

FAIRFAX COUNTY, VIRGINIA

SPECIAL INSPECTIONS PROGRAM - 2015 Edition (2015-SIP)

Effective: September 4, 2018

Publication date: Sep 4, 2018

Based on

Virginia Uniform Statewide Building Code (2015) Edition

13 VAC 5-63-10 ... 5-63-500, effective Sep 4, 2018

Part I Virginia Construction Code

and

International Building Code - 2015 Edition

Administered by

CRITICAL STRUCTURES/COMMERCIAL BUILDING BRANCH

BUILDING DIVISION

LAND DEVELOPMENT SERVICES

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This document is also available on the Fairfax County website:

<https://www.fairfaxcounty.gov/landdevelopment/special-inspections-program>

ACKNOWLEDGMENTS

The Critical Structures/Commercial Building Branch, Building Division, Land Development Services, expresses our appreciation for the valuable assistance of all the individuals, especially Dan K. Williams, P.E., C.B.O, and organizations who contributed to the creation of:

Special Inspections Manual - 2015 Edition

Note: The 2015 *Virginia Uniform Statewide Building Code* amendments of the International Code Council, Inc., model codes are available through the Department of Housing and Community Development. The complete composite building codes (2015 *Virginia Construction Code*, 2015 *Virginia Rehabilitation Code*, 2015 *Virginia Maintenance Code*, etc.) are available through the International Code Council, Inc.

CONTENTS

PREFACE.....

CHAPTER 1
FAIRFAX COUNTY, SPECIAL INSPECTIONS PROGRAM

CHAPTER 2
DEFINITIONS

CHAPTER 3
SPECIAL INSPECTIONS DOCUMENTS REQUIRED

CHAPTER 4
PRECONSTRUCTION MEETING.....

CHAPTER 5
SPECIAL INSPECTIONS AND TESTING SERVICES

CHAPTER 6
STEEL CONSTRUCTION

CHAPTER 7
CAST-IN-PLACE CONCRETE

CHAPTER 8
PRECAST CONCRETE

CHAPTER 9
WOOD

CHAPTER 10
MASONRY

CHAPTER 11
SOILS AND FOUNDATIONS.....

CHAPTER 12
EARTH RETENTION SYSTEMS

CHAPTER 13
EXTERIOR INSULATION AND FINISH SYSTEMS

CHAPTER 14

SPRAYED FIRE-RESISTANT MATERIALS

CHAPTER 15

MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS

CHAPTER 16

SMOKE CONTROL SYSTEMS

CHAPTER 17

MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS

CHAPTER 18

MISCELLANEOUS

SAFEGUARDS DURING CONSTRUCTION

CONSTRUCTION ELEVATORS

FIRE PROTECTION

FIRE PROTECTION AND SAFETY REQUIREMENTS FOR PARTIALLY OCCUPIED BUILDINGS

OCCUPANCY REQUIREMENTS FOR NEW BUILDINGS AND ALTERATIONS TO EXISTING BUILDINGS

APPENDIX A

ARCHITECTS/ENGINEERS SEALED DESIGNS.....

APPENDIX B

CHAPTER N QUALITY CONTROL AND QUALITY ASSURANCE.....

APPENDIX C

QA/QC - 2011 STANDARD FOR QUALITY CONTROL AND QUALITY ASSURANCE FOR INSTALLATION OF STEEL DECK.....

APPENDIX D

TABLE 1.18.2-LEVEL B QUALITY ASSURANCE & TABLE 1.18.3-LEVEL C QUALITY ASSURANCE

PREFACE

Special Inspections Program (2015-SIP) (effective September 4, 2018) must be used in conjunction with the 2015 Virginia Uniform Statewide Building Code Part I Virginia Construction Code (VCC), which incorporates and amends the 2015 International Building Code.

CHAPTER 1 FAIRFAX COUNTY, VIRGINIA SPECIAL INSPECTIONS PROGRAM

SECTION 101 OVERVIEW

101.1 Special inspections required. "Special inspections" are observations, inspections and tests conducted during the construction of building components, elements and connections that require expertise to substantiate adequacy and are required as part of the building code.

Special Inspections shall be performed as required by Chapter 17 (Special Inspections and Tests) of the 2015 Virginia Construction Code and this 2015 edition of the Fairfax County, Virginia Special Inspections Program. Elements listed in Chapter 17, and Earth Retention Systems as listed in Chapter 12 of the Special Inspections Program, require special inspections.

- **Elements** Items of "unique" design or construction characteristics, or unusual materials, or with special installation requirements, may be subject to special inspection and material tests (see VCC-1705.1.1 Special Cases and Code of Virginia § 54.1-402). The Building Plan Review Branch and the Critical Structures/Building Inspections Section will consider such items on a case by case basis.
- **Elective by owner** Owners of buildings may elect to follow the Special Inspections Program on projects that otherwise do not fall under the above criteria. In such cases, the owner shall notify the Building Plan Review Branch and the Critical Structures/Building Inspections Section of this intent prior to issuance of the building permit and must follow all applicable requirements of the Special Inspections Program and this 2015-SIP document.

101.2 Alternative inspections or tests. Proposals for alternative special inspection procedures, or alternative test methods, after review and approval by the appropriate registered design professionals, must be submitted to the Critical Structures/Building Inspections Section for consideration on a case by case basis. Substantiation of equivalence to the minimum requirements of the building code, the Special Inspections Program and this *2015-SIP* document must be provided.

The owner must retain a Registered Design Professional to provide these services and bears the associated costs. Special inspections are required in addition to other inspections prescribed under the 2015 Virginia Uniform Statewide Building Code Part I Virginia Construction Code (VCC), and the 2015 International Building Code (IBC).

SECTION 102 THE SPECIAL INSPECTIONS ENGINEER OF RECORD

102.1 Special inspection services. The owner of a building (or the owner's duly authorized representative) must retain a registered design professional, hereafter called the "special inspections engineer of record" ("special inspector" in *Virginia Construction Code*), who provides special inspection and material test services in accordance with the requirements of the *Virginia Construction Code* and as required in this *2015-SIP* document, including responsibility for the services of an inspection and testing agency which must meet the requirements of ASTM E 329.

- Special inspections are conducted by the special inspections engineer of record, not the county, and are in addition to other inspections required elsewhere by the *Virginia Construction Code*.
- Both the special inspections engineer of record and the inspection and testing agency must be independent of the contractors executing the work requiring special inspection. The contractor is permitted to employ the approved agencies where the contractor is also the owner.
- The special inspections engineer of record and the inspection and testing agency are subject to county approval.
- The role of county staff is to confirm that the work of the special inspections engineer of record and the inspection and testing agency complies with the requirements of the Special Inspections Program and this *2015-SIP* document and the *2015 Virginia Construction Code*.
- At the completion of the project, the special inspections engineer of record must prepare a final report of special inspections for review by the appropriate registered design professionals of record, which must then be submitted to the Critical Structures/Building Inspections Section for approval, prior to final building inspection approval and issuance of a certificate of occupancy.

CHAPTER 2 DEFINITIONS

SECTION 201 DEFINITIONS

The following words and terms will, for the purposes of the Special Inspections Program, have the meanings shown herein. The words, "must" and "will", where used in this *SIP-2015* document, indicate-mandatory requirements. Words and terms not defined herein must have the meanings ascribed to them in the Virginia Construction Code.

Approved. Acceptable to or as authorized by the building official; or if explicit by the context, as reviewed by a registered design professional, with result that construction or fabrication may proceed.

Approved Agency. An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

Architect of record (AR). A registered design professional retained by the owner to design or specify architectural construction in accordance with the *Virginia Construction Code* and the *Code of the County of Fairfax*, and whose signature and seal appear on the county-approved architectural construction documents.

Building. Construction with a roof (a "roofed structure"), for use or occupancy.

Building core and shell. The basic configuration and construction of a building or structure, with the "shell" structure and "core" public areas and services.

- **Building shell.** The overall structure of foundations, exterior walls, columns, floors, and roof, and including stairways, elevator hoistways, common area corridors and grade level exit passageways, and all fire protection (detection, suppression and alarms) systems throughout the building.
- **Building core.** Public areas and services including lobbies, required accessible features and rest rooms; including the primary and emergency electrical services, plumbing water and sewer services, and primary heat, ventilation and air conditioning systems.

Certificate of compliance. A certificate of compliance may be issued by a corporate officer.

Certification. A signed and sealed statement issued by a registered design professional which must indicate that the item under consideration, in the registered design professional's opinion and to the best of the registered design professional's knowledge:

- Complies with county-approved documents; or
- Complies with requirements of the *Virginia Construction Code*.

Completion letter. A certification by a registered design professional which must indicate that the construction elements subject to special inspection and material tests for a specific material or phase of construction have been inspected prior to concealment, the construction is satisfactorily completed, and in the registered design professional's professional opinion and to the best of the registered design professional's knowledge, complies with county-approved documents and project specifications. A completion letter must carry the signature and seal of the registered design professional making the statement. A completion letter may be a portion of the final report of special inspections.

Construction documents. Documents prepared for the purpose of obtaining a building permit.

County-approved documents.

- Building construction documents approved by the Building Plan Review Branch including approved revisions.
- Fabrication and erection documents approved by the Critical Structures/Building Inspections Section including approved revisions.
- Soils-related documents approved by the Site Development and Inspection Division including approved revisions.

Critical structure. See "Special inspections project."

Deep foundation. A deep foundation is a foundation element that does not satisfy the definition of a shallow foundation. A deep foundation usually extends more than 3'-0" below grade. Examples include: driven steel or concrete piles, cast-in-place concrete caissons, helical piles, micropiles, masonry or concrete piers or columns with heights more than four times their minimum thickness, etc.

Essential facility. A building or structure that contains occupancies or provides emergency response services that must remain operational after a fire, flood, earthquake, hurricane or other disaster.

Fabrication and erection documents. Written, graphic and pictorial documents prepared or assembled after issuance of a building permit and in addition to the county-approved construction documents, describing the design, location and physical characteristics of the building elements or materials necessary for fabrication, assembly or erection of the components of the project.

Final report of special inspections. A certification by the special inspections engineer of record which must indicate that all construction elements subject to special inspection and material tests for all materials or phases of construction have been inspected prior to concealment, the required special inspections are completed, and in the special inspections engineer of record's professional opinion and to the best of the special inspections engineer of record's knowledge, complies with county-approved documents and project specifications. The final report of special inspections must carry the signature and seal of the special inspections engineer of record making the statement.

Formwork, concrete. Temporary structures designed to mold and restrain freshly placed concrete until it reaches sufficient solidity and strength to be self-supporting without the formwork (see also "Shores" and "Reshores").

Geotechnical engineer of record (GER). A registered design professional retained by the owner to design or specify earthwork and foundations in accordance with the *Virginia Construction Code* and the *Code of the County of Fairfax*, and whose seal and signature appear on the county-approved geotechnical report.

High-rise building. A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.

Inspection. The continuous or periodic observations of executed work and performance tests, for certain building or structure components, to establish conformance with county-approved documents as required by the *Virginia Construction Code* and this document.

Inspection and testing agency. An established and recognized agency meeting the requirements of ASTM E 329 and accredited by an accreditation body recognized by the county, retained by the owner, independent of the contractors executing the work subject to special inspection, and approved by the Critical Structures/Building Inspections Section to conduct special inspection and material tests required by the *Virginia Construction Code* and this document.

Non-problem soils. Soils and foundation materials in other than problem soils areas. Geotechnical investigations and recommendations for construction in non-problem soils areas shall be submitted to and approved by the Building Plan Review Branch.

Non-Residential Use Permit (Non-RUP). A certificate of occupancy which is issued by the Zoning Administration Division, Department of Planning and Zoning, when a construction project has been completed in compliance with Fairfax County requirements. A certificate of occupancy that is issued for a building shell indicates that the new building is ready for use, but not necessarily for occupancy. A certificate of occupancy that is issued for a specific tenant indicates that the tenant's space can be occupied.

Nonstructural elements. Elements of a building that are not primary or secondary structural load-bearing elements. Examples include exterior curtain walls and cladding, nonbearing partitions, guards, hand rails, etc.

Owner. The word "owner" must be construed as though followed by the words "or the owner's duly authorized representative".

Pre-engineered structural elements. Structural elements specified by the structural engineer of record but which may be designed by a specialty registered design professional. Examples are items such as open web steel joists and joist girders; wood trusses; combination wood, metal and plywood joists; precast concrete elements; prefabricated wood or metal buildings; tilt-up concrete panel reinforcement and lifting hardware.

Primary structural system. The combination of structural (load-bearing) elements which serve to support the weight of the building's structural shell, the applicable live loads based upon use and occupancy, and wind, snow, thermal and seismic environmental loads.

Problem soils. Soils of deficient or questionable bearing capacity, or expansive in nature, when classified in accordance with ASTM D 2487 and as defined in the *Code of the County of Fairfax Chapter 107 Problem soils*. In accordance with the *Fairfax County Public Facilities Manual*, a geotechnical report is required for construction in problem soils areas and must be submitted to and approved by the Site Development and Inspection Division.

Registered design professional (RDP). A professional architect or professional engineer licensed in Virginia.

Reshores. Shores placed snugly, but without preloading, under a concrete slab (or other structural member) after the original formwork and shores have been removed, thus allowing the new slab or structural member to deflect, and to support its own weight and existing construction loads applied, prior to the installation of the reshores.

Reshores are used to distribute future loads into slabs and members below. Reshores may be individual posts, scaffolds, or combinations.

Risk category. Used for structural requirements based on the type of occupancy and the occupant load.

Secondary Members. Building elements that are structurally significant (load-bearing) for the function they serve but are not necessary for stability of the primary structure. Examples include: support beams above the primary roof structure which carry a chiller; elevator support rails and beams; retaining walls independent of the primary building; flagpole or light pole foundations; falsework required for the erection of the primary structural system; steel stairs; etc., not fully specified on the county-approved construction documents.

Seismic design category. Classification based on occupancy category and earthquake criteria.

Shallow foundation. A shallow foundation is an individual or strip footing, a mat foundation, slab-on-grade, or similar foundation element.

A foundation element extending 4'0" or less below grade. Examples include: strip footings, mat foundation, slab-on-grade, masonry or concrete piers with heights less than four times their minimum thickness, etc.

Shores. Vertical (or inclined) temporary supports designed to carry the dead load weight of the concrete and formwork, and construction live loads above. Shores may be individual posts, scaffolds, or combinations.

Special inspections. The continuous or periodic observations of executed work and performance tests, and the conduction of materials tests, during construction of building components, elements and connections requiring special expertise to substantiate adequacy in compliance with county-approved documents and *Virginia Construction Code* requirements. Special inspections are conducted by the special inspections engineer of record, not the building official, and are in addition to other inspections required elsewhere by the building code.

Special inspection, continuous. Full-time special inspection while the work is being executed.

Special inspection, periodic. Part-time or intermittent special inspection where the work has been or is being executed.

Special inspections engineer of record (SIER). Referred to as "Special inspector" in the *Virginia Construction Code*, a registered design professional who is directly responsible for special inspections, materials testing and related services as described in the county-approved statement of special inspections and this document. The special inspections engineer of record must be retained by the owner, independent of the contractors executing the work subject to special inspection, and county-approved.

Special Inspections Program. In Fairfax County, Virginia, the technical requirements for special inspections and material tests in accordance with the *Virginia Construction Code*, and the administrative procedures of the Critical Structures/Building Inspections Section, for a building or structure with elements or components subject to special inspection and material tests during construction.

Special inspections project. A building or structure to be constructed or altered under the Special Inspections Program.

Statement of special inspections. The statement of special inspections is a statement

prepared by the owner and the appropriate registered design professionals (the architect of record, the geotechnical engineer of record, and the structural engineer of record) and submitted by the permit applicant as a condition for permit issuance in accordance with the *Virginia Construction Code*. The statement of special inspections identifies the scope of the special inspection and material test services applicable to a construction project, and the registered design professionals and the inspection and testing agency selected to provide those services.

Structural engineer of record (SER). A registered design professional retained by the owner to design or specify structural documents in accordance with the *Virginia Construction Code* and the *Code of the County of Fairfax*, and whose signature and seal appear on the county-approved structural construction documents.

Structure. Construction without a roof (a "structure"), such as a platform or retaining wall, for use or occupancy.

Tenant space. Construction within a building core and shell to produce a completed, occupiable area. In this context, "tenant space" is construed to mean the additional areas between a building's core public areas and the building's exterior walls.

Vertical masonry foundation element. A foundation pier, pier, column or wall, depending upon its dimensions.

CHAPTER 3 SPECIAL INSPECTIONS DOCUMENTS REQUIRED

SECTION 301 STATEMENT OF SPECIAL INSPECTIONS

301.1 Contents. The statement of special inspections must be submitted with the construction documents by the permit applicant.

For special inspections projects with multiple buildings or structures, a listing of the buildings with street addresses, plan Q-number(s) and building permit numbers must be attached.

The statement of special inspections shall be per section **1704.3.1** of **2105 VCC**.

The special inspections engineer of record and the inspection and testing agency are subject to the Critical Structures/Building Inspections Section approval on behalf of the building official.

301.2 Form. A blank form for the statement of special inspections is provided on the following pages. Page one, to be prepared by the owner, identifies the project and registered design professionals for the project. The remaining pages, to be prepared by the appropriate registered design professionals, describe and specify the scope and extent of special inspection and material test services.

A blank one-page form for a final report of special inspections is also provided, to be prepared by the special inspections engineer of record after all special inspection and material test services are completed.

301. 3 County approval. The Building Plan Review Branch must approve the scope of the statement of special inspections prior to the Critical Structures/Building Inspections Section preconstruction meeting, and the Critical Structures/Building Inspections Section must approve the statement of special inspections during the preconstruction meeting. Both county approvals are required prior to issuance of a building permit.



