concrete placement.
- 4) Verify proper clear distances between bars and to surfaces of concrete.
- 5) Verify reinforcing bar size and placement.
- 6) Verify bar laps for proper length and stagger.
- 7) Verify mechanical splices are placed in accordance with the plans, specifications and reviewed shop drawings.
- 8) Verify weldability of reinforcing steel, other than ASTM A706. Verify welding of reinforcing bars meets requirements set forth in Section 05100.
- 9) Verify epoxy coating is present at locations noted on the plans and specifications, include tie wires, chairs, bolsters, etc. Verify coating damage is repaired in accordance with the contract documents.

The special inspector does not need to be present during the entire reinforcing/ prestressing steel operation, provided he has inspected for conformance prior to closing of forms or delivery of concrete to the job site.

Depending on specific project conditions, the SER may require specific items to be inspected by Structural II personnel.

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but are not critical to the structural integrity.

Structural I

4. Conventional Testing and Inspection Requirements

- a. (Not Used)

F. Section 03300 - Cast-in-Place Concrete

1. General

- a. (Not Used)

2. Definitions

- a. Refer to PART 1 for standard definitions.

b. Special Inspector - Technical

- 1) Technical I
ACI Certified Grade I inspector. Inspector shall be employed by a testing laboratory, under the direct supervision of a Technical III.
- 2) Technical II
ACI Certified Grade II inspector. Inspector shall be employed by a testing laboratory, under the direct supervision of a Technical III.

- 3) Technical III
A civil/structural engineer regularly engaged in this type of work, with a minimum of 4 years experience and licensed in the State in which the project is located and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approved all reports.
- 4) Testing laboratory shall have C.C.R.L. certification at the National Bureau of Standards.

c. Special Inspector - Structural

- 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the State in which the project is located. The licensed engineer shall review and approve all inspection reports.
- 3) Special Inspector - Structural may be an employee of the SER.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform the Special Inspections - Structural Services. The SER is the only party intimately familiar with the original design criteria and intent. The SER is the most qualified to observe the work and make proper judgments related to site conditions and field modifications for critical elements and their effect on the overall building structural integrity.

3. Structural Testing and Special Inspection Requirements

<u>Item and Frequency</u>	<u>Qualifications</u>
---------------------------	-----------------------

a. Sample and test all cast in place concrete.

- 1) Prepare compression test specimens (ASTM C31), one set of four standard cylinders of concrete for each compressive strength test, mold and store cylinders for laboratory-cured specimens.
- 2) Perform compressive strength tests (ASTM C39). One set of four cylinders for each day's pour between one and 25 cubic yards. If a day's pour exceeds 25 cubic yards, one set of four cylinders for each additional 50 cubic yards, or fraction thereof. One specimen at seven days, two at 28 days, and one specimen retained in reserve for later testing if required. For post tensioned concrete, make and test an additional cylinder at three days to verify strength prior to stressing. (When frequency of testing will provide less than five strength tests for a given class of concrete, conduct at least five strength tests from randomly selected batches. If fewer than five batches are used, conduct one test from each batch.)
- 3) Slump (ASTM C143): One test at point of discharge for each set of compression test specimens; additional tests

Insert additional testing as required such as cast-in-place punch out cylinders for P.T. concrete.

- when concrete consistency appears to have changed.
- 4) Air entrainment (ASTM C231): Test the first batch of air entrained concrete and one additional test for each set of compression test specimens.
 - 5) Concrete Temperature: Test concrete temperature hourly when air temperature is 40F and below and when 80F and above, and each time a set of compression test specimens is made.

Technical I

b. Perform concrete mix verification.

- 1) Verify mixer truck trip ticket conforms to approved mix design.
- 2) Verify that total water added to mix on site does not exceed that allowed by concrete mix design.
- 3) Verify that concrete quality is indicative of adequate mixing time, consistency, and relevant time limits.

Technical I

c. Inspect preparation and placement of all concrete, excluding:

- 1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock
- 2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed in accordance with Table 1805.4.2, or the footing structural design is based on a f'_c no greater than 2500 psi.
- 3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch.
- 4) Concrete foundation walls constructed in accordance with Table 1805.5(2), Table 1805.5(3) or Table 1805.5(4).
- 5) Verify the following:
 - a) Verify acceptable general condition of concrete base prior to placement.
 - b) Verify that concrete conveyance and depositing avoids segregation and contamination.
 - c) Verify that concrete is properly consolidated.
 - d) Verify reinforcement remains at proper location.
 - e) Unless noted, inspections shall be continuous.
Inspections shall be performed on a periodic basis for the following types of work:

Depending on specific project conditions, the SER may determine that concrete preparation, placement, protection, and curing should be performed by Technical II personnel. The SER shall modify the exclusions as appropriate. The exclusion for strip footings without transverse reinforcement is justified by considering them as non-reinforced concrete.