Fairfax County, Virginia – Land Development Services
Special Inspections Program



Statement of Special Inspections

Address: _____ Project Name: _____

Project Description: _____ Permit Number: _____

Height/Stories: _____ Group(s): _____ Construction Type(s): _____ Risk Category: _____ Seismic Design
Category: _____

Problem Soils: - Yes - No Prepared Fill: - Yes - No Sprinkler: - Yes - No Fire Alarm: - Yes - No

This statement of special inspections is submitted as a condition for permit issuance in accordance with the *Virginia Construction Code (VCC)*. It includes a schedule of special inspections applicable to this project. The special inspections engineer of record shall keep records of specified special inspections and testing and shall furnish copies of corresponding reports to the Fairfax County Critical Structures Section and to the appropriate registered design professionals of record. Discrepancies from the approved plans and specifications and code violations observed in the field shall be brought to the immediate attention of the contractor, the Critical Structures Section and the appropriate registered design professionals of record. A final special inspections report documenting completion of special inspections, discrepancies correction, and observed code violations shall be approved by the Critical Structures Section prior to the final building i

Structural Engineer of Record: _____ License Number: _____ Company: _____

Signature: _____ Date: _____

Email Address: _____ Phone Number: _____

Architect of Record: _____ License Number: _____ Company: _____

Geotechnical Engineer of Record: _____ License Number: _____ Company: _____

Special Inspection Engineer of Record: _____ License Number: _____ Company: _____

Signature: _____ Date: _____

Email Address: _____ Phone Number: _____

Inspection and Testing Agency Name: _____

Building Owner: _____ Company: _____

Authorization signature: _____ Date: _____

Street Address: _____ City: _____ State: _____ Zip Code: _____



Fairfax County, Virginia – Land Development Services
Special Inspections Program



Statement of Special Inspections

Email Address: _____ Phone Number: _____

General Contractor: _____ License Number: _____ Company: _____

Signature: _____ Date: _____

Email Address: _____ Phone Number: _____

Critical Structures Section Signature: _____ Date: _____

Activity (VCC Reference)	Y/N	Scope of Service	Continuous	Periodic	Agent
Steel Construction (VCC 1705.2)					
Structural steel (VCC 1705.2.1, see Appendix B of the Fairfax County Special Inspection Manual and AISC 360 for the tables below) -Welding: Tables C-N5.4-1, C-N5.4-2, C-N5.4-3 -Bolting: Tables C-N5.6-1, C-N5.6-2, C-N5.6-3		AISC 360 Chapter N, Quality Control and Quality Assurance			
Cold-formed steel deck (VCC 1705.2.2, see Appendix C of the Fairfax County Special Inspection Manual and SDI QA/QC for the tables below) 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, and 1.9		SDI QA/QC- 2011 Standard for Quality Control and Quality Assurance for Installation of Steel Deck			
Open-web steel joists and joist girders (VCC 1705.2.3, Table 1705.2.3) -End connection – Welding or bolted -Bridging – horizontal or diagonal 1- Standard Bridging 2- Bridging that differs from the SJI specifications listed in section 2207.1				X	
Cold-formed steel trusses spanning 60 feet or more (VCC 1705.2.4)					
Special seismic requirements (VCC 1705.12, 1705.13)					
Concrete Construction (VCC 1705.3, Table 1705.3)					
1- Inspect reinforcement including prestressing tendons and verify placement				X	
2- Reinforcing Bar welding: a- Verify weldability of reinforcing bars other than ASTM A706 b- Inspect single-pass fillet welds, maximum 5/16" c- Inspect all other welds			X	X	
3- Inspect anchors cast in concrete				X	
4- Inspect anchors post-installed in hardened concrete members a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension load b. Mechanical anchors and adhesive anchors not defined in 4a			X		



Fairfax County, Virginia – Land Development Services
Special Inspections Program



Statement of Special Inspections

Activity (VCC Reference)	Y/N	Scope of Service	Continuous	Periodic	Agent
5- Verify use of required design mix				X	
6- Prior to concrete placement, fabricate specimen for strength tests, perform slump and air content tests, and determine the temperature of the concrete			X		
7- Inspect concrete and shotcrete placement for proper application techniques			X		
8- Verify maintenance of specified curing temperature and techniques				X	
9- Inspect prestressed concrete for: a. Application of prestressing forces b. Grouting of bonded prestressing tendons			X X		
10- Inspect erection of precast concrete members.				X	
11- Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs				X	
12- Inspect form work for shape, location and dimensions of the concrete member being formed, shoring, and reshoring				X	
Masonry Construction (VCC 1705.4)		(see attached tables)			
--Emp.-Cat. IV, Engr.-Cat. I, II, III (See Table 1.19.2 - Level B Quality Assurance of Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530-13/ ASCE 5-13 (See attached table) --Emp. – Cat IV See Table 1.19.3 - Level C Quality Assurance) of Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530- 13/ ASCE 513		(See Appendix D of the Fairfax County Special Inspection Manual and TMS 402-11/ ACI 530-13/ ASCE 5-13)			
-Mortar & grout proportions, test specimens, Installation of masonry, anchors and ties Placement of reinforcement, Grouting operations					
-Cold weather/hot weather protection					
-Foundation strength prior to erection loads					
Wood Construction (VCC 1705.5)					
-Inspection of fabricator (1704.2.5)				X	
-High-load diaphragms (1705.5.1)				X	
-Metal-plate-connected wood trusses spanning 60 feet or greater (1705.5.2)				X	
-Seismic-resisting systems (1705.12.2)			X		



Fairfax County, Virginia – Land Development Services
Special Inspections Program

Statement of Special Inspections



Activity (VCC Reference)	Y/N	Scope of Service	Continuous	Periodic	Agent
Soil (VCC 1705.6)					
Required Special Inspection and Tests of Soil (Table 1705.6)					
1. Verify materials below shallow foundation are adequate to achieve the design bearing capacity				X	
2. Verify excavations are extended to proper depth and have reached proper material				X	
3. Perform classification and testing of compacted fill material				X	
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill			X		
5. Prior to placement of compacted fill, inspect subgrade and verify the site has been prepared properly				X	
Driven Deep Foundation (VCC 1705.7)					
Required Special Inspection and Tests of Driven Deep Foundation (Table 1705.7)					
1. Verify element materials, sizes, and length comply with the requirement			X		
2. Determine capacities of test elements and conduct additional load tests, as required			X		
3. Inspect driving operations and maintain complete and accurate records of each element			X		
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetration to achieve the design capacity, record tip and butt elevations, and document any damage to foundation element			X		
5. For steel elements, perform additional special inspections in accordance with section 1705.2					
6. For concrete elements and concrete-filled placements, perform tests and additional special inspections in accordance with section 1705.3					
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge					
Cast-In-Place Deep Foundation (VCC 1705.8)					
Required Special Inspection and Tests of Cast-In-Place Deep Foundation (Table 1705.8)					
1. Inspect drilling operations and maintain complete and accurate record for each element			X		



Fairfax County, Virginia – Land Development Services
Special Inspections Program



Statement of Special Inspections

Activity (VCC Reference)	Y/N	Scope of Service	Continuous	Periodic	Agent
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment to bedrock (if applicable) and adequate end-bearing strata capacity					
3. Record concrete or grout volumes			X		
4. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3					
Helical Pile Foundation (VCC 1705.9)			X		
Earth Retention System (VCC 1705.1.1) and (Section 1201.1 of the Special Inspection Manual)			X		
Fabricated Items (VCC 1705.10 and 1704.2.5)					
Seismic Resistance for Plumbing, Mechanical, and Electrical Components (VCC 1705.12.6)				X	
Sprayed Fire-Resistance Material (VCC 1705.14)					
Mastic and Intumescent Fire-Resistance Coatings (VCC 1705.15)					
Exterior Insulation and Finish Systems (EIFS) (VCC 1705.16)					
Testing for Smoke Control (VCC 1705.18)					
OTHER (VCC 1705.1.1)					

SECTION 302 SHOP DRAWINGS AND OTHER DOCUMENTS REQUIRED

302.1 Documents required. Shop drawings and other documents provide necessary details to enable the Special Inspections Engineer of Record (SIER) to perform the required inspection and testing of the structural elements. Fairfax County approved shop drawings, concrete mix designs, and other required documents must be present at the job site for an inspection to be approved by the SIER. Shop drawings and other documents must be approved and sealed as required by this special inspections manual prior to submittal to Fairfax County Critical Structures Section (FCCSS). Table 302 provides a reference guide for documents that require submittal to FCCSS if applicable. Shop drawings are not required for items that are fully detailed on the Fairfax County approved plans.

**TABLE 302
SUBMISSIONS REQUIRED**

Project Scope	Overview Site Plan	Addresses/Permits List	Pre-con Meeting Minutes
Inspection Agency	Resumes/Lab Certifications	Field/Lab Reports	Final Report
Structural Steel Plant Certification	Shop/Field Drawings Joists-Shop/Field Drawings	Connection Letter Deck-Shop/Field Drawings	Erect/Shore – Drawings Structural Light Gauge - Drawings
Concrete	Concrete Mix Formwork Drawings Stripping Letters	Rebar Drawings Reshoring Design/Calculations Concrete Field/Lab Tests	Post-Tension Drawings Stripping Criteria Cold Weather Temperature Log
Precast Concrete	Concrete Mix	Shop/Field/Bracing Drawings	Plant Certification
Wood	Shop/Field Drawings	Plant Certification	
Masonry	Mortar/Grout Mix Wall Bracing Drawings	Mortar/Grout Tests Cold Weather Temperature Log	Rebar Drawings
Soils/Findings	Soils Report/Revisions Deep Foundation– Drawings	Soils Field/Lab Tests Piles/Piers – Drawings	Shallow Foundation – Drawings Piles/Piers - Drawings
Earth Retention Systems	Shop/Field Drawings	Soils Field/Lab Tests	Piling, P/T – Drawings
EIFS	Research Report	Manufacturer’s Instructions/Details	Inspection Criteria
Fireproofing	Spray-On Design/Details	Mastic/Intumescent Design/Details	Repair Specifications
Smoke Control Systems	System Design Drawings	Component Details/Drawings	Inspection Criteria
Mechanical/Electrical/ Plumbing	Manufacturing Certifications/Instructions	Support Design/Drawings	Inspection Criteria
Jobsite	Fence/Barrier/Walkway	Concrete Batch Plant	
Crane/Hoist/Elevator	Specs/Plan/Building Mods	Footings/Assembly Reports	In-Service Letter
Pre-Engineered Building	Shop/Field Drawings	Plant Certification	Footings/Foundation Drawings

SECTION 303 THE STRUCTURAL ENGINEER OF RECORD REVIEW/APPROVAL STAMP

303.1 Required stamp on documents. All fabrication and erection documents required to be reviewed and approved by the structural engineer of record (the geotechnical engineer of record as applicable, and the architect of record if the architect of record is also acting as the structural engineer of record or geotechnical engineer of record) must bear a review/approval stamp conforming to this section. The requirements for review and approval, and the format of the review/approval stamp, are in addition to the seal and signature requirement for construction documents required to be prepared by registered design professionals.

Each individual document must bear the review/approval stamp of the registered design professional or be otherwise individually identified as being reviewed and approved. Submission packages of documents may be accompanied by an index sheet bearing the review/approval stamp and signature of the registered design professional, and specifically listing the documents and dates thereof, including resubmissions of revised documents, to which the review/approval stamp and signature apply.

303.2 Format and language. The review/approval stamp must contain language as shown in the following samples of acceptable formats. The review/approval stamp has three parts:

- **Mandatory.** Results of the review in specific terms, with corresponding instructions. The words or phrases "Approved", "Approved as Noted" (or "Approved as Corrected"), and "Disapproved" (or "Rejected") must appear. Words or phrases such as "Reviewed", "No exception taken", etc., are not acceptable. The word "fabrication" can be interchanged with the word "construction."
- **Optional.** Clarification statements to explain the scope or qualify the results of review. The text most commonly used by engineering firms includes provisions that the approval is for general conformance with the design intent and the contract requirements, or that the reviewer does not assume responsibility for fabrication or construction processes, or that the contractor is responsible for coordination of trades and satisfactory execution of the work.
- **Mandatory.** Signature and date lines. The signatory area must be completed.

APPROVAL FOR GENERAL COMPLIANCE WITH STRUCTURAL CONTRACT DOCUMENTS	
<input type="checkbox"/> APPROVED	Fabrication may proceed as shown.
<input type="checkbox"/> APPROVED AS CORRECTED	Fabrication may proceed based on corrections indicated.
<input type="checkbox"/> APPROVED AS CORRECTED RESUBMIT FILE COPY	Fabrication may proceed based on corrections indicated. Correct submission and resubmit for record purposes only.
<input type="checkbox"/> DISAPPROVED	Fabrication may not proceed. Correct submission for further review.
<input type="checkbox"/> REVIEWED FOR INFORMATION	Approval not required. Accepted for information purposes only.
Approval is for general compliance with the structural contract documents only. This approval assumes no responsibility for dimension, quantities and conditions that pertain to fabrication or installation or for processes and techniques of construction. The Contractor is responsible for the coordination of the work of all trades and the performance of this work in a safe and satisfactory manner.	

DATE	BY	(Company)
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APPROVAL FOR DESIGN CONFORMITY		
<input type="checkbox"/> APPROVED	Construction may proceed as shown.	
<input type="checkbox"/> APPROVED AS NOTED	Construction may proceed based on corrections indicated.	
<input type="checkbox"/> REVISE AS NOTED & RESUBMIT	Construction may proceed based on corrections indicated. Resubmit corrected submission for record purposes.	
<input type="checkbox"/> REJECTED/ RESUBMIT AS SPECIFIED	Construction may <u>not</u> proceed. Correct submission for further review.	
<input type="checkbox"/> FURNISH () CORRECTED COPIES	Approval not required. Accepted for information purposes only.	
<p>Notations do not authorize changes to contract sum. Submittal was reviewed for design conformity and general conformance to contract documents only. The Contractor is responsible for confirming and correlating dimensions at job sites for tolerances, clearances, quantities, fabrication processes and techniques of construction, coordination of his work with other trades and full compliance with contract documents.</p>		
DATE _____	BY _____	(Company)

APPROVAL FOR DESIGN CONCEPT		
<input type="checkbox"/> APPROVED	Final approval. Fabrication may proceed on work as shown.	
<input type="checkbox"/> APPROVED AS NOTED	Fabrication may proceed on the basis of corrections indicated.	
<input type="checkbox"/> DISAPPROVED	Fabrication may not proceed. Revisions shall be made and submitted for further review.	
<p>Approval is only for conformance with the design concept of the project and compliance with the information given in the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job sites, for information that pertains solely to the fabrication processes or to techniques of construction, and for the coordination of the work of all trades.</p>		
DATE _____	BY _____	(Company)

Fairfax County, Virginia - Special Inspections Program
Final Report of Special Inspections

Q-Number:

Permit Number:

PROJECT:

Address:

Special inspections engineer of record:

Inspection reports numbered _____ to _____, and test reports numbered _____ to _____, all submitted prior to this final report, form a basis for, and are to be considered an integral part of, this final report of special inspections.

The special inspections specified for this project and itemized in the county-approved statement of special inspections have been completed pursuant to the Special Inspections Program requirements. The building components and elements subject to special inspection and material tests have been found to be in compliance with county-approved documents and in conformance with project specifications. Violations of the *Virginia Construction Code* observed in the conduct of special inspection and material test services were brought to the attention of the appropriate registered design professional of record, the county, and the owner for resolution and the resolution was approved by the county.

Seal

Submitted by

Special inspections engineer of record:

Signature & Date

(type or print) Name

Reviewed by

Registered design professional:

Signature & Date

(type or print) Name

Accepted by

Building official:

Signature & Date

(type or print) Name

Critical Structures/Building Inspections Section

CHAPTER 4 PRECONSTRUCTION MEETING

SECTION 401 LOCATION AND PARTICIPANTS

401.1. Critical Structures/Building Inspections Section Preconstruction Meeting. A critical structures/building inspections section preconstruction meeting is required for every project that will be constructed under the Special Inspections Program, to review the special inspection and material test requirements of the construction project.

The preconstruction meeting must take place after structural review and approval of structural construction documents is completed by the Building Plan Review Branch, and prior to the issuance of a building permit.

The owner must call the Critical Structures/Building Inspections Section at 703-631-5101 to schedule the preconstruction meeting date and time. The preconstruction meeting location will be determined by the Critical Structures/Building Inspections Section.

Construction team members who must be represented and participate in the Critical Structures/Building Inspections Section preconstruction meeting include:

- Owner (required for all projects)
- Architect of record (required for precast concrete building elements; optional for other building/foundation elements and soils/foundation elements)
- Structural engineer of record (required for building/foundation elements)
- Geotechnical engineer of record (required for soils/foundation elements)
- General contractor (required for all projects)
- Special inspections engineer of record (required for all projects)
- Fairfax County Critical Structures/Building Inspections Section (required for all projects)
- Other parties (inspection and testing agencies, subcontractors, etc.) as deemed appropriate by the owner or the Critical Structures/Building Inspections Section.

SECTION 402 TOPICS

The owner must bring a copy of the county-approved construction documents including the Building Plan Review Branch-approved statement of special inspections to the preconstruction meeting. For projects with multiple buildings, a listing of the buildings, or an annotated site plan, with street addresses, plan Q-number(s) and building permit numbers must be attached to the statement of special inspections, or separately provided, for use during construction.

At the preconstruction meeting, a contact sheet with names, addresses, and telephone numbers of those in attendance must be completed.

402.1 Use of 2015-SIP document. This 2015-SIP document must be used in the preconstruction meeting to review, discuss, clarify and approve elements of the Special Inspections Program that apply to the project. It is recommended that, prior to the

preconstruction meeting, all parties review the requirements of the *Virginia Construction Code* and the 2015-SIP document, as they pertain to the specific project.

The following topics must be discussed:

- **Statement of special inspections.** The scope of special inspections for the project, including required and elective special inspections (see Chapter 3).
- **Responsibilities.** The roles and responsibilities of each party.
- **Communication.** Communication channels between the county's and the owner's representatives.
- **Construction project requirements.** Construction project requirements of the Fairfax County Special Inspections Program, including construction methods, site safety and fire hazard prevention during the construction process.
- **Phased Construction.** Requirements for phasing or separation of permits, certificates of completion and occupancy requirements.

402.2 Statement of special inspections approval. The Critical Structures/Building Inspections Section must approve the statement of special inspections during the preconstruction meeting. The statement of special inspections may be modified during the preconstruction meeting, if necessary. After approval and following the completion of the Building Plan Review Branch approval of the construction documents, a building permit can be issued.

SECTION 403 SPECIAL INSPECTIONS PRECONSTRUCTION MEETING WAIVER

403.1 Special Inspections Preconstruction Meeting Waiver. The Building Plan Review staff may, at their discretion, waive the attendance requirement for preconstruction meetings when projects are of a limited scope.

403.2 Criteria for Preconstruction Meeting Waiver. Special inspections limited to:

- One and two-family dwelling construction
- Exterior insulation and finish systems (EIFS)
- Sprayed fire-resistant material for interior alterations
- Steel construction:
 - Roof top equipment platforms limited to 50 square feet
 - Structural steel for new roof openings limited to 4 square feet
 - Structural steel supporting new roof top equipment
 - Structural steel for new operable partition
 - Infill of floor or roof openings limited to 25 square feet
 - Other minor alterations to existing framing with full details on plan
- Concrete construction:
 - Anchors post installed in hardened concrete
 - Infill of concrete or masonry walls
 - Concrete slabs-on-grade or fill for ramps or stairs
 - Infill off floor or roof openings limiter to 25 square feet
- Retaining walls supporting 5 feet or less of unbalanced fill with no surcharge, back slope or tiered walls.

Statement of Special Inspections. The Statement of Special Inspections must be completed and signed by the appropriate Registered Design Professionals, Building Owner or Authorized Agent, Special Inspections Engineer, and General Contractor

Waivers. A waiver of the special inspections preconstruction meeting does not alter any other aspect of the special inspections program. All requirements for inspection, testing, document submittal, as well as other provisions of the special inspections program must remain unchanged.

CHAPTER 5 SPECIAL INSPECTIONS AND TESTING SERVICES

SECTION 501 PROCEDURAL REQUIREMENTS

501.1 Owner to employ special inspectors. The owner must retain an Independent Special Inspections Engineer of Record and an inspection and testing agency to provide and conduct special inspections, materials testing, and related services, as described in the statement of special inspections and this *2015-SIP* document. Under no circumstances will the general contractor, or any of its subcontractors executing the work subject to special inspection, be permitted to provide special inspection and material test services. As part of the statement of special inspections submitted for county approval and permit issuance, the owner must furnish the county with the names of the special inspections engineer of record and the inspection and testing agency retained to provide special inspection and material test services.

- The special inspections engineer of record must be a registered design professional retained by the owner to conduct special inspection and material test services required by the *Virginia Construction Code* and this *2015-SIP* document and must be independent of the contractors executing the work subject to special inspection. The special inspections engineer of record is responsible for the work of the inspection and testing agency.
- The inspection and testing agency must be retained by the owner, must be an established and recognized agency, and must be independent of the contractors executing the work subject to special inspection. To be approved by the Critical Structures/Building Inspections Section, an inspection and testing agency must meet the requirements of ASTM E 329 and must be accredited by an accreditation body recognized by the county.

The general contractor must coordinate the scheduling of inspections. The inspection and testing agency personnel required on-site must be in numbers and skill levels sufficient to conduct all required tasks.

501.2 County review and approval. The statement of special inspections is approved by both the Building Plan Review Branch (scope) and the Critical Structures/Building Inspections Section (scope and personnel).

The special inspections engineer of record and the inspection and testing agency both are subject to Critical Structures/Building Inspections Section approval to conduct special inspection and material tests. After county approval of the statement of special inspections, the special inspections engineer of record must submit to the Critical Structures/Building Inspections Section one copy of resumes of all inspection and testing agency personnel assigned to the project, inspectors' certifications and accreditation certificates for laboratory facilities. The personnel and laboratories must meet the requirements of Sections 503 and 504.