Periodic inspections are allowed for concrete placement by the MBC, Section 1305.1704, Subp. 2.

Minnesota State Building Code Amendments to the IBC exclude Table 1805.5(1) from the exceptions.

<u>Element</u>	<u>Frequency</u>
----------------	------------------

Structural I

- d. Observe protection and curing methods for all concrete, excluding:
- 1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock
 - 2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed in accordance with Table 1805.4.2, or the footing structural design is based on a f'_c no greater than 2500 psi.
 - 3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch.
 - 4) Concrete foundation walls constructed in accordance with Table 1805.5(2), Table 1805.5(3) or Table 1805.5(4).
 - 5) Verify the following:
 - a) Verify specified curing procedures are followed.
 - b) Verify that specified hot and cold weather procedures are followed.

Minnesota State Building Code Amendments to the IBC exclude Table 1805.5(1) from the exceptions.

Structural I

- e. Inspect all bolts installed in concrete.
- 1) Verify specified size, type, spacing, configuration, embedment, and quantity.
 - 2) Verify proper concrete placement and means have been taken to achieve consolidation around all bolts.

Special Inspection of bolts is required only where allowable loads have been increased by IBC 1912.5

Structural I

4. Conventional Testing and Inspection Requirements

- a. (Not Used)

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but are not critical to the structural integrity. For example:

1. Flatness, jointing and dowels for special slabs on grade.
2. Testing and inspections of test panel for color and finish of exposed concrete.

The SER should include under "Special Structural Inspection and Testing," all items which are critical to structural integrity and require quality control, even if not specifically listed in the IBC.

G. Section 03341 - Insulating Concrete Fill

1. General

- a. (Not Used)

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical
Shall be supervised by a civil/structural engineer licensed in the state where the work is performed. Inspector shall satisfy the following minimum requirements:
 - 1) Technical I
ACI Grade I Certified Inspector, and able to demonstrate previous experience with similar types of construction.
- c. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
 - 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
 - 3) Special Inspector - Structural may be an employee of the SER.

Conventional Testing and Inspection may be used if the insulating concrete fill is not part of a structural system.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|--|-----------------------|
| a. Cast-In-Place Insulating Concrete Fill | |
| b. Procedures and Preparation: | |
| 1) Verify proposed procedures and mix; comply with recommendations of ACI 523.1R Guide for Cast-In-Place Low-Density Concrete. | <u>Technical I</u> |
| 2) Placement: | |
| a) Visually inspect substrate to receive fill prior to each pour. Substrate shall be free of deleterious material. | <u>Technical I</u> |

This section applies for low density concrete with oven-dry unit weight less than or equal to 50 P.C.F.

3) Density Tests:

- a) Test density per ASTM C567 and ACI 523.1R, with 1 test consisting of 2 cylinders for each day's pour between 1 and 75 c.y. and 1 test for each additional 75 c.y. (or fraction thereof). Technical I

4. Conventional Testing and Inspection Requirements

- a. (Not Used)

Reviewer should insert specific requirements for "Conventional Testing and Inspection," if needed.

H. Section 03360 - Shotcrete

1. General

- a. (Not Used).

2. Definitions

- a. Refer to PART 1 for standard definitions.

Special Inspector qualifications and supervising engineers involvement should be adjusted based on project complexity.

b. Special Inspector - Technical

1) Technical I

ACI Certified Grade I Inspector. Inspector shall be employed by a testing laboratory under the direct supervision of a Technical III.

Site visits by the supervising engineer may be appropriate for more complex projects.

2) Technical II

ACI Certified Grade II Inspector. Inspector shall be employed by a testing laboratory under the direct supervision of a Technical III.

3) Technical III

A civil/structural engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.

c. Special Inspector - Structural

1) Structural I

Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

Qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for more complex projects.

- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
- 3) Special Inspector - Structural may be an employee of the SER.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform this work.
The SER is the only party intimately familiar with the original structural design criteria and rationale. The SER is also the party most familiar with the structural details. Thus the SER is the most qualified to observe the on-going work and to make proper judgments related to site conditions and filed modifications on the critical structural members and overall building frame integrity.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|--|-----------------------|
| a. Verify that coarse aggregate, if used, does not exceed 3/4". | |
| b. Verify reinforcing bar size. Verify proper placement, spacing, and minimum clearance bars. | <u>Structural I</u> |
| c. When two or more curtains of reinforcing are used, verify minimum spacing of 12 bar diameters in curtain nearest nozzle and remaining curtain(s) will be 6 bar diameters. | <u>Structural I</u> |
| d. Verify lap splices shall be non-contact lap with 2" minimum clearance between bars. | <u>Structural I</u> |
| e. Verify sample test panel make-up and shotcreting procedures in accordance with IBC Section 1914. | <u>Structural II</u> |
| f. Core or saw concrete sample for test panel and verify compressive strength of cured concrete in accordance with IBC Section 1914. | <u>Technical I</u> |
| g. Shotcrete used for structural members shall be continuously inspected during shotcreting operation. | <u>Structural I</u> |
| h. Completed work to be visually inspected for soundness, bar embedment, voids, pockets and similar deficiencies by examining of 3-3" diameter cores. | <u>Structural II</u> |
| i. Verify specified curing and protection procedures are followed. | <u>Structural I</u> |

Omit when test panel not required.

Continuous is defined as full time inspection during shotcreting of specific members.

Requires destructive testing of finished work.

4. Conventional Testing and Inspection Requirements

- a. Color
- b. Surface texture

These are some suggestions of what might be considered for non-structural testing. Prime professional should include additional items as deemed necessary which serve to verify material qualities or appearance but which are not critical to the structural integrity.

I. Section 03365 - Post-Tensioned Concrete

1. General

- a. Cast-in-place concrete, concrete form work, and mild steel reinforcing related to this section shall have structural testing and special inspection as required by sections:

- 03100 - Concrete Form Work
- 03210 - Concrete Reinforcement
- 03300 - Cast-in-Place Concrete

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical
 - 1) Not Used.
- c. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
 - 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
 - 3) Special Inspector - Structural may be an employee of the SER.

3. Structural Testing and Special Inspection Requirements

Item and Frequency

Qualifications

- a. Inspect prestressing steel in all cast in place concrete, excluding:
 - 1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock
 - 2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed in accordance with Table 1805.4.2,

Refer to Section 03100, Concrete Formwork for items specifically excluded from requiring Special Inspections.

The SER shall modify the exclusions as appropriate.

or the footing structural design is based on a f'_c no greater than 2500 psi.

- 3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch.
- 4) Concrete foundation walls constructed in accordance with Table 1805.5(2), Table 1805.5(3) or Table 1805.5(4).
- 5) Verify the following:
 - a) Verify size and grade.
 - b) Verify prestressing steel is free of rust and damage and is properly wrapped.
 - c) Verify that prestressing steel and ducts are adequately tied, chaired, and supported to prevent displacement during concrete placement.
 - d) Verify proper clear distances between prestressing steel and the surfaces of concrete.
 - e) Verify proper placement of prestressing steel and ducts.
 - f) Verify location, size, and placement of prestressing steel anchors. Verify coatings and watertight elements are in conformance with the contract documents.
 - g) Verify sheathing is of proper thickness and damage is repaired in accordance with the contract documents.
 - h) Verify proper calibration of stressing ram.
 - i) Verify steel is prestressed at the proper time, using proper techniques, including stressing locations, and sequence. Verify field elongation conforms with the calculated elongation.
 - j) Verify proper placement of grout into post tensioning ducts.

Minnesota State Building Code Amendments to the IBC exclude Table 1805.5(1) from the exceptions.

The special inspector does not need to be present during the entire reinforcing /prestressing steel operation, provided he has inspected for conformance prior to closing of forms or delivery of concrete to the job site.

The SER may require the SI to sign off on the stressing record as a means of verification.

Depending on specific project conditions, the SER may require specific items to be inspected by Structural II personnel.

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but are not critical to the structural integrity.

4. Conventional Testing and Inspection Requirements

- a. Not Used.

J. Section - 03500 Reinforced Gypsum Concrete

1. General

- a. Not Used.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical

Technician qualifications and supervising engineer's involvement should be adjusted based on the project complexity.