501.3 Changes in construction team. If the registered design professionals of record, the general contractor, the special inspections engineer of record, the inspection and testing agency, or other organizations or individuals contracted for special inspections or testing services are changed during the course of the work, the owner must notify the Critical Structures/Building Inspections Section immediately. The owner must provide a written explanation for such change, identify and obtain county approval for the replacement party and schedule a new meeting with the Critical Structures/Building Inspections Section and the

replacement party. The owner must ensure that there is a timely transfer of information and responsibility to the replacement party.

Change of the architect of record, or change of the structural engineer of record, requires approval by the Building Plan Review Branch, and may invalidate county-approved construction documents, requiring their resubmission for review and approval for new permits.

Change of the geotechnical engineer of record requires approval by the Site Development and Inspection Division and the Critical Structures/Building Inspections Section and may invalidate the county-approved geotechnical report.

Change of the general contractor requires notification to the Building Plan Review Branch and the Critical Structures/Building Inspections Section and requires a new building permit if the general contractor is the building permit holder.

Change of the special inspections engineer of record or the inspection and testing agency requires approval by the Critical Structures/Building Inspections Section and may invalidate further special inspections. In the event the inspection and testing agency has significant changes in management, ownership, personnel certifications or laboratory accreditation, re-approval by the Critical Structures/Building Inspections Section is required.

SECTION 502 ROLES AND RESPONSIBILITIES

502.1 Special inspections. The special inspections engineer of record must conduct and certify special inspection of building components and tests of construction materials where such special inspection and material tests are required by the *Virginia Construction Code*, the statement of special inspections and this *2015-SIP* document.

502.2 Approved documents. Prior to conducting special inspections and materials testing, the special inspections engineer of record must be responsible for verification of the following:

- **Building permit.** A building permit for the particular construction has been issued and a copy of the building permit is posted at the construction site.
- **County-approved construction documents.** A set of original county-approved construction documents is available at the construction site.
- **County-approved fabrication and erection documents.** County-approved fabrication and erection documents, which also bear the structural engineer of record review/approval stamp, are available at the construction site. Other approved fabrication and erection documents, which do not require county approval but which bear the structural engineer of record's review/approval stamp, are available at the construction site and a record copy of such documents has been received by the Critical Structures/Building Inspections Section where required by this *2015-SIP* document.
- **Revisions to county-approved documents.** All revisions to county-approved construction documents, or county-approved fabrication and erection documents, or other documents, such as field change orders in response to requests for information, are in writing and have been approved, signed and sealed by the architect of record, the structural engineer of record, the geotechnical engineer of record, and the county, as appropriate. If such revisions do not bear the county stamp of approval, the special

inspections engineer of record must confirm with the Critical Structures/Building Inspections Section whether the revisions are authorized or whether formal re-approval of revised documents by the Building Plan Review Branch, the Environmental and Site Development and Inspection Division or the Critical Structures/Building Inspections Section is required. It is the responsibility of the architect of record, the structural engineer of record, and the geotechnical engineer of record, as appropriate, to submit written revisions to the Critical Structures/Building Inspections Section within seven working days of approval.

502.3 Deviations. The special inspections engineer of record and the special inspections engineer of record's representatives/field technicians may not suggest, direct or authorize the fabricator, erector or contractor to deviate from the contract documents, county-approved construction documents, or county-approved fabrication and erection documents, without the express written approval of the architect of record, the structural engineer of record, the geotechnical engineer of record and the Critical Structures/Building Inspections Section, as appropriate.

502.4 Special inspection and material test reports. The special inspections engineer of record must report the results of testing and inspections, both approvals and rejections, to the Critical Structures/Building Inspections Section according to the following procedures:

- **Seal and signature.** Each report must bear a signature and seal of the special inspections engineer of record and must include the correct building permit number and project address. Reports without project identification will be rejected.
- **Submissions.** Both approval and rejection reports must always be submitted to the general contractor, the owner, and the Critical Structures/Building Inspections Section, and must be submitted to the architect of record, the structural engineer of record, and the geotechnical engineer of record as appropriate. With the exception of situations where a code violation or safety hazard is discovered (see Sections 502.5 and 502.6) and must be reported immediately, all inspection and test reports must be submitted to the Critical Structures/Building Inspections Section within seven working days of the inspection or test conducted.
- **Compliance.** Unless deficiencies are discovered, or code violations are revealed during the conduct of special inspection and material test services, special inspection and material test reports must indicate that the specified work has been inspected and found to be in compliance with county-approved documents.
- **Deficiencies.** Deficiencies must be reported to the general contractor for correction. Deficiency reports must contain the details describing the nature and specific location of the deficiency and include a description of the action recommended by the architect of record, the structural engineer of record or the geotechnical engineer of record, as appropriate, to correct it. After correction, re-inspection is required. At the completion of a project, all recorded problems or deficiencies must be documented as having been corrected and approved by the appropriate registered design professionals.
- **Completion letters.** Upon completion of special inspection and material tests for a particular construction discipline, such as "structural steel", the special inspections engineer of record may, after review by the appropriate registered design professionals, submit a completion letter to the Critical Structures/Building Inspections Section as a part of the final report of special inspections.

- **Final report of special inspections.** Upon completion of special inspection and material tests for all construction elements subject to special inspection for all phases of construction, the special inspections engineer of record must, after review by the appropriate registered design professionals, submit a final report of special inspections to the Critical Structures/Building Inspections Section for approval. Any unresolved deficiencies notated by the appropriate registered design professionals or Critical Structures/Building Inspections Section must be addressed and corrected prior to final building inspection approval.

502.5 Code violations. In the event that the special inspections engineer of record or the special inspections engineer of record's representatives/field technicians observe a condition during the conduct of special inspection and material test services that constitutes a violation of the *Virginia Construction Code* or the *Code of the County of Fairfax*, the special inspections engineer of record must *immediately* notify the appropriate registered design professionals and the Critical Structures/Building Inspections Section for resolution, followed with a written report submitted to the Critical Structures/Building Inspections Section within seven working days.

502.6 Construction site safety violations. In the event that the special inspections engineer of record or the special inspections engineer of record's representatives/field technicians observe a condition that poses an immediate or serious safety hazard to construction site workers or the general public, the special inspections engineer of record must *immediately* notify the general contractor and the Critical Structures/Building Inspections Section for resolution.

SECTION 503 PERSONNEL QUALIFICATIONS

503.1 Direct supervision. The inspection and testing agency personnel assigned to conduct special inspections in Fairfax County must work under the supervision of an approved registered design professional with demonstrated proficiency in the construction discipline to be evaluated.

503.2 Certification. Except for individuals who are registered design professionals, inspection and testing agency field inspection personnel must be certified by examination through WACEL, the American Concrete Institute, the American Welding Society, the American Society for Nondestructive Testing, the National Institute for Certification in Engineering Technologies, or other organizations whose programs are recognized by the county. Inspection and testing agency personnel must be reviewed and approved by the Critical Structures/Building Inspections Section on a case by case basis. The inspection and testing agency personnel must conduct only those special inspection and material test services in which they have demonstrated competency through an approved certification or registration program. Different levels or types of special inspections require different levels or types of expertise by the inspector, and competency certifications must match the tasks. Tests or inspections conducted by unqualified or unapproved inspection and testing agency personnel will be automatically rejected, and further construction work must not proceed until re-inspections are conducted and approved. Documentation of individual resume's and laboratory certification must be submitted, upon request, to the Critical Structures Section.

503.3 Unusual functions. In the event there is no certification program applicable to a specific special inspection or material test function, the special inspections engineer of record must submit a signed statement attesting to the competency of inspection and testing agency personnel and identifying the basis upon which such statement is made.

SECTION 504 LABORATORY ACCEPTANCE STANDARDS

All laboratory facilities conducting special inspection and material test services in the county must meet the requirements of ASTM E 329, ASTM D 3740, and ASTM C 1077 as applicable and must be individually accredited by organizations such as WACEL, the American Association for Laboratory Accreditation, the National Institute of Standards and Technology, the National Voluntary Laboratory Accreditation Program, or other organizations whose programs are recognized by the county. Where an inspection and testing agency has multiple offices and laboratory facilities conducting special inspection and material test services in the county, each laboratory to be utilized on construction projects must be individually accredited and meet the requirements of ASTM E 329, ASTM D 3740, and ASTM C 1077, as applicable. Laboratories must be reviewed and approved by the Critical Structures/Building Inspections Section on a case by case basis and must conduct only those tests and analyses for which accreditation has been obtained. The special inspections engineer of record must approve on-site laboratories provided the on-site laboratory demonstrates that it has (and follows) an effective quality control program; equipment calibration program; and a technician certification program of an accredited laboratory.

CHAPTER 6 STEEL CONSTRUCTION

SECTION 601 GENERAL

601.1 Scope. The requirements of this chapter, VCC-1705.2 *Steel construction*, and the quality assurance inspection requirements of AISC 360, apply when construction includes structural hot-rolled steel building elements or structural cold-formed steel building elements (see Chapter 14 for sprayed fire-resistant materials and Chapter 15 for mastic and intumescent fire-resistant coatings). Where required, steel building elements must also comply with VCC-1705.11 *Special inspections for wind resistance* and VCC-1705.12 *Special inspections for seismic resistance*.

601.2 Inspection of steel fabricators and fabrication procedures. The special inspections engineer of record must conduct special inspection of the steel fabricator and fabrication procedures, as required by VCC-1704.2.5 *Inspection of fabricators*, for all steel fabricated assemblies that are themselves subject to special inspection, except as exempted in VCC-1705.2 *Steel construction*. The report of special inspection of the fabricator and fabrication procedures must be submitted to the Critical Structures/Building Inspections Section.

- **Certification.** The fabricator may demonstrate to the special inspections engineer of record that the requirements of VCC-1704.2.5 *Inspection of fabricators* have been met by furnishing AISC STD Certification or furnishing evidence of compliance with the AISC certification program in the appropriate category.
- **Procedures implementation.** The special inspections engineer of record must state in writing that the fabricator complies with the fabrication and quality control procedures outlined above. Verification may be on a job basis or by inspection within the previous twelve months.
- **Steel elements.** Structural steel and steel elements other than structural steel are subject to special inspection per Chapter 17 of the *2015 Virginia Construction Code*.

SECTION 602 FABRICATION AND ERECTION DOCUMENTS

602. 1 Preparation of fabrication and erection documents. The structural steel fabrication and erection documents must include designs and details for welded and bolted connections.

- Details for connections must clearly indicate moment connections.
- Details must clearly indicate seismic-resisting elements of buildings of Seismic Category C.
- Details for welded connections must clearly indicate the type of design and the size and type of welds.
- Details for bolted connections must clearly indicate the type of design (simple bearing or slip-critical moment), amount of tensioning required (snug tight or fully tensioned) and the ASTM specifications for the bolts, nuts and washers.
- Erection shoring. Shoring for composite construction (concrete slab/steel beam or concrete slab/steel joist) or shoring for erection of structural steel must be designed to meet the structural engineer of record's requirements.

602.2 Review and approval. Prior to erection of steel elements, the structural steel erection documents must be submitted to the structural engineer of record, for approval for compliance

with the county-approved construction documents and in accordance with the following requirements:

602.3 Primary structural system. The structural engineer of record's approval for primary structural elements must specifically include approval of any connections developed by the steel fabricator. The structural engineer of record must indicate approval with a signed and sealed statement, attached to the documents, accepting responsibility for the design of connections which shall include language as given in either:

The structural steel fabrication and erection documents have been reviewed, including a verification of all the structural steel connections shown. Where marked "Approved" or "Approved as Noted", I accept full responsibility for the design of the connections to support the design loads required by the county-approved construction documents for the completed project.

or

I have reviewed the structural steel fabrication and erection documents (*list*) as prepared by (*company*) for the above referenced project. My review and approval, or approval as noted, dated (*date*), included a verification of all the structural steel connections shown. I accept the responsibility for the design of the connections to support the design loads required by the county-approved construction documents for the completed project.

602.4 Secondary structural elements. The structural engineer of record must approve the effects the secondary structural elements impose on the primary structural system.

The general contractor must submit two sets of the structural engineer of record-approved structural steel fabrication and erection documents, including the structural engineer of record's approval of connections, to the Critical Structures/Building Inspections Section for approval. After county approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 603 SPECIAL INSPECTIONS AND TESTS

603.1 Material receiving. The special inspections engineer of record must conduct special inspection of steel elements, welding material, and high strength bolts upon receipt on the construction site and in accordance with the quality assurance and inspection requirements of AISC 360. High strength bolts and nuts must be clearly marked with an identifiable manufacturer's mark on both the bolt head and nut. All shipments of high-strength bolts, nuts, and washers, whether from manufacturer, distributor, or reseller, must include manufacturer's current test reports for chemical composition (ASTM A 751) and mechanical properties, including proof load testing (ASTM F 606).

603.2 Steel elements. The special inspections engineer of record must conduct special inspection of steel elements in accordance with VCC-1705.2 *Steel construction* and the quality assurance inspection requirements of AISC 360.

- **Steel erection.** Erection must be in conformance with industry standard practice (AISC 303). Adequate guying and bracing shall be used during the erection process to maintain the stability of the structure. Structural steel, joists, etc. may not be erected on concrete or masonry footings, piers, walls, etc. less than seven days old, or less than 75

percent strength (concrete f'_c or masonry f_m), unless the concrete and masonry strength criteria that have been established by the structural engineer of record for carrying such loads are satisfied.

The special inspections engineer of record must conduct special inspection of anchor bolts, bolts, welding, connections, and details. Any observed discrepancies between the county-approved construction documents and the county-approved structural steel fabrication and erection documents must be brought to the immediate attention of the structural engineer of record and the Critical Structures/Building Inspections Section. All steel elements must be inspected before they are covered by fire-resistant materials or otherwise concealed.

- **High strength bolts.** Installation shall conform to the county-approved construction documents, county-approved structural steel fabrication and erection documents, VCC-1705.2.1 *High-strength bolts*, AISC 360 and the RCSC specifications. In the event any bolt, nut, or washer is broken during normal installation (except bolts purposely over-torqued in order to draw the parts together), the special inspections engineer of record must bring such failures to the immediate attention of the structural engineer of record and the Critical Structures/Building Inspections Section. The special inspections engineer of record must observe the on-site proof load testing of any suspect bolt(s) per ASTM and AISC standards. Should the bolts fail load testing, they will be rejected, and the structural engineer of record will make recommendations in writing for remedial actions. All test results and recommendations must be reported to the Critical Structures/Building Inspections Section.
- **Welding.** All welders and weld special inspectors must be certified in accordance with AWS D1.1. Special inspection for structural steel must be in conformance with the quality assurance requirements of AISC 360.
- **Rigid or semi-rigid connections.** When field welding of rigid or semi-rigid connections is required, or when bolted connections are required to be pretensioned beyond snug tight conditions, the special inspections engineer of record must conduct special inspection of the connections.
- **Details.** The special inspections engineer of record must conduct special inspection of the steel frame to verify compliance with the details shown on the county-approved construction documents and the county-approved fabrication and erection documents, such as bracing, stiffening, member locations, and proper application of joint details at each connection.
- **Composite construction.** The special inspections engineer of record must conduct special inspection of shoring required for erection of composite (steel beams/concrete deck) construction.

603.3 Seismic-resisting systems. The special inspections engineer of record must conduct special inspection of seismic-resisting systems, as required by VCC-1705.12. and VCC-1705.12.2 *Structural steel*, including periodic special inspection of mechanical bolting, anchoring, and other fastening of components within the seismic-resisting system, and continuous special inspection as required by the quality assurance plan and AISC 341 for structural welding of the seismic-resisting system, except for periodic special inspection of single-pass fillet welds not exceeding $\frac{5}{16}$ inch in size and floor deck and roof deck welding.

The special inspections engineer of record must conduct special inspection of cold-formed steel framing as required by VCC-1705.12.3 *Cold-formed steel light-frame construction*,

including periodic special inspection of welding and mechanical bolting, anchoring, and other fastening of components within the seismic-resisting system.

SECTION 604 COMPLETION OF STRUCTURAL STEEL CONSTRUCTION

Upon completion of structural steel construction, the special inspections engineer of record may, after review by the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 7 CAST-IN-PLACE CONCRETE

SECTION 701 GENERAL

701.1 Scope. The requirements of this chapter, and VCC-1705.3 *Concrete construction* and VCC-Table 1705.3 *Required verification and inspection of concrete construction*, will apply when construction includes cast-in-place concrete. Where required, cast-in-place concrete building elements must also comply with VCC-1704.3.2 *Seismic resistance*, VCC-1705.12 *Special inspections for seismic resistance* and VCC-1705.12 *Structural testing for seismic resistance*.

701.2 Concrete elements. Concrete elements as required by chapter 17 of the *2015 Virginia Construction Code* will be subject to special inspection and material tests as required by Section 703. Please see section VCC-1705.3 for the exceptions.

701.3 Construction loads. The general contractor must coordinate construction operations so that at all times the dead loads, live loads and construction loads delivered to the building while it is under construction are within the capacity of the building to carry such loads. In addition, no structural loads may be imposed on any vertical load carrying member which is less than seven days old, or less than 75 percent strength (f_c), unless the concrete strength criteria established by the structural engineer of record for carrying such loads is satisfied.

701.4 Posting of concrete placement schedule. As construction proceeds, the general contractor must post the updated concrete placement schedule, which must indicate building floor level, placement number, and date of placement, on the door of the general contractor field office. This schedule must be available for use in case of emergency by the Fairfax County Fire and Rescue Department.

SECTION 702 FABRICATION AND ERECTION DOCUMENTS

702. 1 Seal and signature requirements. The following fabrication and erection documents must be prepared, signed and sealed by registered design professionals with experience in the requisite disciplines:

- Concrete formwork and shoring designs.
- Concrete formwork stripping and reshoring schedules.
- Tendons to be post-tensioned.

702.2 Formwork, shoring and reshoring design requirements. The fabrication and erection documents for the concrete formwork, shoring and reshoring of structural concrete slabs, beams, walls, and columns must include:

- Concrete formwork and shoring design calculations, construction details and placement plans.
- Formwork and shoring for horizontal concrete construction (slabs, beams and girders) must include concrete dead loads, formwork loads, and construction live loads.
- Shoring for concrete frames must be designed to meet the structural engineer of record's requirements.
- Formwork for vertical concrete construction (walls and columns) must include lateral concrete pressures and rate of placement assumed or required for walls and columns.
- Shoring and reshoring design calculations, placement plans and reshoring procedures for horizontal concrete construction (slabs, beams and girders) must include:

- Number of levels of shores and reshores;
 - Loads to be delivered to the shores and reshores at each level;
 - Shore capacities and reshore capacities;
 - Construction loads to be delivered to the building at each level;
 - Time-dependent strengths of the building components required for the delivered construction loads and assumed construction schedules.
- Temporary erection shoring for composite construction (concrete slab/steel beam, concrete slab/steel joist, or concrete slab/wood joist), or for erection of structural steel must be designed to meet the structural engineer of record's requirements.
 - Necessary construction schedules. The general contractor must coordinate the construction schedule with the registered design professional responsible for formwork, shoring and reshoring design, and with the structural engineer of record.

702.3 Review and approval. Prior to concrete construction and formwork erection, as appropriate, the fabrication and erection documents listed below must be submitted to the structural engineer of record, for approval for compliance with the county-approved construction documents and in accordance with the following requirements:

- Concrete formwork and shoring designs, and formwork stripping and reshoring designs and schedules, as required by Section 702.2, for compliance with the county-approved construction documents, and verification of the capacity of the building components, exclusive of the formwork and shoring, to carry the construction loads delivered to the building.
- Steel reinforcement (non-prestressed cast-in-place concrete).
- Steel reinforcement and tendons (prestressed or post-tensioned cast-in-place concrete).
- Concrete mix designs, including any accelerators or other admixtures, for each class of concrete to be used. The structural engineer of record's approval shall include the following language:

I have reviewed the concrete mix designs as prepared by (*company*) for the above referenced project. My approval or approval as noted, dated (*date*), including approval of concrete mix designs (*list*), including any accelerators or other admixtures, for each class of concrete to be used, is for compliance with the project requirements.