- 1) Technical I
ACI Certified Grade I Inspector. Inspector shall be under the direct supervision of a Technical III. The licensed Engineer shall review and approve all inspection reports.
- 2) Technical II
ACI Certified Grade II Inspector. Inspector shall be under the direct supervision of a Technical III. The licensed engineer shall review and approve all inspection reports.
- 3) Technical III
A civil/structural engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.

Qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for more complex projects.

Site visits by the supervising engineer may be appropriate for more complex projects.

c. Special Inspector - Structural

- 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.
- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
- 3) Special Inspector - Structural may be an employee of the SER.

Qualifications and supervising engineer's involvement should be adjusted based on project complexity. Site visits by the supervising engineer may be appropriate for more complex projects.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform the work of Special Inspector Structural. The SER is the only party intimately familiar with the original structural design criteria and rationale. The SER is also the party most familiar with the structural details. Thus the SER is the most qualified to observe the on-going work and to make proper judgments to the effect of site conditions and field modifications on the critical structural members and their effect on the overall building frame integrity.

3. Structural Testing and Special Inspection Requirements

- | <u>Item and Frequency</u> | <u>Qualifications</u> |
|---|-----------------------|
| a. Test for specified compressive strength of gypsum cores. | <u>Technical I</u> |
| b. Verify placement and drupe of reinforcing. Verify size, type and grade of reinforcing. | <u>Structural I</u> |
| c. Verify size, type, placement and spacing of subpurlins. | <u>Structural I</u> |
| d. Verify thickness of formboard. Verify support and joint tightness. | <u>Structural I</u> |

- 1) Verify embedment, spacing, size and grade of bolts and dowels in gypsum concrete.

Structural I

4. Conventional Testing and Inspection Requirements

- a. Finish
- b. Curing

Include additional items as deemed necessary, which serve to verify material qualities or appearance, but which are not critical to the structural integrity.

K. Section 04200 - Masonry

1. General

- a. Special inspection of masonry is required during preparation of masonry wall prisms or test specimens, sampling and placing of masonry units, placement of structural reinforcement, cleanout of grout space immediately prior to closing of elements, and during all grouting operations.
- b. Inspections noted below as being periodic shall be performed at least once per 500 square feet, except 100% of shear walls, masonry beams, and masonry columns shall be inspected.

Special Inspection of masonry are not required for: Empirically designed masonry, glass unit masonry, or masonry veneer designed by Section 2109, 2110, or ACI530 Chapters 5, 6, or 7 when they are part of nonessential buildings; or masonry foundation walls constructed in accordance with Table 1805.5(2), 1805.5(3), or 1805.5(4).

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector - Technical
 - 1) Technical I
Technician shall be under the direct supervision of a Technical III regularly engaged in testing and inspection of this type of work. The licensed engineer shall review and approve all inspection reports.
 - 2) Technical II
Graduate civil/structural engineer, with experience in this type of work. Supervised by a Technical III. The licensed engineer shall review and approve all inspection reports.
 - 3) Technical III
A civil/structural engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.
- c. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel

CASE/MN recommends defining the maximum amount of placement between inspections, with a range 500 to 1500 sf being reasonable. Depending on project conditions, a time period may also be appropriate to define. Critical items noted should be added or deleted depending on project conditions.

acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
- 3) Special Inspector - Structural may be an employee of the SER.

3. Structural Testing and Special Inspection Requirements – Level 1

Item and Frequency

Qualifications

a. Samples and Tests for Special Inspections

- 1) Masonry Unit Test – shall be performed in accordance with IBC Section 2105, as follows:
 - a) Units conform to ASTM C 55 or ASTM C 90.
 - b) Test units according to ASTM C 140 prior to the start of construction.
 - c) During construction one set of tests for each 5,000 SF of wall area, but not less than one set for the project.

Technical I

Generally, Unit Tests or Prism Tests should be specified, some projects may require both types of tests.

SER should indicate which wall types require testing.

- 2) Prism Tests - number and frequency in accordance with IBC Section 2105, as follows:

- a) A set of 3 masonry prisms for each masonry type requiring testing, shall be built and tested in accordance with ASTM C1314 prior to the start of construction.
- b) During construction a set of 3 masonry prisms shall be built and tested in accordance with ASTM C1314 for each 5,000 SF of wall area in question, but not less than one set of 3 masonry prisms for the project.
- c) The compressive strength of masonry determined in accordance with ASTM C1314 for each set of prisms shall equal or exceed specified f_m.

Technical I

SER should indicate which wall types require testing.

- 3) Preparation, storage, handling of prism tests. (Contractor shall provide labor and materials to construct all prism tests.)

Technical I

Specifier should indicate contractor's work in execution section of specification.

b. Masonry Preparation and Placement

- 1) Base Conditions:
On a periodic basis, verify that masonry bearing surfaces

are clean.

- 2) Condition of Units:
On a periodic basis, verify that masonry units are clean and sound and dry.
- 3) Proportions of site-prepared mortar:
On a periodic basis, verify proportions of prepared mortar are consistent with previously submitted materials.

Technical I

- 4) Placement:
On a periodic basis, inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.
- 5) Joints:
On a periodic basis, inspect construction, expansion and contraction joints for location and continuity of steel.
- 6) On a periodic basis, verify hot and cold weather procedures are followed.
- 7) On a periodic basis, verify wall cavities are protected against entry of precipitation.

SER should add other specific requirements as required such as grouting of collar joints.

SER to determine frequency.

Structural I

c. Masonry Reinforcement:

- 1) Vertical Reinforcement:
On a periodic basis, inspect placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls, and positioning of steel.
- 2) Horizontal Reinforcement:
On a periodic basis, inspect horizontal joint reinforcement steel and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearance to masonry units and outside face of walls, and alignment.
- 3) Ties:
On a periodic basis, inspect ties in masonry for type, straightness, embedment, spacing and size.
- 4) Dowels and Anchors:

Welding of Reinforcement is specified in Section 05120, Structural Steel. SER should review and edit that section as appropriate for the work. Welding inspection is to be continuous while the welding is being performed.

On a periodic basis, inspect the installation of masonry anchor bolts, joist anchors, inserts, straps, and dowels.

Structural I

d. Prior to Masonry Grouting and Capping

1) Grout Spaces:

On a periodic basis, verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.

2) Reinforcement:

On a periodic basis, verify placement of reinforcement and connectors remains consistent with construction documents.

3) Site Prepared Grout:

On a periodic basis, verify proportions of site prepared grout are consistent with previously submitted materials.

SER to determine frequency. Table 1704.5.1 as modified by the Minnesota State Building Code allows for grout placement to be periodic when acceptable to the structural engineer of record and the building official.

Structural I

e. During Grouting Operations

1) Grouting:

On a periodic basis, verify proper grouting technique including consolidation to approved height of grout space, reconsolidation and vibration.

2) Dry Packing:

On a periodic basis, verify proper application of dry packing.

Structural I

f. General Compliance

- 1) On a periodic basis, verify that work is being performed in accordance with the contract documents and the approved submittals and that materials used are consistent with prior submittals.

Structural I

4. Structural Testing and Special Inspection Requirements – Level 2

Level 2 inspections are required for engineered masonry in essential facilities.

Item and Frequency

Qualifications

a. Samples and Tests for Special Inspections

Generally, Unit Tests or Prism Tests should be specified, some projects may require both types of tests.

1) Masonry Unit Test – shall be performed in accordance with IBC Section 2105, as follows:

SER should indicate which wall types require testing.

- a) Units conform to ASTM C 55 or ASTM C 90.
- b) Test units according to ASTM C 140 prior to the start of construction.
- c) During construction one set of tests for each 5,000 SF of wall area, but not less than one set for the project.

Technical I

2) Prism Tests - number and frequency in accordance with IBC Section 2105, as follows:

SER should indicate which wall types require testing.

- a) A set of 3 masonry prisms for each masonry type requiring testing, shall be built and tested in accordance with ASTM C1314 prior to the start of construction.
- b) During construction a set of 3 masonry prisms shall be built and tested in accordance with ASTM C1314 for each 5,000 SF of wall area in question, but not less than one set of 3 masonry prisms for the project.
- c) The compressive strength of masonry determined in accordance with ASTM C1314 for each set of prisms shall equal or exceed specified f_m.

Technical I

3) Preparation, storage, handling of prism tests. (Contractor shall provide labor and materials to construct all prism tests.)

Specifier should indicate contractor's work in execution section of specification

Technical I

b. Masonry Preparation and Placement

1) Base Conditions:

On a periodic basis, verify that masonry bearing surfaces are clean.