The general contractor must submit two sets of structural engineer of record-approved cast-in-place concrete fabrication and erection documents, including; concrete mix designs, reinforcement, and concrete formwork, shoring and reshoring designs; to the Critical Structures/Building Inspections Section for approval. After county approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

Exceptions: Unless required by project specifications or the structural engineer of record, county approval is not required for the following items. For these items, one set of structural engineer of record-approved fabrication and erection documents must be available on the job site for use by the special inspections engineer of record to conduct special inspections and tests during construction, and one set must be submitted to the Critical Structures/Building Inspections Section for record purposes.

- Steel reinforcement for non-prestressed cast-in-place concrete.
- Concrete formwork for walls 10'-0" in height or less, and which does not support workmen scaffolding at heights greater than 10'-0" above any adjacent surface.

- Concrete formwork for columns 15'-0" in height or less, and which does not support workmen scaffolding at heights greater than 10'-0" above any adjacent surface.

SECTION 703 SPECIAL INSPECTIONS AND TESTS

703.1 Special inspections. The special inspections engineer of record must conduct special inspection and material tests in accordance with this chapter, and with VCC-1705.3 *Concrete construction*, and VCC-Table 1705.3 *Required verification and inspection of concrete construction*.

703.2 Particular elements.

a. Concrete formwork, shoring and reshoring erection. Prior to placement of concrete, the special inspections engineer of record must verify that:

- Formwork materials, cleanliness, size, and installation conform to county-approved formwork fabrication and erection documents.
- Shoring and reshoring is installed in conformance with the county-approved documents.

VCC-Table 1705.3 Item 12 *Required verification and inspection of concrete construction, inspection of concrete formwork, shoring and reshoring* requires periodic special inspection of formwork, shoring and reshoring. Inspection reports must be submitted to the Critical Structures/Building Inspections Section within (3) three working days of each inspection.

b. Reinforcing steel and imbedments. The special inspections engineer of record must conduct special inspection of steel reinforcement, in compliance with county-approved construction documents and approved fabrication and erection documents, including welding of reinforcement of the structural seismic-resisting system.

- Reinforcing steel placement requires periodic special inspection.
- Welding of steel reinforcement requires continuous or periodic special inspection, depending upon the use of the reinforcing steel, in accordance with VCC-Table 1705.3 Item 2b *Required verification and inspection of steel construction, inspection of welding, reinforcing steel*:
 - Periodic special inspection to verify weldability of steel reinforcement other than ASTM A 706.
 - Continuous special inspection of welding for reinforcement resisting shear, flexural and axial loads in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.
 - Periodic special inspection of welding for other reinforcement.
- Special inspection is required for embedded bolts, anchors, dowels and imbeds securely fastened in place, including anchors installed in hardened concrete, in accordance with VCC-Table 1705.3 Items 3 and 4:
 - Continuous special inspection is required for bolts and anchors installed where strength design is used or allowable loads have been increased.
 - Periodic special inspection is required for other installations.

c- Tendons to be post-tensioned. The special inspections engineer of record must conduct special inspection of tendons to be post-tensioned, in compliance with county-

approved construction documents and approved fabrication and erection documents, including:

- Periodic special inspection of tendon placement, to include tendon size and strength, chair height, tendon profile, tendon snaking elimination, horizontal ties between chairs and condition of sheathing.
- Continuous special inspection of grouting, consolidation and reconsolidation of bonded tendons.
- Continuous special inspection and monitoring of tendon stressing operations, in compliance with project specifications. Stressing of tendons must not start before the specified minimum strength of field-cured test cylinders has been achieved and verified by the special inspections engineer of record and approved by the structural engineer of record. Elongation records must be made and checked against project specifications. Tendon failures or tendon elongations not in compliance with project specifications will be rejected, and the structural engineer of record must make recommendations in writing for remedial actions.

d- Concrete. The special inspections engineer of record must:

- Verify use of proper concrete design mix.
- Monitor placement of concrete.
- Conduct special inspection and material tests listed in VCC-Table 1705.3 *Required verification and inspection of concrete construction*.

Continuous monitoring of concrete delivery will be required at the point of discharge from trucks/batch plant, and at the point of deposit/consolidation of concrete. See Section 704 for concrete testing requirements and Section 706 for cold weather concreting.

SECTION 704 CONCRETE TESTING

Concrete must be tested in accordance with this section and with ACI 318-14 *Building Code Requirement for Structural Concrete*.

Testing required. Tests for cast-in-place concrete material properties and attained strength must comply with the following:

a- Test cylinders. Concrete samples for strength testing (both laboratory-cured cylinders and field-cured cylinders) must be taken in accordance with ASTM C 172. Concrete test cylinders must be 6 x 12 inches in size, with two 6 x 12-inch cylinders cast for each test.

Exception: Concrete test cylinders may be 4 x 8 inches in size, subject to the following conditions:

- The use of alternative concrete test cylinders must be specified by the structural engineer of record on a case by case basis.
- The use of alternative concrete test cylinders must be considered by the county on a case by case basis, and in accordance with the requirements of Section 101.3.
- Concrete mix designs must be adjusted for the alternative concrete test cylinders and must be reapproved by both the structural engineer of record and the county.
- Three 4 x 8-inch cylinders must be cast for each test.

- Test results must be de-rated by 5%; i.e., nominal results must be multiplied by 0.95 to obtain the final results.

b- Frequency of sampling. Samples for strength tests of each class (concrete mix design) must be taken in accordance with ACI 318-14 Section 5.6.2.1 *Frequency of testing*. Samples must be taken not less than once per day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5,000 square feet of surface area for slabs or walls. Additional test cylinders for strength tests must be cast if required by the architect of record, the structural engineer of record, or county-approved documents.

Additional cylinders to be field-cured must be required to evaluate strengths of concrete prior to removal of shores and concrete formwork, prior to stressing of post-tensioning tendons, loading of vertical building elements, erection of structural steel, and adequacy of concrete curing and protection methods during cold weather concreting conditions.

c- Laboratory-cured cylinders. Cylinders for strength tests for acceptance of concrete must comply with this section, and with ACI 318-14 section 5.6.3 *Standard-cured specimens*. Cylinders for strength tests must be cast, stored, transported and laboratory-cured in accordance with ASTM C 31. The testing must be done at 28 days or the time designated on the county-approved documents for determination of specified compressive strength of concrete, f_c , if different from 28 days. Concrete tests must be in accordance with ASTM C 39. Test results for multiple samples must be individually reported. Test results must not be averaged together.

Test results for a class of concrete must be considered satisfactory if every arithmetic average of any three consecutive strength tests equals or exceeds f_c and no individual strength test falls below f_c by more than 500 psi when f_c is 5,000 psi or less, or by more than $0.10 f_c$ when f_c is more than 5,000 psi. See Section 704.2 for low-strength test results.

d. Field-cured cylinders. Field-cured cylinders, to evaluate strengths of concrete prior to removal of concrete formwork and shoring/reshoring, prior to stressing post-tensioning tendons, and to determine adequacy of curing and protection of concrete during cold weather, must comply with this section, and with ACI 318-11 section 5.6.4 *Field-cured specimens*. Field-cured cylinders must be cured as closely as possible to the location of placement of the concrete pour they represent and be exposed as nearly as possible to the same temperature and moisture environment, in accordance with ACI 318 and ASTM C 31.

Cylinders may be fabricated on the ground or on the slab and moved to the curing location no more than 30 minutes after fabrication. If fabricated on the ground, cylinders must be placed in a temporary open storage location, protected by no more than insulated blankets, remain undisturbed for a minimum of 16 hours but no more than 24 hours after molding, and then be relocated into or on the structure as closely as is practicable to the concrete they represent. If molded on the slab, cylinders must be placed into or on the structure as closely as is practicable to the concrete they represent immediately after molding.

Equivalency may be achieved by storing uncapped cylinders on or immediately adjacent to the structural concrete placement as soon as practical after casting (and until six hours or less prior to testing) and subjecting them to the same temperature and moisture loss controls as the structure itself. Test cylinders must be protected from cold weather and cured in the same manner as the concrete they represent. Under no circumstances may field-cured cylinders be subjected to a curing environment that is better than the concrete they represent, such as placement within a temperature and humidity-controlled container.

Concrete tests must be in accordance with ASTM C 39. Test results for multiple samples must be individually reported. Test results may not be averaged together.

Test results will be considered satisfactory if the strength of all cylinder tests equal or exceed the strength required at the age of testing. See both Section 705.3 and Section 704.2 for low-strength test results.

Protection procedures must be improved when the strength of field-cured cylinders at the test age designated for determination of f_c is less than 85 percent of that of companion laboratory-cured cylinders, unless the field-cured strength exceeds f_c by more than 500 psi.

704.2 Low-strength concrete test results. Investigation of low-strength concrete must be in accordance with this section, and with ACI 318-14 section 5.6.5 *Low-strength test results*. The following procedures will apply when test results do not comply with the acceptance criteria of ACI 318 for concrete strength.

Data and recommendations. The special inspections engineer of record must submit to the Critical Structures/Building Inspections Section a copy of any records pertaining to under-strength concrete, with the written recommendations of the structural engineer of record.

Nondestructive testing. If nondestructive testing is recommended by the structural engineer of record to evaluate or confirm the *in-situ* concrete strength, the Critical Structures/Building Inspections Section will only accept testing by concrete cores obtained and tested in accordance with ASTM C 42 and conditioned in accordance with ACI 318, and tested not less than two days nor more than seven days after coring, or by penetration resistance in accordance with ASTM C 803 and calibrated for the particular concrete mix. The impact rebound hammer (ASTM C 805) method of testing will not be approved.

SECTION 705 CONCRETE FORMWORK STRIPPING AND RESHORING

705.1 Critical Structures/Building Inspections Section approval required. Specific Critical Structures/Building Inspections Section approval is required prior to removal of concrete formwork and shoring, and installation or removal of reshores. Requests for the Critical Structures/Building Inspections Section approval must be submitted in the form of stripping letters (see Section 705.2).

Exception: Stripping approval is not required for certain walls and columns, as listed in Section 702.3.

Removal may not commence until the Critical Structures/Building Inspections Section-approved stripping letter is on-site.

Removal of shores, formwork stripping, and installation of reshores must conform to the county-approved fabrication and erection documents.

705.2 Requests for formwork and shoring removal (stripping letter).

a- Preparation of stripping letter. The special inspections engineer of record must initiate a stripping letter when concrete strengths have achieved the levels specified by the county-approved documents, requesting approval for removal of shores and formwork, and reshoring operations. This letter must contain the test results of the field-cured cylinders (and laboratory-cured cylinders when specified by the structural engineer of record) molded for this purpose, and the stripping requirements stated in the county-approved documents. The stripping letter must contain the seal and signature of the special inspections engineer of record.

A stripping letter must state that *in-situ* concrete strengths and conditions meet or exceed the project design specifications and design stripping criteria and must request approval to remove formwork and shoring. In the event of a deficiency, the structural engineer of record's recommendations must be included. Stripping letters must also include:

- **"Design" data.** The project's requirements, including but not limited to the concrete mix design strength and concrete strength/time specifications for stripping, the formwork shoring, reshoring or stripping design criteria established by a registered design professional responsible for formwork and shoring design, and cold weather concreting methods.
- **"Actual" data.** The construction results attained for the particular stripping request, including but not limited to cold weather concreting temperature logs, concrete cylinder break tests (each test shall be individually included), post-tensioning stressing records, and formwork shoring/reshoring/stripping modifications.

b- County approval of stripping letter required. The Critical Structures/Building Inspections Section approval of the stripping letter is required prior to shoring removal, formwork stripping and reshoring operations.

- For post-tensioned concrete construction, the stripping letter must be reviewed and approved by the structural engineer of record prior to submittal to the Critical Structures/Building Inspections Section.
- For other concrete construction, the stripping letter must be reviewed and approved by the structural engineer of record prior to submittal to the Critical Structures/Building Inspections Section.

Exception: The structural engineer of record may elect to waive review of stripping letters for concrete construction other than post-tensioned concrete construction. Waiver of review constitutes the structural engineer of record's approval of the stripping letters. The structural engineer of record's election to waive review of stripping letters must be conveyed to the Critical Structures/Building Inspections Section in writing prior to commencement of concrete placement for the project.

After approval, the Critical Structures/Building Inspections Section must return the county-approved stripping letter for use on the job site.

Possession of the county-approved stripping letter does not in any way relieve the general contractor of responsibility to evaluate the removal of formwork and shoring to determine if it is safe and appropriate to do so.

705.3 Low-strength concrete. When field-cured concrete strength test results do not meet formwork and shoring removal requirements, the registered design professional who designed the concrete formwork and shoring must make a recommendation, either to allow stripping to proceed, or to postpone stripping until specified concrete strengths are attained, for approval by both the structural engineer of record and the Critical Structures/Building Inspections Section. See also Section 704.2.

705.4 Tendon elongation records. When structural members to be stripped are of post-tensioned concrete, tendon elongation records must be approved by the structural engineer of record and must be attached to the stripping letter. In the event that tendons are broken, tendon elongations do not meet project specifications, or other deficiencies occur, the registered design professional who designed the post-tensioned tendons must address the

case and make a recommendation, for approval by both the structural engineer of record and the Critical Structures/Building Inspections Section.

SECTION 706 COLD-WEATHER CONCRETING

706.1 Requirements. The requirements of this section apply after three consecutive days of average daily temperatures below 40F (degrees Fahrenheit), or when the internal concrete temperature falls below 50F during curing. The general contractor must make specific provisions to continuously protect the concrete during cold weather periods. During periods when the average daily temperatures are intermittently above or below 40F on any day, provisions for protection must be available as needed. In Fairfax County, cold weather usually may be expected between November 1 and April 1.

The special inspections engineer of record must verify adherence to the following requirements:

- **Minimum temperature of concrete.** All concrete (slabs, columns, walls, beams, footings, etc.) must be maintained above 50F and be kept moist during the first seven days (or three days if high-early strength concrete is used) after placement.
- **Maximum temperature in enclosures.** If the area is enclosed, the temperature in the enclosure must be monitored so that it does not exceed 104F, or as otherwise specified by the structural engineer of record. Proper moisture levels must be maintained at all times.
- **Environment of field-cured cylinders.** When cylinders are fabricated for acceptance testing, additional cylinders must be made to be field-cured for purposes of determining adequacy of protection and curing (see ACI 318-14 section 5.4.6 Field-cured specimens). Field-cured concrete cylinders must be cured in the identical environment, and the least favorable curing conditions, as the structural members they represent. Each set of field-cured cylinders must remain in the exact curing environment of the structural members they represent for 100 percent of the minimum curing time required by the structural engineer of record prior to transport to the approved testing laboratory for compressive strength testing.

706.2 Temperature readings.

- **Temperature records.** The special inspections engineer of record must record ambient temperature, air temperature under slab (when applicable), and concrete temperatures at regular time intervals on all concrete until 72 cumulative hours of internal concrete temperatures above 50F are achieved, or until the average ambient temperature rises above 40F for more than three successive days. Temperature readings must be taken by personnel of the special inspections engineer of record, using tamper-resistant devices. Concrete temperature readings must be taken at a minimum of four locations along the edge of the slab being monitored. The Critical Structures/Building Inspections Section may designate additional locations if the concrete placement is unusually large. Temperature readings and appropriate data must be recorded on a temperature log sheet which must be attached to each stripping letter to facilitate approval of the stripping request.
- **Frequency of readings.** Periodic readings of temperatures are required to verify adequacy of curing and protection methods. During the season when temperatures are

not within the "cold weather concreting" conditions, high and low readings of concrete temperatures must be conducted once for each 24-hour period. Such readings must be labeled, "not cold weather". During "cold weather concreting" conditions, the special inspections engineer of record must monitor ambient temperature, air temperature under slab, and concrete temperatures at regular time intervals for the specified duration of temperature-controlled curing. The concrete curing time begins when the last delivery of concrete is deposited into the formwork, with temperature monitoring beginning immediately after concrete placement and finishing is complete and continuing until the cumulative duration of satisfactory curing is achieved.

If instantaneous temperature readings only are recorded, there must be not less than six recordings per 24-hour period (at 4-hour intervals). If there are less than six recordings per 24-hour period, recordings must include the instantaneous temperature and also include both minimum/maximum temperatures reached during the previous recording period, with not less than two recordings per 24-hour period (12-hour intervals). In all cases, if the temperature reading(s) indicate a minimum concrete temperature below 50F, then that period of time between readings cannot be included in the required curing duration.

- **Use of automatic recorders.** Automatic temperature monitoring and maturity metering devices may be used only to verify the temperature data required by this section.
- **Deficiencies.** The general contractor must adjust cold-weather concreting procedures and protective measures if temperature readings indicate deficiencies in protective measures.

706.3 Testing of field-cured cylinders for curing. For cold-weather concreting, testing of field-cured cylinders is required, to verify adequacy of curing and protection measures. The testing must be done at 28 days or the time designated on the county-approved documents for determination of specified compressive strength of concrete, f_c , if different from 28 days.

Cylinders cured in the field for purposes of determining formwork and shoring removal may be used to satisfy this requirement.

SECTION 707 COMPLETION OF CAST-IN-PLACE CONCRETE CONSTRUCTION

Upon completion of cast-in-place concrete construction, the special inspections engineer of record may, after review by the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

Fairfax County, Virginia Special Inspections Program
Cold Weather Concrete Slab Temperature Log

Report
 Date: _____

Pour Date:	PROJECT: _____ Permit #: _____ Description of Pour: _____							
Start Time:								
Finish Time:								
		Station #1	Station #2	Station #3	Station #4	Air Temp Und.Slab	Ambient Air Temp	Remarks
Day 1	12 a.m.							
	4 a.m.							
	8 a.m.							
	12 p.m.							
	4 p.m.							
	8 p.m.							
Day 2	12 a.m.							
	4 a.m.							
	8 a.m.							
	12 p.m.							
	4 p.m.							
	8 p.m.							
Day 3	12a.m.							
	4 a.m.							
	8 a.m.							
	12 p.m.							
	4 p.m.							
	8 p.m.							
Day 4	12 a.m.							
	4 a.m.							
	8 a.m.							
	12 a.m.							
	4 p.m.							
	8 p.m.							

- 1) Maintain data for 72 hours after finish of placement.
- 2) Number of temperature monitoring stations may be increased as needed.
- 3) Stations shall be located near the outer edges.

CHAPTER 8 PRECAST CONCRETE

SECTION 801 GENERAL

801.1 Scope. The requirements of this chapter, and VCC-1705.3 *Concrete construction* and VCC-Table 1705.3 Item 10 *Required verification and inspection of concrete construction, erection of precast concrete members*, will apply when construction includes precast concrete building elements. Where required, precast concrete building elements must also comply with VCC-1704.6.1 *Structural Observation for Seismic resistance*, VCC-1705.12 *Special inspections for seismic resistance*, and VCC-1705.13 *Structural testing for seismic resistance*.

801.2 Inspection of precast concrete fabricators and fabrication procedures. When precast concrete elements are fabricated off-site, the special inspections engineer of record must conduct special inspection of the precast concrete fabricator and fabrication procedures, as required by VCC-1704.2.5 *Special Inspection of fabricated items*, for all precast concrete elements that are themselves subject to special inspection. The report of special inspection of the fabricator and fabrication procedures must be submitted to the Critical Structures/Building Inspections Section.

- **Certification.** The fabricator may demonstrate to the special inspections engineer of record that the requirements of VCC-1704.2.5 *Special Inspection of fabricated items* have been met by furnishing Precast/Prestressed Concrete Institute Plant Certification in the appropriate category. The special inspections engineer of record may inspect the precast plant at appropriate intervals to verify that materials, methods, products, and quality control comply with project specifications, county-approved fabrication and erection documents, and PCI MNL-116 or PCI MNL-117S, as applicable.
- **Procedures implementation.** The special inspections engineer of record must state in writing that the fabricator has a documented and implemented quality control program. Verification may be on a job basis or by inspection within the previous twelve months.
- **Certificate of compliance.** At the completion of fabrication, the fabricator must submit a certificate of compliance to the Critical Structures/Building Inspections Section.