2) Condition of Units:

On a periodic basis, verify that masonry units are clean and sound and dry.

3) Proportions of prepared mortar

Technical I

4) Placement:

On a periodic basis, inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.

SER should add other specific requirements as required such as grouting of collar joints.

5) Joints:

On a periodic basis, inspect construction, expansion and contraction joints for location and continuity of steel.

SER to determine frequency.

6) On a periodic basis, verify hot and cold weather procedures are followed.

7) On a periodic basis, verify wall cavities are protected against entry of precipitation.

Structural I

c. Masonry Reinforcement:

1) Vertical Reinforcement:

On a periodic basis, inspect placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls, and positioning of steel.

Welding of Reinforcement is specified in Section 05120, Structural Steel. SER should review and edit that section as appropriate for the work. Welding inspection is to be continuous while the welding is being performed.

2) Horizontal Reinforcement:

On a periodic basis, inspect horizontal joint reinforcement steel and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearance to masonry units and outside face of walls, and alignment.

3) Ties:

On a periodic basis, inspect ties in masonry for type, straightness, embedment, spacing and size.

Structural I

4) Dowels and Anchors:

Inspect the installation of all masonry anchor bolts, joist anchors, inserts, straps, and dowels.

Continuous

Structural I

d. Prior to Masonry Grouting and Capping

1) Grout Spaces:

Verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.

SER to determine frequency. Table 1704.5.1 as modified by the Minnesota State Building Code allows for grout placement to be periodic when acceptable to the structural engineer of record and the building official.

Structural I

2) Reinforcement:

Verify placement of reinforcement and connectors remains consistent with construction documents.

3) Site Prepared Grout:

Verify proportions of site prepared grout are consistent with previously submitted materials.

Structural I

e. During Grouting Operations

1) Grouting:

On a periodic basis, verify proper grouting technique including consolidation to approved height of grout space, reconsolidation and vibration.

2) Dry Packing:

On a periodic basis, verify proper application of dry packing.

Structural I

f. General Compliance

- 1) On a periodic basis, verify that work is being performed in accordance with the contract documents and the approved submittals and that materials used are consistent with prior submittals.

Structural I

5. Conventional Testing and Inspection Requirements

- a. Not Used.

L. Section 05100 - Structural Steel

1. General

- a. If special inspection of fabricators work is required, testing agent may test and inspect structural steel at plant before shipment. Owner and SER reserve right to reject material not

The SER should consider inclusion under "Special Structural Inspection and Testing", all items which are critical to structural integrity and require quality control, even if not specifically listed in the IBC.

complying with Contract Documents at any time before final acceptance.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. A.S.N.T:
The American Society for Non-destructive Testing.
- c. N.D.E.:
Non-destructive Evaluation.
- d. A.W.S./C.A.W.I. :
American Welding Society/Certified Associate Weld Inspector.
- e. A.W.S./C.W.I.
American Welding Society/Certified Weld Inspector.
- f. R.C.S.C
Research Council On Structural Connections
- g. Special Inspector – Technical
Shall be employed by a testing agency and shall be supervised by an A.W.S./C.W.I. with a minimum of 10 years experience or an A.S.N.T. Level III with a minimum of 10 years experience. These individuals shall satisfy the following requirements:
 - 1) Technical I
Non-destructive Testing Technician S.N.T.-TC-1A Level I, and/or A.W.S. Certified Associate Weld Inspector (C.A.W.I.)
 - 2) Technical II
Non-destructive Testing Technician A.S.N.T. TC-1A Level II, (NDE Technician II), A.W.S./C.A.W.I., with minimum 3 years experience, or an A.W.S./C.W.I.
 - 3) Technical III
A.S.N.T. Level III with a minimum of 10 years experience or an A.W.S./C.W.I. with a minimum of 10 years experience.
- h. Special Inspector - Structural
 - 1) Structural I
Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

In specifying the type and level of special inspector the SER should take into account the complexity, importance, and life-safety considerations of the project.

"Technical I" classification shall only be engaged to assist a "Technical II" or III.

- 2) Structural II
Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.
- 3) Special Inspectors - Structural may be an employee of the SER.

3. Structural Testing and Special Inspection Requirements

<u>Item and Frequency</u>	<u>Qualifications</u>
a. High Strength Bolting (Field Installed):	
1) General	
a) On a periodic basis, visually inspect mating surfaces and bolt type for all slip-critical bolted connections for general conformance with the contract documents prior to bolting.	
b) Determine the requirements for bolts, nuts, washers, paint and installation/tightening standards are met.	
c) Observe calibration procedures when such procedures are required in the contract documents and verify that selected procedure is used to tighten bolts.	
	<u>Technical II</u>
2) Slip Critical Bolts and Tension Bolts	
a) Test bolt tightening in 10% of all bolts. Test a minimum of two bolts in each connection. Verify that all plies of connected elements have been brought into contact, at 100% of connections. Verify all tips are removed from "twist"-off bolts.	
	<u>Technical II</u>
3) Bearing Bolts	
a) On a periodic basis, visually inspect to confirm all plies of connected elements have been brought into contact, at 100% of connections. (Applies only to bolts designed for values not requiring exclusion of threads from failure plane, all other bolts require testing as for tension bolts.)	
	<u>Technical II</u>
4) Standard	
a) Test High Strength bolted connections per R.C.S.C. "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."	

b. High Strength Bolting (Shop Installed):

- 1) For shop fabricated work, perform tests required for field installation, except that bolt testing may be reduced or deleted, if fabrication shop satisfies AISC Quality Certification Program - Category I, or more stringent criteria, or is approved by building official and SER.

Specifier should note that the special inspector will not be able to give the Owner a reliable cost on a "not-to-exceed" basis, for this work, until the fabricator is selected.

SER should adjust these requirements depending on project complexity, but should be specific about requirements, if A.I.S.C. quality certification program is not specified.

c. Welding (General): The Special Inspector shall perform the following on a periodic basis:

- 1) Prior to start of fabrication determine if fabrication shop meets the criteria for exempting shop welds from inspection and confirm in writing to building official and SER.
- 2) Verify qualifications of all welders as AWS certified.
- 3) Verify Manufacturer's certificate of compliance for weld filler materials.
- 4) Verify proposed welding procedures and materials.
- 5) Verify adequate preparation of faying surfaces.
- 6) Verify preheat and interpass temperatures of steel, proper technique and sequence of welding, and cleaning and number of passes are provided as required.

Verification of procedures are recommended, but are not required by IBC.

Technical II

d. Welding (Field):

1) Fillet Welds:

On a periodic basis, visually inspect 100% of all fillet welds, for size, length, and quality, per AWS D1.1.

Technical II

2) Partial Penetration Welds:

Test 100% of all partial penetration welds exceeding 5/16 inch, using Ultrasonic Testing per A.W.S. D1.1. Test 25% of all partial penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E-109, performed on root pass and on finished weld.

Refer to IBC 1704.3, exception 2) for exceptions to continuous inspection for items including:

1. Single pass fillet welds not exceeding 5/16" size.
2. Welded studs when used for structural diaphragm.
3. Sheet metal or cold formed framing.
4. Stairs and railing systems.

Technical II

- 3) Full Penetration Welds:
Test 100% of all full penetration welds exceeding 5/16 inch, using Ultrasonic Testing per A.W.S. D1.1 Test 25% of all full penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E-109, performed on root pass and on finished weld.

Technical II

- 4) Stud Shear Connector Welds: Visually inspect 100% of installed studs for full 360° flash. Test all questionable studs, not showing full 360° flash by bending studs to 15° from vertical, away from weld discontinuity, per AWS D1.1. All ceramic welding ferrules shall be removed by contractor. Randomly test all other studs by bending to 15° from vertical as noted:
- Studs welded thru deck 15%
 - Studs welded to bare steel 5%
- Alternatively, sound 100% of installed studs, for full penetration weld, using an 8 lb. maul. Test questionable studs as noted above. Welding ferrules need not be removed.

Technical I

- 5) Steel Joist/Joist Girder Welds:
Provide testing and inspection for field welds previously described.
- 6) Deck Welds:
On a periodic basis, visually inspect size, location, length and burn thru for 100% of puddle welds on metal deck designed as a structural element, per AWS D1.3.

Technical I

- 7) Cold Formed Metal Framing Welds:
On a periodic basis, visually inspect 100% of welds for specified length, size, and continuity in accordance with AWS D1.3 for metal less than 1/8" in thickness, for work designed as a structural element.

Technical I

- 8) Welding of Reinforcing Bars:
Visually inspect 100% of all reinforcing bar welds as the welding is performed, per AWS D1.4.
- a) Verify weldability of reinforcing steel other than ASTM A706.