801.3 Precast concrete elements cast off-site. All architectural and structural precast concrete building elements manufactured off-site, except miscellaneous cast stone items such as sills, coping, pavers, etc., or as otherwise approved.801.2

801.4 Precast concrete elements cast on-site. All architectural and structural precast concrete building elements manufactured on-site, including tilt-up concrete wall panels, except miscellaneous cast stone items such as sills, coping, pavers, etc., or as otherwise approved.

SECTION 802 FABRICATION AND ERECTION DOCUMENTS

802.1 Preparation of fabrication and erection documents. A registered design professional with experience in the design of precast concrete structures shall prepare, sign, and seal fabrication and erection documents for precast concrete building elements, including but not limited to: design drawings and calculations, connection details, design of lifting inserts,

rigging requirements, and erection bracing. The concrete mix designs shall be approved by the registered design professional responsible for preparation of precast concrete designs. Documents for site-cast precast concrete shall also include, but are not limited to: element fabrication, form removal, storage and transportation.

802.2 Review and approval. Prior to fabrication and erection of precast concrete elements, the precast concrete fabrication and erection documents, including the concrete mix designs, shall be submitted to both the architect of record and the structural engineer of record, for approval for compliance with the architectural and structural design of the building and the county-approved construction documents. The general contractor shall submit two sets of the architect of record/structural engineer of record-approved precast concrete fabrication and erection documents, including the concrete mix designs, to the Critical Structures/Building Inspections Section for approval. After county approval, one set of county-approved concrete mix designs and county-approved fabrication and erection documents shall be returned for use on the construction site. The special inspections engineer of record shall use county-approved documents to conduct special inspections and tests during construction.

SECTION 803 SPECIAL INSPECTIONS AND TESTS

The special inspections engineer of record must conduct special inspection of precast concrete building elements during fabrication and erection as required by VCC-1705.3 *Concrete construction*, and VCC-Table 1705.3.10 Item 10 *Required verification and inspection of concrete construction, erection of precast concrete members* for conformance with county-approved documents.

803.1 Fabrication of precast concrete elements cast on-site. During on-site fabrication of precast concrete elements, the special inspections engineer of record must verify the following:

- **Concrete.** Concrete complies with the county-approved concrete mix designs and the applicable provisions of Chapter 7 for cast-in-place concrete.
- **Compressive strength of field-cured cylinders.** The compressive strength of field-cured cylinders satisfies minimum strength requirements of the county-approved construction documents and the lifting requirements and lifting insert specifications of the county- approved fabrication and erection documents.
- **Reinforcing steel.** Reinforcing steel, including lifting inserts, is installed in accordance with county-approved documents.

803.2 Precast concrete erection: During erection of precast concrete elements, the special inspections engineer of record must verify the following:

- **Assembly.** Precast concrete elements are lifted, assembled and braced in accordance with county-approved fabrication and erection documents.
- **Welders.** Welders and weld inspectors are certified in accordance with AWS D1.1,
 - Chapter 5, Part C.
- **Connections.** All welded connections in the structural frame are in accordance with county-approved documents and the applicable sections of AWS D1.1, SJI specifications, AISC specifications, and the *Virginia Construction Code*.

SECTION 804 COMPLETION OF PRECAST CONCRETE CONSTRUCTION

Upon completion of architectural and structural precast concrete construction, the special inspections engineer of record may, after review by the architect of record and the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 9 WOOD

SECTION 901 GENERAL

Scope. The requirements of this chapter, and VCC-1705.5 *Wood construction*, must apply when construction includes wood building elements. Where required, wood building elements must also comply with VCC-1704.3.2 *Seismic requirements in the statement of special inspections*, VCC-1704.5 *Structural observation*, VCC-1705-12 *Special inspections for seismic resistance*.

Inspection of wood fabricators and fabrication procedures. The special inspections engineer of record must conduct special inspection of the wood fabricator and fabrication procedures, as required by VCC-1704.2.5 *Special Inspection of fabricated items*, for all wood fabricated assemblies that are themselves subject to special inspection. Glue-laminated members and sandwich panels must bear the mark of an approved agency. The report of special inspection of the fabricator and fabrication procedures must be submitted to the Critical Structures/Building Inspections Section.

- **Certification.** The fabricator may demonstrate to the special inspections engineer of record that the requirements of VCC-1704.2.5 *Inspection of fabricators* have been met by furnishing evidence of compliance with the WTCA QC program, or its equivalent.
- **Procedures implementation.** The special inspections engineer of record must state in writing that the fabricator complies with the fabrication and quality control procedures outlined above. Verification may be on a job basis or by inspection within the previous 12 months.
- **Certificate of compliance.** At the completion of fabrication, the fabricator must submit a certificate of compliance to the Critical Structures/Building Inspections Section.

901.3. Wood elements. The following wood elements are subject to special inspection:

- Structural glue-laminated members;
- Sandwich panels;
- Wood trusses, except those built as standard roof trusses for light-frame construction;
- Wood I-joists, except those built as standard floor or ceiling joists for light-frame construction;
- High-load diaphragms;
- Metal-plate-connected trusses spanning 60'-0" or more;
- Seismic-resisting systems. (Seismic Design Category C): as required by VCC-1705.12 *Structural wood*.

SECTION 902 FABRICATION AND ERECTION DOCUMENTS

902.1 Preparation of fabrication and erection documents. A registered design professional with experience in the design of prefabricated wood elements and assemblies must prepare, sign and seal fabrication and erection documents for prefabricated wood elements. The fabrication and erection documents must include but are not limited to: design drawings and calculations, connection details, supports, rigging requirements and lifting procedures, and erection bracing and details. Permanent bracing systems for lateral stability must be detailed and included in the fabrication and erection documents. Details for welded or bolted connections must clearly indicate the seismic-resisting elements of buildings of Seismic Design Category C.

Details for bolted connections must clearly indicate the amount of tensioning required and the ASTM specifications for the nuts, bolts and washers.

Review and approval. Prior to fabrication and erection of wood prefabricated elements, the wood prefabricated elements fabrication and erection documents must be submitted to the architect of record and the structural engineer of record for approval, for compliance with the architectural and structural design of the building and the county-approved construction documents. For prefabricated wood trusses, the architect of record and the structural engineer of record must also submit a certification of compliance to the Building Plan Review Branch. The general contractor must submit the architect of record/structural engineer of record-approved fabrication and erection documents for county approval, in accordance with the following:

- **Structural glue-laminated members.** Two sets of the fabrication and erection documents must be submitted to the Critical Structures/Building Inspections Section for approval.

Sandwich panels. Two sets of the fabrication and erection documents must be submitted to the Critical Structures/Building Inspections Section for approval.

Wood trusses. Two sets of architect of record-approved and structural engineer of record-approved fabrication and erection documents must be submitted to the Building Plan Review Branch for approval. At least one set must bear the original seal and signature of the registered design professional responsible for truss design. The architect of record and the structural engineer of record must also submit a certification of compliance to the Building Plan Review Branch. After county approval, the Building Plan Review Branch must retain one set of county-approved fabrication and erection documents and must return the others.

Wood I-joists. Architect of record/structural engineer of record-approved fabrication and erection documents must be available for use on the construction site. County approval is not required.

After county approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 903 SPECIAL INSPECTIONS AND TESTS

903.1 Erection of elements. The special inspections engineer of record must conduct special inspection of wood building elements, including connections, during erection as required by the

Virginia Construction Code for conformance with county-approved documents. The special inspections engineer of record must verify the following:

903.2 Connections. Special inspection as required by VCC-1705.5 *Wood Construction* must include verification that all connections of the seismic-resisting elements of buildings assigned to Seismic Category C, regardless of height, are in accordance with county-approved documents and applicable sections of the *Virginia Construction Code*. For all buildings, special inspection must include nailing, bolting, structural gluing or other fastening of the wood elements subject to special inspection. Glue-laminated members and sandwich panels must bear the mark of an approved agency. When bolted connections are required to be pretensioned beyond snug tight conditions, the special inspections engineer of record must conduct special inspection of the connections.

903.3 High-load diaphragms. Special inspection of site-built assemblies, as required by VCC-1705.5.1 *Fabrication of high-load diaphragms*, must include verification of grade, material thickness and member sizes, fastener size and spacing, and assembly installation.

903.4 Metal-plate trusses. Special inspection of long-span wood trusses, as required by VCC-1705.5.2 *Metal-plate-connected wood trusses spanning 60 feet or greater*, must include verification of temporary truss restraints and bracing, and permanent individual truss restraints/bracing, in accordance with county-approved documents.

903.5 Seismic-resisting systems. Continuous special inspection of field-gluing operations and periodic special inspection of mechanical nailing, bolting or fastening operations are required, except fastening of sheathing where fastener spacing is greater than 4" on center.

SECTION 904 COMPLETION OF WOOD CONSTRUCTION

Upon completion of wood construction, including connections, the special inspections engineer of record may, after review by the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section

CHAPTER 10 MASONRY

SECTION 1001 GENERAL

Scope. All masonry construction must comply with VCC-2104 *Construction, masonry*.

No structural loads may be imposed on any vertical load carrying masonry member which is less than seven days old or less than 75 percent strength (masonry f_m), unless the masonry strength criteria established by the structural engineer of record for carrying such loads are satisfied.

The requirements of this chapter, and VCC-1705.4 *Masonry construction*, VCC 1705.4.2 Vertical masonry foundation elements will apply when masonry building components require special inspection. Where required, masonry construction will also comply with VCC-1705.4 *Seismic resistance*, VCC-1705.11 *Special inspections for seismic resistance* and VCC-1705.4 *Structural testing for seismic resistance*.

Masonry elements.

The extent of special inspections depends upon the masonry design method (as “engineered” or “empirical”) and the building’s occupancy classification (as “essential” or “other”).

“**Engineered**” masonry design usually means reinforced structural load-bearing masonry, supporting vertical or lateral loads in addition to its self-weight.

“**Empirical**” masonry design usually means nonstructural or un-reinforced masonry.

“**Essential**” facilities are buildings with Occupancy Category IV that contain occupancies or provide emergency response services that must remain operational after a fire, earthquake or other disaster.

“**Other**” facilities are buildings with Occupancy Category I, II or III.

The following masonry construction are subject to special inspection:

a. Masonry components. Masonry components as listed below:

Engineered masonry, including vertical foundation elements, in Occupancy Category IV (essential facilities) (See Table 1.19.3 - Level C Quality Assurance of Building Code Requirements and specification for Masonry Structures).

Empirical masonry, including vertical foundation elements, glass unit masonry and masonry veneer in Occupancy Category IV (essential facilities) (See Table 1.19.2 - Level C Quality Assurance of Building Code Requirements and specification for Masonry Structures).

Engineered masonry, including vertical foundation elements, in Occupancy Category I, II or III (other facilities) (See Table 1.19.2 - Level C Quality Assurance of Building Code Requirements and specification for Masonry Structures).

b. Seismic-resisting systems. (Seismic Design Category C): as required by VCC-1705.11 *Masonry* (see Section 1003).

Exceptions: Empirical masonry, glass unit masonry and masonry veneer in Occupancy Category I, II or III (other) facilities, and certain masonry foundation walls, fireplaces and chimneys.

1001.3 Protection during masonry wall construction. The general contractor must ensure that masonry wall construction complies with this section, and with applicable Virginia Occupational Safety and Health Administration regulations. The special inspections engineer of record must verify that construction bracing, with limited access zones, is installed as required by Section 1001.3, and must immediately notify the Critical Structures/Building Inspections Section if either the construction bracing is not installed, or limited access zones are compromised.

Protection measures include:

Bracing of walls. See Section 1002.1 for construction bracing design requirements. All masonry walls over 8'-0" in height must be laterally braced to prevent overturning and collapse unless the wall has adequate permanent lateral support. Construction bracing must be erected as soon as masonry construction exceeds 8'-0" in height. The bracing must not be removed for any reason and must remain in place until permanent supporting elements of the structure are in place.

Limited access zone. A limited access zone must be established for construction of any masonry wall greater than 4'-0" in height. Entry to the zone must be limited to employees actively engaged in constructing the wall. No other persons are permitted to enter the zone.

Zone location and extent. The zone must be established prior to the start of construction of the wall, on the side of the wall which will be unscaffolded. The zone minimum width must be at least 4'-0" greater than the maximum height of the wall to be constructed, and the zone minimum length must be greater than or equal to the entire length of the wall to be constructed.

Zone duration. The zone must remain in place until the wall is laterally supported to prevent overturning and collapse, either by construction bracing or adequate permanent supporting elements of the structure.

SECTION 1002 FABRICATION AND ERECTION DOCUMENTS

Review and approval. Prior to construction, the general contractor must submit the masonry fabrication and erection documents, including mortar and grout mix designs, to the architect of record and the structural engineer of record for approval. The general contractor must submit two sets of the architect of record/structural engineer of record-approved-masonry fabrication and erection documents, including mortar and grout mix designs, to the Critical Structures/Building Inspections Section for approval.

Construction bracing design. Construction bracing designs for masonry walls or columns construction must include consideration of wind forces, workmen and materials loadings, and anchorage, and must comply with Virginia Occupational Safety and Health Administration requirements. Construction bracing designs for walls or columns greater than 12'-0" in height must be prepared, signed and sealed by a registered design professional. Prior to masonry construction, the general contractor must submit two sets of construction bracing designs to the Critical Structures/Building Inspections Section for approval.

After county approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1003 SPECIAL INSPECTIONS AND TESTS

The special inspections engineer of record must conduct special inspection and material tests of masonry construction for conformance with county-approved documents and in accordance with VCC-1705.4 *Masonry construction*, and Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530-11/ ASCE 5-11 Table 1.19.2 - Level B Quality Assurance and Table 1.19.3 - Level C Quality Assurance as appropriate for the type of masonry design and classification of the building occupancy.

Empirical masonry in Occupancy Category IV (essential) facilities. The special inspections engineer of record must conduct special inspection and material tests in accordance with VCC - 1705.4 and Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530-11/ ASCE 5-11 Table 1.19.2 - Level B Quality Assurance which generally require:

Periodic special inspection for proportions of site-prepared mortar and grout, placement of masonry units, reinforcement, connectors and anchors, cleaning of grout spaces, and construction of mortar joints, as well as cold weather or hot weather protection.

Continuous special inspection for welding of reinforcing bars, grouting, prestressing, and preparation of mortar specimens, grout specimens, and prisms.

Certificates of compliance. Verification of f'_m prior to construction.

Engineered masonry in Occupancy Category I, II or III (other) facilities. The special inspections engineer of record must conduct special inspection and material tests as required by Section 1003.1., VCC -1705.4 and Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530-11/ ASCE 5-11 Table 1.19.2 - Level B Quality Assurance.

Engineered masonry in Occupancy Category IV (essential) facilities. The special inspections engineer of record must conduct special inspection and material tests in accordance with VCC -1705.4 and Building Code Requirements and specification for Masonry Structures TMS 402-11/ ACI 530-11/ ASCE 5-11 Table 1.19.3 - Level C Quality Assurance, which generally require:

Periodic special inspection for proportions of site-prepared mortar and grout, placement of masonry units, reinforcement, and construction of mortar joints, as well as cold weather or hot weather protection.

Continuous special inspection for connectors and anchors, cleaning of grout spaces, welding of reinforcing bars, grouting, prestressing, and preparation of mortar specimens, grout specimens, and prisms.

Certificates of compliance. Verification of f'_m prior to construction and every 5,000 square feet during construction, and verification of proportions of materials delivered for mortar and grout.

SECTION 1004 COLD-WEATHER AND HOT-WEATHER CONSTRUCTION

1004.1 Cold weather. When either the ambient temperature falls below 40F (degrees Fahrenheit) on any day, or the temperature of masonry units is below 40F, cold weather construction requirements as specified in VCC-2104.3 *Cold weather construction* must be implemented, which generally includes heating of water and aggregates, and using blankets and heated enclosures as required. In Fairfax County, cold weather usually may be expected between November 1 and April 1.

1004.2 Hot weather. When either the ambient temperature equals or exceeds 100F on any day, or the ambient temperature equals or exceeds 90F with a wind velocity greater than eight miles per hour on any day, hot weather construction requirements as specified in VCC-2104.4 *Hot weather construction* must be implemented, which generally includes cooling of water, and using shades and fog spray as required.

1004.3 Temperature records. The special inspections engineer of record must record ambient air temperature at regular time intervals during cold weather and hot weather periods. Temperature readings must be taken by personnel of the special inspections engineer of record, using tamper-resistant devices. Periodic readings of temperatures are required to verify adequacy of protection methods.

1004.4 Deficiencies. The general contractor must adjust cold-weather concreting procedures and protective measures if temperature readings indicate deficiencies in protective measures.

SECTION 1005 COMPLETION OF MASONRY CONSTRUCTION

Upon completion of masonry special inspection, the special inspections engineer of record may, after review by the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 11 SOILS AND FOUNDATIONS

SECTION 1101 GENERAL

1101.1 Scope. The requirements of this chapter, and VCC-1705.6 *Soils*, VCC-1705.7 *Driven deep foundations*, VCC-1705.8 *Cast-in-place deep foundations*, VCC-1705.9 *Helical pile foundations*, and VCC-1705.4.2 *Vertical masonry foundation elements*, as applicable, will apply when construction includes soil-related conditions or foundation systems. Where required, soils and foundations must also comply with VCC-1705.12 *Special inspections for seismic resistance*.

1101.2 Soils and foundations components. The following elements and components of soil-related conditions or foundation systems are subject to special inspection:

a- Shallow footings and foundations. Soils and building foundation components when any of the following conditions exist:

- **Problem soils.** The building footprint is located in a problem soils area, or as indicated by the county-approved geotechnical report; or
- **Compacted fill material or controlled low-strength material (CLSM).** The bearing material under the building footprint consists of compacted structural fill or controlled low-strength material, except when the bearing material is less than 1'-0" in total depth.

b- Deep foundations. Building foundation components for the following systems:

Pile foundations of all buildings.

Specialty piles and piers, including micropiles or other systems. The statement of special inspections shall specifically include the special inspections required.

Compacted aggregate piers.

Pier foundations of all buildings assigned to Seismic Design Category C. The statement of special inspections shall specifically include the special inspections required for the seismic-resisting elements.

c- Foundation bearing loads. Foundation materials, when an allowable load-bearing support capacity greater than 3,000 pounds per square foot is required by the building's foundation design or is specified by the responsible registered design professional.

1101.3 Geotechnical report and investigations. In problem soils areas, the geotechnical report as required by VCC-1803.2 *Geotechnical investigations, where required* and VCC-1803.6 *Reporting, reports* must be prepared, signed and sealed by the geotechnical engineer of record and shall be submitted to the Site Development and Inspection Division for approval prior to permit issuance. In non-problem soils areas, the geotechnical investigations and recommendations must be submitted to the Building Plan Review Branch for approval prior to permit issuance. After approval, one copy of the county-approved geotechnical report must be returned for use on the construction site. County-approved documents must be used by the special inspections engineer of record to conduct special inspections and tests during construction.

SECTION 1102 FABRICATION AND ERECTION DOCUMENTS

1102.1 Preparation of fabrication and erection documents. A registered design professional with experience in the design of deep foundation elements must prepare, sign and seal fabrication and erection documents for pile and pier foundations. Fabrication and erection documents for cast-in-place concrete shallow foundations must comply with Chapter 7.

1102.2 Review and approval. Prior to construction, the soils and foundations fabrication and erection documents must be submitted to the geotechnical engineer of record and the structural engineer of record, as appropriate, for approval. The general contractor must submit two sets of the geotechnical engineer of record/structural engineer of record-approved fabrication and erection documents to the Critical Structures/Building Inspections Section for approval. After approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1103 SPECIAL INSPECTIONS AND TESTS

Soils. The geotechnical engineer of record must conduct special inspection and material tests of soils in accordance with VCC-1705.6 *Soils*, VCC Table-1705.6 *Required Verification and Inspection of Soils* and VCC-1804 *Excavation, grading and fill*. Special inspection and material tests must be conducted to determine compliance with the county-approved geotechnical report and the county-approved construction documents, and must include:

- **Subgrade.** Subgrade must be specially inspected for compatibility of bearing material and ground water conditions with the county-approved geotechnical report, prior to construction of footings and slabs.
- **Fill material.** Fill material must be specially inspected for compliance with county-approved structural fill specifications prior to, during, and following its placement in each lift, for structural fill 1'-0" or greater in total depth. Fill material less than 1'-0" in total depth does not require special inspection, nor need it comply with an approved report, provided it complies with the provisions of VCC-1804.6 *Compacted fill material* for materials and compaction, unless otherwise specified.
- **Compaction.** Special inspection of the compaction process must be conducted to determine that materials' quality and in-place density tests comply with the county-approved specifications and geotechnical notes.
- **Controlled low-strength material.** Special inspection must be conducted to comply with the provisions of an approved report, in accordance with VCC-1804.7.

1103.2 Deep foundations. The geotechnical engineer of record must conduct special inspection of deep foundations to determine them in-place load-bearing capacity. Special inspection must include:

- **Driven deep foundations.** Special inspection as required by VCC-1705.7 *Driven deep foundations* and VCC-Table 1705.7 *Required verification and inspection of driven deep foundation elements*, and VCC-1705.8 *Cast-in-place deep foundations*, and VCC-Table 1705.8 *Required verification and inspection of cast-in-place deep foundation elements*, and VCC-1705.9 *Helical pile foundations*, and VCC-1810.4.10 *Micropiles*, and VCC-1810 *Deep foundations*, as appropriate. Special inspection must include inspection of piles before, during, and after driving. Inspection reports must contain an evaluation of

the pile capacity based on driving resistance, and dynamic or static pile testing. Pile driving records must be submitted to the Critical Structures/Building Inspections Section prior to placement of pile caps.

- **Cast-in-place deep foundations.** Special inspection and material tests as required by VCC-1705.8 *Cast-in-place deep foundations*, and VCC-Table 1705.8 *Required verification and inspection of cast-in-place deep foundation elements*, and VCC-1810.4.10 *Micropiles*, as appropriate. Special inspection and material tests must be as required by the statement of special inspections, including drilling operations, dimensions and lengths, concrete volumes, and additional inspections in accordance with VCC-1705.3 *Concrete construction*. Special inspection and material tests must include concrete strength, steel reinforcement, orientation and shape of caissons, and bearing capacity at the base of the caisson. Inspection reports must be submitted to the Critical Structures/Building Inspections Section prior to the placement of grade beams. Special inspection and material tests for micropiles shall include pile diameter and depth, grout testing, reinforcement, and grout placement.

1103.3 Shallow footings and foundations. The special inspections engineer of record or the geotechnical engineer of record must conduct special inspection and material tests of footings and foundation systems, including shallow foundations, foundation walls, mats and slabs. Special inspection and material tests of cast-in-place concrete must be conducted in accordance with Chapter 7, to include monitoring the placement of concrete, concrete reinforcement, and the dimensions, shapes and locations of footings, slabs, and foundation walls. Special inspection and material tests of masonry must be conducted in accordance with Chapter 10.

SECTION 1104 SOILS-RELATED DEVIATIONS AND REVISIONS

In the event that field conditions vary materially from the county-approved geotechnical construction documents, the special inspections engineer of record or the geotechnical engineer of record must notify the general contractor, and the requirements this section shall apply.

1101.1 Preparation of revisions. The geotechnical engineer of record must prepare, sign and seal revisions to the county-approved geotechnical construction documents if on-site soil or ground water conditions vary materially from those presumed to exist based on the initial subsurface exploration and as indicated in the county-approved geotechnical construction documents. The geotechnical engineer of record must coordinate revisions to the county-approved geotechnical construction documents and county-approved fabrication and erection documents with the structural engineer of record responsible for structural design of foundations, and a registered design professional responsible for deep foundations if applicable. The structural engineer of record, and the registered design professional responsible for deep foundations if applicable, must prepare, sign and seal revisions to the county-approved construction documents and county-approved fabrication and erection documents.

1104.2 County approval. Revisions to the county-approved geotechnical report, county-approved geotechnical construction documents, and county-approved fabrication and erection documents must bear the seal and signature of the appropriate registered design professionals and must be submitted to the Site Development and Inspection Division for construction in problem soils areas, or to the Building Plan Review Branch for construction in non-problem soils areas, as appropriate, for approval prior to continuation of construction. The Critical Structures/Building Inspections Section Inspector must determine if the construction can proceed, pending approvals by the Site Development and Inspection Division or the Building Plan Review Branch. After approval, one set of county-approved documents must be returned

for use on the construction site. County-approved documents must be used by the special inspections engineer of record to conduct special inspections and tests during construction.

SECTION 1105 COMPLETION OF SOILS AND FOUNDATIONS CONSTRUCTION

1105.1 Soils. Upon completion of soil-related special inspection, the geotechnical engineer of record may, after review by the structural engineer of record as applicable, submit a completion letter to the Critical Structures/Building Inspections Section.

1105.2 Deep foundations. Upon completion of all piling and caisson deep foundations, including specialty piling and piers, the geotechnical engineer of record may, after review by the structural engineer of record as applicable, submit a completion letter to the Critical Structures/Building Inspections Section.

1105.3 Shallow footings and foundations. Upon completion of structural special inspection and material tests of footings and foundations, the special inspections engineer of record or the geotechnical engineer of record, as applicable, may, after review by the structural engineer of record and the geotechnical engineer of record as applicable, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 12 EARTH RETENTION SYSTEMS

SECTION 1201 GENERAL

Scope. The requirements of this chapter must apply when construction includes earth retention systems or trenching operations, whether permanent or temporary. Earth retention systems include, but are not limited to:

- Building foundation walls.
- Retaining walls.
- Soldier piles and lagging, with or without tie-backs, post-tensioning or rock anchors.
- Soil nailing systems.
- Drilled piers or other structural means for stabilization of slopes.
- Sheet piling.
- Braced or shored walls.
- Tied-back walls.
- Slurry walls.
- Trench bracing.

Systems. The following earth retention systems are subject to special inspection:

- All earth retention systems retaining 10'-0" or more of unbalanced fill;
- When specified by the structural design, such as, but not limited to:
 - Segmental block retaining walls of any height, with geosynthetic restraints when designed as restrained walls rather than gravity walls.
 - Soldier piles and lagging of any height, with post-tensioned tie-backs.

Construction documents. Earth retention system construction documents, including the related design calculations, must be prepared, signed and sealed by a registered design professional experienced in the design of such systems. In addition to structural design, the construction documents must include the following:

Adjoining properties. Recommendations for protecting adjoining properties, including existing public and private streets.

Slope protection. Specification of responsibility for protecting all slopes throughout the course of the project in accordance with general practice.

Dewatering. Any requirements for dewatering of the excavation, as specified or assumed in the earth retention system design.

Installation. System installation criteria, including allowable inward movement, pile installation and tie-back criteria.

Special inspections. Special inspection and material test criteria for the earth retention system construction.

Earth retention system construction documents must be submitted to the Building Plan Review Branch for approval. Construction documents, including field inspection requirements, for earth retention systems which are to become a permanent part of the final structure must be approved by the structural engineer of record prior to submission to the Building Plan Review Branch. After county approval, one set of county-approved construction documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1202 FABRICATION AND ERECTION DOCUMENTS

Preparation of fabrication and erection documents. The registered design professional responsible for the construction documents must also prepare, sign and seal the fabrication and erection documents.

Review and approval. The earth retention system fabrication and erection documents must be submitted to the structural engineer of record and the geotechnical engineer of record, as appropriate, for approval. The general contractor must submit two sets of structural engineer of record/geotechnical engineer of record-approved fabrication and erection documents to the Critical Structures/Building Inspections Section for approval prior to construction. After county approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1203 SPECIAL INSPECTIONS AND TESTS

Special inspections. In problem soils areas, the geotechnical engineer of record must conduct special inspection and material tests of the earth retention system. In non-problem soils areas, either the geotechnical engineer of record or the special inspections engineer of record must conduct special inspection and material tests of the earth retention system.

Earth retention systems must have special inspection and material tests conducted for compliance with county-approved documents, including, but not limited to, the following:

Installation criteria and anchorage. Verification of pile-tip depth, tie-backs, post-tensioned anchorage, geosynthetic restraints, or other items as specified by the system design.

Compaction. Compaction process to determine that materials' quality and in-place density tests comply with the county-approved specifications and geotechnical notes.

Backfill, drainage and waterproofing. Backfill, foundation drainage systems, and waterproofing during and following their placement for compliance with county-approved backfill, foundation drainage systems, and waterproofing specifications.

Inspection reports. Inspection reports must be submitted to the appropriate registered design professionals and the Critical Structures/Building Inspections Section.

Deviations. Deviations from the county-approved earth retention system construction documents must be subject to approval by the appropriate registered design professionals, the Building Plan Review Branch and the Critical Structures/Building Inspections Section prior to work continuing in the affected area.

SECTION 1204 COMPLETION OF EARTH RETENTION SYSTEM CONSTRUCTION

At the completion of the earth retention system construction, the special inspections engineer of record may, after review by the appropriate registered design professionals, submit a completion letter to the Critical Structures/Building Inspections Section.

When the earth retention system is to become a permanent part of the final structure, the structural engineer of record must approve the completion letter, with such approval indicating that the system is acceptable as a structural element of the final structure, prior to submission to the Critical Structures/Building Inspections Section.

CHAPTER 13 EXTERIOR INSULATION AND FINISH SYSTEMS

SECTION 1301 GENERAL

Scope. The requirements of this chapter, and VCC-1705.16 *Exterior insulation and finish systems (EIFS)*, apply for all exterior insulation and finish systems (EIFS) applications.

Exceptions:

- EIFS installed over a water-resistive barrier with a means of draining moisture to the exterior (but when installed over a sheathing substrate, special inspection of the water-resistive barrier coating is required, in accordance with VCC-1705.16.1 *Water-resistive barrier coating*);
- EIFS installed over masonry or concrete walls.

Construction documents. Construction documents for the EIFS, including the related design calculations, must be prepared, signed and sealed by a registered design professional. The construction documents must include, but not be limited to, the following information and details:

- Copy of the EIFS research report.
- Design wind pressure on the EIFS and related calculations.
- Waterproofing and drainage provisions including weep holes and any limitations on EIFS or building materials, especially substrate and building framing, for prevention of moisture infiltration to building sheathing or framing.
- EIFS material types and thicknesses, including flame spread and smoke development ratings.
- Details consistent with intent of the research report and manufacturer's instructions for method of installation at all openings, corners and panel terminations.
- Location and configuration of control joints, weep holes, and flashing.
- Typical cross-sectional configuration showing all components of the wall. All building sheathing and framing materials in contact with the EIFS shall be dampproofed in accordance with VCC-1805.2 *Dampproofing required*. Wood shall also be naturally durable or preservative-treated in accordance with VCC-2304.12 *Protection against decay and termites* and VCC-2303.1.9 *Preservative-treated wood*.
- Typical wall configuration showing details of system penetrations.
- System installation criteria, including ambient temperature limitations.

Two sets of the EIFS construction documents must be submitted to the Building Plan Review Branch for approval. After county approval, the Building Plan Review Branch must retain one set of county-approved construction documents and return the others. One set of county-approved documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1302 FABRICATION AND ERECTION DOCUMENTS

1302.1 Preparation of fabrication and erection documents. The registered design professional responsible for preparation of the EIFS construction documents must also prepare, sign and seal the EIFS fabrication and erection documents. Information must include, but not be limited to:

- Reference to research report number and identification of EIFS manufacturer.
- EIFS manufacturer installation and application instructions.
- Layout and details for application of insulation boards.
- Details for control joints, flashing, weep holes, sealants and caulking.
- System installation criteria, including ambient temperature limitations.
- Criteria and timing for special inspection during construction.

1302.2 Review and approval. The architect of record and the structural engineer of record must approve the fabrication and erection documents for compliance with the architectural and structural design of the building and the county-approved construction documents. The general contractor must submit two sets of architect of record/structural engineer of record-approved EIFS fabrication and erection documents to the Critical Structures/Building Inspections Section for approval prior to EIFS elements' fabrication, erection or application, as appropriate. After approval, one set of county-approved fabrication and erection documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1303 SPECIAL INSPECTIONS AND TESTS

EIFS installation must be executed by trained applicators. All EIFS elements must be subject to special inspection during erection and application. The special inspections engineer of record must conduct special inspection of EIFS installations during erection for conformance with county-approved documents, including the information required by Sections 1301.2 and 1302.1, and as required by VCC-1705.16.1 *Water-resistive barrier coating*.

For EIFS systems otherwise exempted in accordance with Section 1301.1, when a water-resistive barrier coating is installed over a sheathing substrate, special inspection of the water-resistive barrier coating is required.

SECTION 1304 COMPLETION OF EIFS CONSTRUCTION

Upon completion of EIFS construction, the special inspections engineer of record may, after review by the architect of record and the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 14 SPRAYED FIRE-RESISTANT MATERIALS

SECTION 1401 GENERAL

1401.1 Scope. The requirements of this chapter, and VCC-1705.14 *Sprayed fire-resistant materials*, apply to all applications of sprayed fire-resistant materials used to provide required fire-resistance ratings for structural elements and decks. Sprayed fire-resistant materials must not be applied to building elements until all other required inspections of the building elements and connections have been conducted and approved. Sprayed fire-resistant materials must be inspected and approved prior to attachment of other elements of the building and re-inspected prior to concealment.

The special inspections engineer of record must conduct special inspection and material tests of sprayed fire-resistant materials, including:

- Preparation of structural member surfaces (substrates).
- Verification of substrate ambient temperatures.
- Ventilation requirements.
- Testing samples for:

- Condition of substrates
- Thickness
- Density
- Bond strength
- Condition of finished application

1401.2 Construction documents. Designs for sprayed fire-resistant materials must be listed in the Underwriters Laboratories, Inc. (UL) *Fire Resistance Directory* to provide the required fire-resistance rating for structural elements and decks. Structural elements must be classified as "thermally unrestrained" in accordance with the UL *Fire Resistance Directory* unless written certification by the structural engineer of record is provided to the Critical Structures/Building Inspections Section that the assembly meets "thermally restrained" criteria.

The fire-resistance designs must be designated on the county-approved construction documents. Copies of the UL listings must be provided on the construction site. After county approval, one set of county-approved construction documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1402 FABRICATION AND ERECTION DOCUMENTS

1402.1 Preparation of fabrication and erection documents. The sprayed fire-resistant material manufacturer's installation requirements and details, including specific UL listing information, must be included on the fabrication and erection documents. Unusual or special design features such as adhesives, overcoats, metal lath, netting, etc., and clips, standoffs or other devices necessary for attachment of other elements of the building must be specifically detailed.

1402.2 Review and approval. The fabrication and erection documents must be approved by both the architect of record and the structural engineer of record. The general contractor must submit two (2) sets of the architect of record/structural engineer of record-approved fabrication

and erection documents to the Critical Structures/Building Inspections Section for approval. After approval, one set of county-approved documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1403 SPECIAL INSPECTIONS AND TESTS

1403.1 Special Inspections. The special inspections engineer of record must conduct special inspection and material tests of sprayed fire-resistant materials to verify compliance with VCC- 1705.14 *Sprayed fire-resistant materials* and the following:

1403.1.1 Building elements and connections. In addition to other required inspections of the building elements and connections, inspections must include any unusual or unique design features or devices as shown on the county-approved fabrication and erection documents for sprayed fire-resistant materials. Sprayed fire-resistant materials must not be applied to building elements until all other required inspections of the building elements and connections that will be concealed have been conducted and approved. The sprayed fire-resistant materials must be applied to all surfaces and lengths of members such that the continuity of fire-resistance required by the county-approved fire-resistive designs is obtained.

1403.1.2 Sampling and testing.

- **Thickness.** Sampling and testing must be in accordance with VCC-1705.14.4 *Thickness* and ASTM E 605, at least four measurements for each 1,000 square feet of sprayed area for floors, roofs and walls in each story, and 25 percent of the structural members (beams, girders, trusses, pipe columns and columns) on each floor.
- **Density.** Sampling and testing must be in accordance with VCC-1705.14.5 *Density* and ASTM E 605, at least once for each 2,500 square feet of sprayed area in each story, and at least one sample of each type of structural member for each 2,500 square feet of floor area in each story
- **Bond strength.** Sampling and testing must be in accordance with VCC-1705.14.6 *Bond strength* and ASTM E 736, and VCC-403.2.4 *Sprayed fire-resistant materials (SFRM)*, at least once for each 2,500 square feet of sprayed area for floors, roofs and walls and at least one sample of each type of structural member per 2,500 square feet of floor area in each story. (When applied over a primed, painted or encapsulated surface, a qualification bond test for the coating must be performed first.) Required bond strength must be at least:

Low-rise buildings less than 75'-0" high: 150 pounds per square foot (psf);
 High-rise buildings 75'-0" - 420'-0" high: 430 pounds per square foot (psf);
 Super-tall buildings greater than 420'-0" high: 1,000 pounds per square foot.

1403.1.3 Attachment of other elements. Other building elements such as precast concrete spandrel panels, electrical conduits, mechanical ductwork or metal studs whose installation would interfere with the application of sprayed fire-resistant materials must not be installed until after approval of the sprayed fire-resistant materials. Sprayed fire-resistant materials must be inspected and approved before attachment of other elements of the building and must not be scraped off or removed to attach other building elements. Any damaged sprayed fire-resistant materials must be repaired. Prior to concealment, sprayed

fire-resistant materials must be re-inspected and approved after attachment of other elements of the building.

SECTION 1404 COMPLETION OF SPRAYED FIRE-RESISTANT MATERIALS

Upon completion of sprayed fire-resistant material construction, the special inspections engineer of record may, after review by the architect of record and the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 15 MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS

SECTION 1501 GENERAL

1501.1 Scope. The requirements of this chapter, and VCC-1705.15 *Mastic and intumescent fire-resistant coatings*, apply to all applications of mastic and intumescent fire-resistant coatings used to provide required fire-resistance ratings for structural elements and decks. Mastic and intumescent fire-resistant coatings must not be applied to building elements until all other required inspections of the building elements and connections have been conducted and approved. Mastic and intumescent fire-resistant coatings must be inspected and approved prior to attachment of other elements of the building and re-inspected prior to concealment.

The special inspections engineer of record must conduct special inspection and material tests of mastic and intumescent fire-resistant coatings, including preparation of structural member surfaces, verification of substrate ambient temperatures and ventilation requirements, and testing samples for thickness.

1501.2 Construction documents. Designs for mastic and intumescent fire-resistant coatings must be listed in the Underwriters Laboratories, Inc. (UL) *Fire Resistance Directory* to provide the required fire-resistance rating for structural elements and decks. Structural elements must be classified as "thermally unrestrained" in accordance with the UL *Fire Resistance Directory* unless written certification by the structural engineer of record is provided to the Critical Structures/Building Inspections Section that the assembly meets "thermally restrained" criteria.

The fire-resistance designs must be designated on the county-approved construction documents. The manufacturer's installation requirements and details, including coating thickness and unusual or special design features such as adhesives, overcoats, metal lath, netting, etc., and clips, standoffs or other devices necessary for attachment of other elements of the building must be specifically detailed.

After county approval, one set of county-approved construction documents must be returned for use on the construction site. Copies of the UL listings must be provided on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1502 SPECIAL INSPECTIONS AND TESTS

1502.1 Coatings. The special inspections engineer of record must conduct special inspection and material tests of mastic and intumescent fire-resistant coatings to verify compliance with VCC-1705.15 *Mastic and intumescent fire-resistant coatings* and the following:

1502.1.1 Building elements and connections. In addition to other required inspections of the building elements and connections, inspections must include any unusual or unique design features or devices as shown on the county-approved construction documents for mastic and intumescent fire-resistant coatings. Mastic and intumescent fire-resistant coatings must not be applied to building elements until all other required inspections of the building elements and connections that will be concealed have been conducted and approved. The mastic and intumescent fire-resistant coatings must be applied to all surfaces and lengths of members such that the continuity of fire-resistance required by the county-approved fire-resistive designs is obtained.