- b) Verify proper joint preparation is provided and proper electrodes are used and properly stored and dried.

Technical II

- 9) Miscellaneous Metals, Inserts and Prefabricated Components:
Where integrity of the connections impact life safety or performance of the building structure, provide testing and inspection as for typical welds previously specified.

The SER should list items which are of structural concern for the project. Possible elements may include:

- Stairs
- Railings
- Precast connections to support structure

- e. Welding (Shop):

- 1) Perform inspections as for field welding except weld testing may be reduced or deleted, if fabrication shop satisfies AISC Quality Certification Program - Category I, or more stringent criteria, and is approved by building official and SER.

SER may adjust these requirements depending on project complexity, but should be specific about requirements, if A.I.S.C. quality certification program is not specified.

- f. Mechanical Fasteners (Misc.):

- 1) Fasteners:
Visually inspect specified size, spacing, embedment, and location.

Technical I

- g. Structural Configuration:

- 1) Submittals:
Verify mill test reports and other submitted documentation, for compliance with contract document.

Structural I

- 2) Materials:
Verify materials delivered to site comply with contract documents and approved shop drawings. Materials include:

- a) Structural Steel
- b) Bolts
- c) Electrodes
- d) Mechanical fasteners
- e) Deck gauge

Technical I

- 3) Detail Compatibility. On a periodic basis:
 - a) Review project documents affecting integrity of the structure, including contract documents and pertinent submittals (approved shop drawings).
 - b) Visit site, at intervals appropriate to the stage of construction, to perform review of the structure and visually confirm general compliance with the project documents.

CASE/MN strongly recommends that the SER, or personnel directly under his/her supervision, perform the work of Special Inspector Structural. The SER is the only party intimately familiar with the original structural design rationale and related loads and safety factors. The SER is also the party most familiar with the structural details. The SER is thus the party most likely to detect flaws in the original design or errors in the ongoing construction, and is the most qualified to evaluate their effect on the integrity of the structure.

- c) Inspect the following to verify member orientation, configuration, type, and size complies with details indicated on the contract documents an approved shop drawings:
 - Bracing and stiffening members.
 - Proper applications of joint details at connections for structural members.
 - Other work critical to the integrity of the building structure.

Structural I

4. Conventional Testing and Inspection Requirements

Item and Frequency

Qualifications

a. High Strength Bolting

1) Bolt Material Test

Test a minimum of two bolts of each ASTM class specified, for bolt hardness and tensile properties.

SNT-TC-1A

2) Fabrication and Erection Tolerances

Verify in-place structure satisfies specified tolerances.

For example, specific preconstruction testing agency engaged by contractor, should be included under "Conventional Testing and Inspection".

Other quality control issues requiring documentation may be listed here.

M. Section 07250 - Spray Applied Fire-resistive material

1. General

- a. Testing agency shall be familiar with the requirements and testing methods required in IBC Standards and with approved UL assembly requirements.

2. Definitions

- a. Refer to PART 1 for standard definitions.
- b. Special Inspector – Technical
 - Shall be supervised by an engineer licensed to practice in the state where the work is performed. Inspector shall be acceptable to the building official, the Owner and the SER and shall satisfy the following minimum requirements:
 - 1) Technical I
 - Shall be familiar with the interpretation and use of IBC Standard 7-6, and have prior field experience in testing and inspection of spray-applied Fire-resistive material.

3. Structural Testing and Special Inspection Requirements

Specified should insert into the appropriate technical specification section.

Architect should provide adequate definition of required assembly and fire rating on the contract documents.

<u>Item and Frequency</u>	<u>Qualifications</u>
a. Spray Applied Fire-resistive material	
1) Procedures and Preparation Verify substrates to receive Fire-resistive material are prepared in accordance with manufacturer's instructions and are free of materials which may prevent adequate adhesion. Inspect batching to comply with manufacturer's requirements for first 3,000 s.f. applied.	<u>Technical I</u>
2) Thickness Test thickness of applied Fire-resistive material as per ASTM E605.	<u>Technical I</u>
3) Density Test density per ASTM E605.	<u>Technical I</u>
4) Bond Strength Test bond strength of cured fire-resistant material per ASTM E 736.	<u>Technical I</u>
4. Conventional Testing and Inspection Requirements	
a. Not used.	

Reviewer should insert specific requirements for "Conventional Testing and Inspection", if needed.