1502.1.2 Sampling and testing. Sampling and testing of mastic and intumescent fire-resistant coatings must be in accordance with AWCI 12-B.

1502.2.3 Attachment of other elements. Other building elements such as precast concrete spandrel panels, electrical conduits, mechanical ductwork or metal studs whose installation would interfere with the application of mastic and intumescent fire-resistant coatings must not be installed until after approval of the mastic and intumescent fire-resistant coatings. Mastic and intumescent fire-resistant coatings must be inspected and approved before attachment of other elements of the building and must not be scraped off or removed to attach other building elements. Any damaged mastic and intumescent fire-resistant coatings must be repaired. Prior to concealment, mastic and intumescent fire-resistant coatings must be re-inspected and approved after attachment of other elements of the building.

SECTION 1503 COMPLETION OF MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS

Upon completion of mastic and intumescent fire-resistant coatings, the special inspections engineer of record may, after review by the architect of record and the structural engineer of record, submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 16

SMOKE CONTROL SYSTEMS

SECTION 1601 GENERAL

1601.1 Scope. The requirements of this chapter, VCC-909 *Smoke control systems*, VCC-909.18.8 *Testing for smoke control*, and VCC-1705.18 *Special inspection for smoke control*, shall apply for all smoke control systems.

Please refer to *Guidelines for Smoke Control Manual* for all design, commission and additional testing requirements. Where conflict occurs, SIP shall take precedence. The *Guidelines for Smoke Control Manual* can be found at <https://www.fairfaxcounty.gov/fire-ems/fire-marshal/plans-review>. If you have questions with regards to this Manual, please call Fairfax County Fire Marshal Office, Engineering Plans Review Division at 703-246-4806 or email fire.engplansreview@fairfaxcounty.gov.

SECTION 1602 FABRICATION AND ERECTION DOCUMENTS

1602.1 Preparation of fabrication and erection documents A registered design professional with experience in the design of smoke control systems shall prepare, sign and seal fabrication and erection documents for the smoke control system. In accordance with VCC-909 *Smoke control systems*, the fabrication and erection documents shall include, but are not limited to, the following information (see also Section 1603.2 below):

- Design method, calculations and analysis (see VCC-909.4 *Analysis*).
- System components, elements and details.
- Scope, extent, procedures and methods for special inspection and tests. The design shall clearly identify the procedures and methods to be used to verify the proper commissioning of the smoke control system in its final installed condition (see VCC-909.3 *Special inspection and test requirements*).

A set of fabrication and erection documents shall be submitted along with the construction documents during the application for building permit. Fire Marshal Office, fire reviewers will review and approve the documents in compliance with *Guidelines for Smoke Control Manual*. The original seal and signature of the responsible registered design professional is required on the smoke control documents. After county approval, the approved construction documents shall be returned for use on the construction site. The special inspections engineer of record for smoke control systems shall use county-approved documents to conduct special inspections and tests during construction.

SECTION 1603 SPECIAL INSPECTIONS AND TESTS

1603.1 Special inspector. As required by VCC-1705.18.2 *Qualifications*, special inspection and tests for smoke control systems shall be conducted by qualified individuals, agencies or firms with expertise in fire protection engineering, mechanical engineering and certification as air balancers. The special inspections engineer of record for smoke control systems shall be approved by the Fire Marshal Office, Engineering Plans Review Division, on behalf of the Building Official. The special inspections engineer of record for smoke control systems might be different from the special inspections engineer of record for other special inspections. The special inspector engineer is named in the fabrication and erection documents and is approved during the construction document review.

1603.2 Special inspections. The special inspections engineer of record for smoke control systems shall conduct special inspections and tests shall as required by this section, Smoke Control Manual, and VCC-1705.18.1 *Testing scope*. Special inspections and tests shall be conducted during erection of ductwork and prior to concealment, and after completion and prior to occupancy.

a. Special inspections. Special inspection of smoke control systems shall assess, document and verify the following systems and elements:

- Automatic dampers
- Control air tubing and direct digital control wiring
- Control diagrams and sequences
- Fan belts
- Exhaust fan components.
- Power: normal and standby

b. Tests. Tests of smoke control systems shall document and verify the adequate performance of:

- Control elements and sequences.
- Control air tubing and direct digital control wiring.
- Control devices.
- Dampers.
- Detection devices and their tolerances.
- Doors.
- Ducts and shafts.
- Fans.
- Inlets and outlets, including sizes and positions.
- Pressurized stair enclosures.
- Smoke zone or area boundary elements and barriers.
- Response times.
- Leakage of boundary or barrier elements, including doors and partitions.
- Power: normal and standby.

All special inspection and test results, including rejections and subsequent follow-up retests and corrective actions, shall be recorded and form part of the final report. Final reports shall verify compliance with all portions of VCC-909.18 *Acceptance testing*, VCC-909.19 *System acceptance* and VCC-909.20 *Smokeproof enclosures*, as applicable.

SECTION 1604 COMPLETION OF SMOKE CONTROL SYSTEMS

Upon completion of smoke control systems, the special inspections engineer of record for smoke control systems shall prepare a complete final report of testing (see VCC-909.18.8.3 *Reports*) for review by the registered design professional responsible for smoke control system design. After approval, the registered design professional shall sign and seal the final report, for submittal to Fairfax County Fire Marshal Office, Engineering Plans Review Division at fire.engplansreview@fairfaxcounty.gov for review and approval. Fire Marshal Office will notify LDS Special Inspections Division of such results. In addition, a permanent copy of the final report shall be maintained in an approved location in the building, in accordance with VCC-909.18.8.3.1 *Report filing*.

CHAPTER 17 MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS

SECTION 1701 GENERAL

1701.1 Scope. Mechanical, electrical and plumbing components in buildings assigned to Seismic Design Category C must be specially inspected and tested for seismic resistance, in accordance with VCC-1705.12.6 *Mechanical and electrical components*, and as required by the component-specific information included in the county-approved construction documents and the statement of special inspections.

The information to be included in the statement of special inspections must be prepared by a registered design professional and shall specify the type and frequency of special inspections and testing (see Section 1702 below).

All manufacturers involved must submit a certificate of compliance and manufacturer installation instructions to the general contractor for approval by the architect of record. The general contractor must submit two (2) sets of the architect of record-approved certificate of compliance and manufacturer installation instructions to the Critical Structures/Building Inspections Section for approval. After approval, one set of county-approved documents must be returned for use on the construction site. The special inspections engineer of record must use county-approved documents to conduct special inspections and tests during construction.

SECTION 1702 SPECIAL INSPECTIONS AND TESTS

Pursuant to VCC-1705.12.6 *Mechanical and electrical components*, periodic special inspections are required for mechanical, electrical and piping components during their installation and anchorage. The special inspector must verify that the label, anchorage or mounting conforms to the certificate of compliance, manufacturer installation instructions and county-approved construction documents.

For buildings in Seismic Design Category C, periodic special inspections are required for:

- Anchorage of electrical equipment for emergency or standby power systems;
- Piping systems intended to carry hazardous materials;
- HVAC ductwork systems intended to carry hazardous materials;
- Vibration isolation systems with small clearances.

For buildings in Seismic Design Category E or F, periodic special inspections are required for:

- Anchorage of electrical equipment for other than emergency or standby power system

SECTION 1703 COMPLETION OF MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS

Upon completion of mechanical, electrical and plumbing components, the special inspections engineer of record may submit a completion letter to the Critical Structures/Building Inspections Section.

CHAPTER 18 MISCELLANEOUS

The requirements of this chapter and VCC Chapter 33 *Safeguards during construction* shall apply to all construction sites.

SECTION 1801 SAFEGUARDS

1801.1 Materials and equipment. The general contractor is responsible for safe storage and placement of materials and equipment, as required by VCC-3301.2 *Storage and placement*. See also Section 1806.2.

1801.2 Occupied buildings. Means of egress from occupied buildings must be maintained at all times, must not be blocked, and must not pass through construction areas. In the event that existing exits are proposed to be blocked by construction, alternative exits must be provided or constructed in advance and approved by the Critical Structures/Building Inspections Section and by the Inspections Section, Fire Prevention Division. Occupied buildings undergoing remodeling or additions must also comply with the requirements of VCC-3302 *Construction safeguards*. Fire protection devices and equipment must be maintained at all times throughout the building. See Sections 1805 and 1806.

1801.3 Fencing, construction railings, barriers and covered walkways. The general contractor must install construction site fencing, construction railings, barriers and covered walkways for protection of the public, in accordance with this section and VCC-3306 *Protection of pedestrians*, prior to the excavation for footings or underground utilities, and continuing for the duration of the construction project. Impact barricades required for projects located near a public use roadway must be installed in accordance with the Virginia Department of Transportation regulations. Upon written request by the general contractor, the criteria outlined below may be modified by the Critical Structures/Building Inspections Section when a natural barricade surrounding a construction site exists. The special inspections engineer of record must notify the Critical Structures/Building Inspections Section if protection is not installed or maintained.

1801.3.1 Site fencing. Every construction site must be enclosed with a non-climbable fence not less than 6'-0" high. The general contractor must have the option of fencing the total perimeter of a construction site or an area within a minimum of 20'-0" away from the structure. Fencing must be maintained until the building can be secured against entry and the exterior site is free of hazards.

1801.3.2 Construction railings, barriers and covered walkways. Covered walkways, construction railings and barriers must be of noncombustible or fire-retardant treated materials and must comply with VCC-3306 *Protection of pedestrians* and VCC-Table 3306.1 *Protection of pedestrians*, except that construction railings or barriers located outside the building may be of any approved material.

Construction railings must be 3'-6" high. Covered walkways must be as wide as required for corridors or exits, or at least 4'-0" wide, whichever is greater, and shall include necessary illumination. See VCC-3306.7 *Covered walkways* for construction criteria. Barriers, when required by VCC-Table 3306.1 *Protection of pedestrians*, must comply with VCC-3306.5 *Barriers* and VCC-3306.6 *Barrier design*. The general contractor must submit designs for barriers and covered walkways to the Critical Structures/Building Inspections Section for approval.

SECTION 1802 ON-SITE CONCRETE BATCH PLANTS

The requirements of this section, ASTM C 94 and ASTM C 685 apply whenever a concrete batch plant is erected on-site. Prior to the manufacture of concrete, the special inspections engineer of record must inspect the concrete batch plant site and batch plant and state in writing that:

- The scales are accurate.
- The batch plant can produce concrete in compliance with ACI 318 26.4, and the batch plant complies with requirements of ASTM C 94 and ASTM C 685.
- Access roads are at least 20'-0" wide, located such that delivery trucks will not contaminate stock piles. Mud mats are large enough to prevent stock pile contamination.
- Barricades and warning devices are installed to prevent workers from entering the working radius of the scraper boom. Stock piles are separated by walls having a 45-degree minimum angle from the leading edge of the stock pile and extending to the outside perimeter of the boom radius.

SECTION 1803 VIRGINIA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

The general contractor must ensure that the construction site is safe and in compliance with all applicable Virginia Occupational Safety and Health Administration regulations. A copy of the *Virginia Occupational Safety and Health Standards for the Construction Industry* (29 CFR Part 1926) must be available on the construction site at all times.

SECTION 1804 TOWER CRANES, PERSONNEL HOISTS, MATERIAL HOISTS AND CONSTRUCTION ELEVATORS

1804.1 General.

Scope. The requirements of this section apply whenever a tower crane, personnel hoist, material hoist, or construction elevator (herein called "equipment") is to be erected onsite, whether free-standing or attached to the building under construction. Documents must include the crane or hoist location and crane boom swing. The general contractor and suppliers of tower cranes, personnel hoists, material hoists, and construction elevators are responsible for the safe construction, installation and use of the crane, hoist or elevator. The structural engineer of record is responsible for the structural design strength of the building to support the loads imposed on it by the crane, hoist or elevator. Crane booms must not swing over public streets without special approval by the Critical Structures/Building Inspections Section.

Permit requirements.

- Tower Crane: An electrical permit is required. A building permit for the crane and its foundation is recommended (but not required).
- Personnel hoist, material hoist or construction elevator:
 - An elevator (mechanical) permit is required
 - An electrical permit is required

1804.2 Documents.

Construction documents and fabrication and erection documents for the crane, hoist or elevator and its foundation must be prepared by registered design professionals. Prior to the placement of the crane foundation, the general contractor or the owner or contractor for the crane must submit one record copy of the following information to the Critical Structures/Building Inspections Section:

Crane specifications. Specifications for cranes must include manufacturer's operating model number, hook height, boom length, and manufacturer's specifications relative to overturn moment, slewing moment, vertical load (minimum and maximum), shear per bolt group, uplift per bolt group, compression per corner and horizontal shear (minimum and maximum). Fabrication and erection documents must include the crane location and crane boom swing.

Crane Foundations. Fabrication and erection documents must include structural calculations and design of equipment foundations. Plans and calculations must clearly indicate footing dimensions, required compressive strength of concrete, steel reinforcement, and allowable soil bearing pressure. The allowable soil bearing pressure must be consistent with values shown in the soil test report for the project prepared by the geotechnical engineer of record. Concrete mix design, and steel reinforcement, must be reviewed and approved by a registered design professional responsible for design of equipment foundations.

Cranes within or attached to the structure. For cranes located within or supported by the structure, the fabrication and erection documents must indicate the size and location of slab openings, method of support or attachment of the crane, hoist or elevator, service loads to be delivered to or imposed on the structure, and the inspections required. Such documents must be reviewed and approved by the structural engineer of record.

1804.3 Inspections.

1804.3.1 Foundations. The special inspections engineer of record must conduct foundation inspections in accordance with Chapters 7 and 11, including special inspections for soil bearing capacity, footing construction, and concrete tests. Upon completion of the foundation the special inspections engineer of record must, after review by the appropriate registered design professionals, submit a completion letter to the Critical Structures/Building Inspections Section.

1804.3.2 Crane.

Components. Prior to assembly, the crane components must be inspected for structural defects by the crane manufacturer or a registered design professional.

Assembly. The crane must be assembled according to the manufacturers Specifications. All bolts must be secured in accordance with manufacturer's project specifications and must be inspected by the general contractor at erection, 30 days after erection, and every 90 days thereafter.

1804.3.3 Electrical and Elevator inspection. An inspection by a Fairfax County Electrical Inspector must be conducted and approved. Material hoists, personnel hoists and construction elevators must also be inspected and approved by a Fairfax County Elevator Inspector prior to use.

1804.3.4 Critical Structures/Building Inspections Section approval for Crane prior to use. The General contractor must, after review by the appropriate registered design professionals, submit a letter of completion of installation to the Critical Structures/Building Inspections Section for approval. The Critical Structures/Building Inspections Section approval is required prior to use of the crane.

1804.4 Safety rules and regulations. The Critical Structures/Building Inspections Section can require a load test for a crane at any time. Virginia Occupational Health and Safety Administration regulations also apply for Cranes and derricks (Subpart N), Material Hoists, Personnel Hoists and Elevators (Subpart N), and Concrete and Masonry Construction (Subpart Q).

SECTION 1805 FIRE PROTECTION

1805.1 Fire extinguishers. The general contractor is responsible for installing and maintaining portable fire extinguishers during construction, at each floor level, in storage sheds, and wherever flammable or combustible materials are used or stored, as required by VCC-3309 *Fire extinguishers*.

1805.2 Standpipes. In buildings four stories or more in height, the general contractor is responsible for installing and maintaining standpipes during construction as required by VCC-3311 *Standpipes*. Standpipes must be installed during construction as the work of the building progresses, beginning at 40'-0" in height. Standpipes must be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring and must be installed and ready for use as each floor progresses. Free access from the street to such standpipes must be maintained at all times. Materials must not be stored within 5'0" of any fire hydrant or in the roadway between such hydrant and the center line of the street. Failure to comply with this section will result in the immediate stop of all work on the project until such time as the standpipes are properly placed.

1805.3 Fire suppression system. Sprinkler systems must comply with Section 1706.3 and VCC-3312 *Automatic sprinkler system*. Sprinkler systems shall be tested and approved by the Fire Prevention Division prior to occupancy of any portion of the building. Sprinkler control valves shall only be operated by authorized personnel after due notification to the Fire Prevention Division.

SECTION 1806 FIRE PROTECTION AND SAFETY REQUIREMENTS FOR PARTIALLY OCCUPIED BUILDINGS

1806.1 General. The existing fire protection, egress paths, and fire-resistant construction protection required for occupied areas must be maintained at all times while ongoing construction in unoccupied areas is in progress.

1806.2 Material storage.

Noncombustible storage, area limitations. Noncombustible materials are those that do not support combustion and are not readily ignitable. Examples of noncombustible

materials are: drywall; metal studs, fire retardant lumber; metal doors; solid core wood doors, including packaging aids without voids; sheet metal ducts; masonry; noncombustible insulation; plumbing fixtures; light fixtures wrapped in tight plastic; and other materials of similar characteristics.

Noncombustible storage may be unlimited in area; however, the weight of material stored must not exceed the structural design capacity of the floor.

Combustible storage, area limitations. Combustible materials are those that readily support combustion or are readily ignitable. Examples of combustible materials are: hollow core wood doors; wood studs, paneling and other wood products; carpet and padding; vinyl core trim and base; insulation with combustible vapor facing; noncombustible products wrapped in large quantities of combustible packaging or storage aids, and other materials of similar characteristics.

Combustible storage must be limited to 2,500 cubic feet or 10 percent of the floor area, whichever is smaller; however, the weight of material stored must not exceed the structural design capacity of the floor. The owner is responsible for obtaining a Fire Prevention Code Permit for combustible storage exceeding these limitations pursuant to the Virginia Statewide Fire Prevention Code. Combustible storage areas located on an occupied floor must be separated from the occupied areas by one-hour fire-resistance rated fire partitions.

- a. **Storage arrangement.** Stored materials must be arranged in neat piles with the floor kept broom clean and free of construction debris. Egress aisles must be maintained. Storage must be kept a minimum of 2'-0" below ceilings, sprinkler heads, or the lowest member of the floor/ceiling or roof/ceiling assembly.

1806.3 Fire suppression system requirements. Sprinkler systems must comply with this section and VCC-3312 *Automatic sprinkler system*. In fully sprinkler-protected buildings, sprinkler protection must be operational at all times throughout the entire building, including areas under construction (see Section 1707.2.1 for additional information).

Sprinkler heads that are or will be installed within 1'-0" of the floor/roof above must be installed in either the upright position with upright heads, or the pendant position with pendant heads. If the ceiling or ceiling grid is in place, the sprinkler heads must be installed in the pendant position, with pendant heads.

Sprinkler heads that are or will be installed at a ceiling line located lower than 1'-0" below the floor/roof above must be installed either in the upright position and turned up to within 1'-0" of the floor/roof above with upright heads, or in the pendant position with pendant heads at the ceiling line. In the pendant position, the entire ceiling must be constructed, or the ceiling grid with all ceiling tiles must be in place. If the entire ceiling is not constructed, or the ceiling grid does not have all ceiling tiles in place, then in lieu of standard response sprinkler heads, the use of commercial, rapid or quick response sprinkler heads, with at least a 2'-0" x 2'-0" ceiling tile suspended at each sprinkler head to act as a heat trap, will be subject to approval by the Fire Prevention Division. Such rapid or quick response sprinkler heads may later remain as part of the permanent sprinkler system.

Where, in the opinion of the Critical Structures/Building Inspections Section or the Fire Prevention Division, the type or quantity of combustible storage exceeds the limitations of the existing sprinkler system design, the sprinkler system in those areas must be modified to conform with the fire hazard posed by the combustible storage.

1806.4 Special cases. The criteria for fire prevention measures set forth in this section cover the majority of field conditions. It is conceivable that individual situations may arise which must be evaluated for compliance on a case by case basis.

1807 OCCUPANCY REQUIREMENTS FOR NEW BUILDINGS AND ALTERATIONS TO EXISTING BUILDINGS

The requirements of this section apply for all nonresidential commercial construction projects of Groups A (assembly), B (business), E (educational), F (factory), H (high-hazard), I (institutional), M (mercantile), S (storage) and U (utility, miscellaneous), and for all residential construction projects of Groups R-1 (hotels, motels) and R-2 (multi-family residential dwelling units). A "building" is identified by a unique street address.

It is the responsibility of the owner to obtain a certificate of occupancy for a building shell prior to any tenant occupancies. It is the responsibility of building "tenants" to file for and obtain a certificate of occupancy for individual tenant spaces prior to occupancy. For purposes of this section, the terms "tenant space," "tenant occupancy," etc., refer to all space and occupancy, whether occupied by a tenant or an owner.

1807.1 Certificate of occupancy. A certificate of occupancy (also called a Non-RUP) is required prior to initial use or occupancy, or a change in use or occupancy, of a building or tenant space. The certificate of occupancy is issued by the Zoning Administration Division, Department of Planning and Zoning.

A new certificate of occupancy is required for:

- A new building or tenant space
- Change of Group classification of a building or tenant space
- Increase or decrease in gross floor area of a building or tenant space
- Change in owner or tenant name or proprietorship of a building or tenant space

For a new Group R-2 building, a certificate of occupancy is not issued for the building shell upon its completion, but final inspection approvals may serve as a certificate of completion for the shell building. Individual Residential Use Permits (also called RUPs) are subsequently issued for each dwelling unit ("tenant space") upon its final inspection approval.

In renovations of an existing building or an existing tenant space having a valid certificate of occupancy, final inspection approvals may serve as the revised certificate of occupancy, and a new certificate of occupancy is not required.

1807.2 Procedural requirements.

1807.2.1 Building core and shell completion. The following building components, fire protection systems and life safety features must be completed:

- Exit stairs
- Grade level exits, lobbies, corridors and passageways
- Required exit lights and emergency lighting
- Elevator shaft enclosures
- Elevators and elevator emergency recall system (at least one elevator must be approved and operational in high-rise buildings), or elevators will be locked out of service

- Required fireproofing of structural members in the core and occupied areas
- Firestopping of wiring, piping and other penetrations, both vertical and horizontal, in floors, ceilings and walls
- Sprinkler systems and fire suppression systems - building core and shell (see Section 1706.3 for further information)
- Fire alarm systems - building core and shell
- Special locking devices - building core and shell
- Material storage areas complying with Section 1806.2
- Removal of combustible trash and construction debris

All sprinklers, standpipes, alarms, signaling systems and other required fire suppression or firefighting systems must be activated throughout the entire structure prior to building shell certificate of occupancy. Under no conditions may any fire suppression or firefighting system be shut off in any occupied area, unless the valve or other activation control mechanism is continuously manned, during the period the system is shut off. If this provision is deemed unworkable, any work must be done after normal business hours.

Subject to prior approval by the Fire Prevention Division and by the Critical Structures/Building Inspections Section, a fire watch must be instituted during the time any fire suppression or firefighting system is out of service, with the number of persons required for fire watch such that the entire building, must be checked every hour, except residential buildings of Group R, educational buildings of Group E and institutional buildings of Group I must be checked every half hour. The general contractor must submit a written record of fire watch activities to the Fire Prevention Division. The general contractor must also notify the Fairfax County Emergency Operations Center when any fire suppression or firefighting system is placed out of service.

1807.2.2 Building core and shell final inspections. A certificate of occupancy for a building shell may be obtained after building core and shell final inspections are approved by the appropriate Fairfax County organizations:

- For buildings subject to special inspections, the final report of special inspections - by Critical Structures/Building Inspections Section.
- Electrical systems final - building core and shell - by Electrical Inspections Section.
- Mechanical systems final - building core and shell - by Mechanical Inspections Section.
- Plumbing systems, including cross connection, final - building core and shell - by Plumbing Inspections Section.
- Elevators final - by Mechanical Inspections Section.
- Sprinkler system and fire suppression system finals - building core and shell - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Fire alarm system final - building core and shell - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Special locking devices final - building core and shell - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Fire lanes final - by Inspections Section, Fire Prevention Division.
- Fuel storage tanks final - by Inspections Section, Fire Prevention Division.
- Health systems final - building core and shell - by Department of Health Services (as applicable, for health spas, food establishments, medical buildings, swimming pools, commercial kitchens, etc.).

All the above final inspections are required prior to:

- Occupancy - building core and shell - by Inspections Section, Fire Prevention Division. For Groups A, E, H, I or R-1, the owner must request this inspection prior to applying for the certificate of occupancy (either before or after the building final inspection).
- Building final - building core and shell - by the Critical Structures/Building Inspections Section.
- Site work final - by Site Development and Inspection Division.

After all the above items are satisfied, application may be made for the building core and shell certificate of occupancy by submitting the building final, fire occupancy (if applicable), and site work final approvals (see Section 1707.1 above).

After occupancy:

Occupancy - building core and shell - by Inspections Section, Fire Prevention Division.

For Groups B, F, M, S or U, the owner must request this inspection within five working days after the certificate of occupancy.

Occupant load postings - by the Critical Structures/Building Inspections Section. The owner must request occupant load posting documents for common area rooms of assembly with an occupant load of 50 or more, and as otherwise required by the *Virginia Construction Code*.

1807.2.3 Tenant space final inspections. The certificate of occupancy for a building core and shell is required prior to a certificate of occupancy for any tenant space in a building. A certificate of occupancy for a tenant space may be obtained after tenant space final inspections are approved by the appropriate Fairfax County organizations:

- For tenant spaces subject to special inspections, the final report of special inspections - by Critical Structures/Building Inspections Section.
- Electrical systems final - tenant space - by Electrical Inspections Section.
- Mechanical systems final - tenant space - by Mechanical Inspections Section.
- Plumbing systems, including cross connections, final - tenant space - by Plumbing Inspections Section.
- Elevators final - tenant space - by Mechanical Inspections Section.
- Sprinkler system and fire suppression system finals - tenant space - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Fire alarm system final - tenant space - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Special locking devices final - tenant space - by Fire Protection Systems Testing Section, Fire Prevention Division.
- Health systems final - tenant space - by Department of Health Services (as applicable, for health spas, food establishments, medical buildings, swimming pools, commercial kitchens, etc.).

All the above final inspections are required prior to:

Occupancy - tenant space - by Inspections Section, Fire Prevention Division. For Groups A, E, H, I or R-1, the owner or tenant must request this inspection prior to applying for the certificate of occupancy (either before or after the building final inspection).

Building final - tenant space - by the Critical Structures/Building Inspections Section.

After all the above items are satisfied, application may be made for the tenant space certificate of occupancy by submitting the building final, and fire occupancy (if applicable) approvals (see Section 1807.1 above).

After occupancy:

Occupancy - tenant space - by Inspections Section, Fire Prevention Division. For Groups B, F, M, S or U, the owner or tenant must request this inspection within five working days after the certificate of occupancy.

Occupant load postings - by the Critical Structures/Building Inspections Section. The owner or tenant must request occupant load posting documents for rooms of assembly with an occupant load of 50 or more, and as otherwise required by the *Virginia Construction Code*.

APPENDIX A ARCHITECTS/ENGINEERS SEALED DESIGNS

The *Code of Virginia* § 54.1-402 requires that buildings which meet the specific criteria in these charts are to be designed by registered design professionals, with an Architect/Engineer (A/E) seal on the documents.

§ 54.1-402 CHART A - GENERAL DESIGN

A proposed structure classified within any of the categories marked "Yes" requires an A/E seal on the documents. See Charts B and C for electrical and mechanical/plumbing systems.

Group	Description	Area (ft ²)			Height (Stories)	
		5,000 or less	5,001 - 15,000	Over 15,000	3 or less	Over 3
A ¹	Assembly	Yes	Yes	Yes	Yes	Yes
B	Business	—	Yes	Yes	—	Yes
E	Educational (schools & day care centers)	Yes	Yes	Yes	Yes	Yes
F	Factory & Industrial	—	—	Yes	—	Yes
H	High Hazard	Yes	Yes	Yes	Yes	Yes
I	Institutional	Yes	Yes	Yes	Yes	Yes
M	Mercantile	—	Yes	Yes	—	Yes
R-1	Hotel, Motel & Dormitory	Yes	Yes	Yes	Yes	Yes
R-2 ⁷	Multi-Family Residential	—	—	Yes	Yes	Yes
R-3	1 & 2 Family Attached	—	—	Yes	—	Yes
R-4	Assisted Living	—	—	Yes	—	Yes
R-5	1 & 2 Family Detached	—	—	Yes	—	Yes
S	Storage (Non-Farm)	—	—	Yes	—	Yes
U	Utility & Miscellaneous	—	—	Yes	—	Yes
All	Interior Design	See Note 4.				

Notes:

1. Churches are exempt if building does not exceed 5,000 ft² or three stories, and the occupant load does not exceed 100.
2. A local building official may require an A/E seal even if not required by this chart.
3. Where an A/E seal is not present, the plans must be signed by the individual (not company) responsible for the design, including the individual's occupation and address.
4. Additions, remodeling or interior design defined under § 54.1-400 of the *Code of Virginia* might not require an A/E seal. For construction, additions or remodeling resulting in a change in occupancy, occupancy load, modification of the structural system, change in access or egress, or increase in fire hazard an A/E seal is required in accordance with § 54.1-400, although Notes 1 and 2 still apply.
5. Any unique design of structural elements for floors, walls, roofs or foundations requires an A/E seal, regardless of whether or not the remainder of the plans requires such certification.
6. Buildings, structures, or electrical and mechanical installations which are not otherwise exempted but which are of standard design, provided they bear the certification of a professional engineer or architect registered or licensed in another state, and provided that the design is adapted for the specific location and conformity with local codes, ordinances and regulations, and is so certified by a professional engineer or architect licensed in Virginia may not require an A/E seal. One exit and three stories or less Group R-2 buildings would normally be exempted from an A/E seal except where required by Note 2. Most other three stories or less Group R-2.

§ 54.1-402 CHART B - ELECTRICAL DESIGN

A proposed electrical system classified within any of the categories marked "Yes" requires an A/E seal on the documents. Those NOT marked "Yes" may not require an A/E seal only if designed by a licensed master electrician or Class A electrical contractor (see Notes 2 and 3). See Charts A and C for general design and mechanical/plumbing systems.

Group	Description	Height (Stories)		Occupant Load		Volts		Amps	
		3 or less	Over 3	100 or less	Over 100	600 or less	Over 600	800 or less	Over 800
A-1	Theaters	—	Yes	—	Yes	—	Yes	—	Yes
A-2	Restaurants, Nightclubs	—	Yes	—	—	—	Yes	—	Yes
A-3	Dance Halls, Churches	—	Yes	—	—	—	Yes	—	Yes
A-5	Grandstands, etc.	—	Yes	—	—	—	Yes	—	Yes
B	Business	—	Yes	—	—	—	Yes	—	Yes
E	Schools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F	Factory & Industry	—	Yes	—	—	—	Yes	—	Yes
H	High Hazard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
I	Institutional (I-1, I-2 & I-3)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
I-4	Day care/Nurseries	—	Yes	—	Yes	—	Yes	—	Yes
M	Mercantile	—	Yes	—	—	—	Yes	—	Yes
R	Residential	—	Yes	—	Yes	—	Yes	—	Yes
S	Storage	—	Yes	—	—	—	Yes	—	Yes
U	Utility & Miscellaneous	—	Yes	—	—	—	Yes	—	Yes

Notes:

1. A local building official may require an A/E seal for electrical work even if not required by this chart.
2. Where an A/E seal is not present, the plans must be signed by the individual (not company) responsible for the design, including the individual's occupation and address.
3. The above chart applies both to new construction and to additions or remodeling.
4. The exemption for electrical contractors and electricians is applicable only when both design and installation are under their direction or control.

§ 54.1-402 CHART C - PLUMBING & MECHANICAL DESIGN

A proposed plumbing or mechanical system classified within any of the categories marked "Yes" requires an A/E seal on the documents. Those NOT marked "Yes" may not require an A/E seal only if designed by a person licensed as a master plumber, master mechanical worker, or Class A contractor in those specialties by written examination (see Notes 3 and 5). See Charts A and B for general design and electrical systems.

Group	Description	Height (Stories)		Occupant Load		Threshold Level ¹	
		3 or less	Over 3	100 or less	Over 100	Below	Above
A-1	Theaters	—	Yes	—	Yes	—	Yes
A-2	Restaurants, Nightclubs	—	Yes	—	—	—	Yes
A-3	Dance Halls, Churches	—	Yes	—	—	—	Yes
A-5	Grandstands, etc.	—	Yes	—	—	—	Yes
B	Business	—	Yes	—	—	—	Yes
E	Schools	Yes	Yes	Yes	Yes	Yes	Yes
F	Factory & Industry	—	Yes	—	—	—	Yes
H	High Hazard	Yes	Yes	Yes	Yes	Yes	Yes
I	Institutional (I-1, I-2 & I-3)	Yes	Yes	Yes	Yes	Yes	Yes
I-4	Day care/Nurseries	—	Yes	—	—	—	Yes
M	Mercantile	—	Yes	—	—	—	Yes
R	Residential	—	Yes	—	Yes	—	Yes
S	Storage	—	Yes	—	—	—	Yes
U	Utility & Miscellaneous	—	Yes	—	—	—	Yes

Notes:

1. The "Threshold Level" is defined in the law as "Plumbing and mechanical systems using packaged mechanical equipment, such as equipment of cataloged standard design which has been coordinated and tested by the manufacturer, which comply with all applicable codes. These mechanical systems shall not exceed gauge pressures of 125 psi, other than refrigeration, or temperatures other than flue gas of 300°F...."
2. A local building official may require an A/E seal for plumbing and mechanical systems even if not required by this chart.
3. Where an A/E seal is not present, the plans must be signed by the individual (not company) responsible for the design, including the individual's occupation and address.
4. The above chart applies to both new construction and to additions or remodeling.
5. The exemptions for plumbers, HVAC workers, and mechanical contractors are applicable only when both design and installation are under their direction or control.

APPENDIX B

CHAPTER N QUALITY CONTROL AND QUALITY ASSURANCE

This chapter on quality control and quality assurance does not address a number of applications associated with structural steel. The following is a list of references that may help with quality control and quality assurance for some of these items:

- (1) Steel (open web) joists and joist girders—Each model specification of the Steel Joist Institute contains a section on quality.
- (2) Concrete reinforcing bars, concrete materials, or placement of concrete for composite members—ACI 318 and ACI 318M (ACI, 2014).
- (3) Surface preparations for painting or coatings—SSPC Painting Manual, Volumes 1 and 2 (SSPC, 2002, 2012).

N1. GENERAL PROVISIONS

This chapter provides minimum requirements for quality control (QC), quality assurance (QA) and nondestructive testing (NDT) for structural steel systems for buildings and other structures. Chapter N also addresses the inspection of field installed shear stud connectors of composite slab construction that are frequently within the scope of the fabricator and/or erector. The inspection requirements for the other elements of composite construction, such as concrete, formwork, reinforcement, and the related dimensional tolerances, are addressed elsewhere. Three publications of the American Concrete Institute may be applicable. These are ACI 117-10, Specifications for Tolerances for Concrete Construction and Commentary (ACI, 2010a), ACI 301-10, Specifications for Structural Concrete (ACI, 2010b), and ACI 318 and ACI 318M, Building Code Requirements for Structural Concrete and Commentary (ACI, 2014). Minimum observation and inspection tasks deemed necessary to ensure quality structural steel construction are defined.

This chapter also defines a comprehensive system of “Quality Control” requirements on the part of the steel fabricator and erector and similar requirements for “Quality Assurance” on the part of the project owner’s representatives when such is deemed necessary to complement the contractor’s quality control function. These requirements exemplify recognized principles of developing involvement of all levels of management and the workforce in the quality control process as the most effective method of achieving quality in the constructed product. The chapter supplements these quality control requirements with quality assurance responsibilities as are deemed suitable for a specific task. The requirements follow the same requirements for inspections utilized in AWS D1.1/D1.1M (AWS, 2015) and the RCSC Specification (RCSC, 2014).

Under AISC Code of Standard Practice Section 8 (AISC, 2016a), the fabricator or erector is to implement a QC system as part of their normal operations. Those that participate in AISC Quality Certification or similar programs are required to develop QC systems as part of those programs. The engineer of record should evaluate what is already a part of the fabricator’s or erector’s QC system in determining the QA needs for each project. Where the fabricator’s or erector’s QC system is considered adequate for the project, including compliance with any specific project needs, the special inspection or quality assurance plan may be modified to reflect this. Similarly, where additional needs are identified, supplementary requirements should be specified.

The terminology adopted is intended to provide a clear distinction between fabricator and erector requirements and the requirements of others. The definitions of QC and QA used here are consistent with usage in related industries, such as the steel bridge industry, and they are used for the purposes of this Specification. It is recognized that these definitions are not the only definitions in use. For example, QC and QA are defined

differently in the AISC Quality Certification program in a fashion that is useful to that program and are consistent with the International Standards Organization and the American Society for Quality.

For the purposes of this Specification, QC includes those tasks performed by the steel fabricator and erector that have an effect on quality or are performed to measure or confirm quality. QA tasks performed by organizations other than the steel fabricator and erector are intended to provide a level of assurance that the product meets the project requirements.

The terms quality control and quality assurance are used throughout this Chapter to describe inspection tasks required to be performed by the steel fabricator and erector and project owner's representatives, respectively. The QA tasks are inspections often performed when required by the applicable building code or authority having jurisdiction (AHJ), and designated as "Special Inspections," or as otherwise required by the project owner or engineer of record.

Chapter N defines two inspection levels for required inspection tasks and labels them as either "observe" or "perform." The choice in terminology reflects the multi-task nature of welding and high-strength bolting operations, and the required inspections during each specific phase.

N2. FABRICATOR AND ERECTOR QUALITY CONTROL PROGRAM

Many quality requirements are common from project to project. Many of the processes used to produce structural steel have an effect on quality and are fundamental and integral to the fabricator's or erector's success. Consistency in imposing quality requirements between projects facilitates more efficient procedures for both.

The construction documents referred to in this chapter are, of necessity, the versions of the design drawings, specifications, and approved shop and erection drawings that have been released for construction, as defined in the AISC Code of Standard Practice (AISC, 2016a). When responses to requests for information and change orders exist that modify the construction documents, these also are part of the construction documents.

When a building information model is used on the project, it also is a part of the construction documents.

Elements of a quality control program can include a variety of documentation, such as policies, internal qualification requirements, and methods of tracking production progress. Any procedure that is not apparent subsequent to the performance of the work should be considered important enough to be part of the written procedures. Any documents and procedures made available to the quality assurance inspector (QAI) should be considered proprietary and not distributed inappropriately.

The inspection documentation should include the following information:

- (1) The product inspected
- (2) The inspection that was conducted
- (3) The name of the inspector and the time period within which the inspection was conducted
- (4) Nonconformances and corrections implemented Records can include marks on pieces, notes on drawings, process paperwork, or electronic files. A record showing adherence to a sampling plan for pre-welding compliance during a given time period may be sufficient for pre-welding observation inspection.

The level of detail recorded should result in confidence that the product is in compliance with the requirements.

N3. FABRICATOR AND ERECTOR DOCUMENTS

1. Submittals for Steel Construction

The documents listed must be submitted so that the engineer of record (EOR) or the EOR's designee can evaluate that the items prepared by the fabricator or erector meet the EOR's design intent. This is usually done through the submittal of shop and erection drawings. In many cases, digital building models are produced in order to develop drawings for fabrication and erection. In lieu of submitting shop and erection drawings, the digital building model can be submitted and reviewed by the EOR for compliance with the design intent. For additional information concerning this process, refer to the AISC Code of Standard Practice (AISC, 2016a).

2. Available Documents for Steel Construction

The documents listed must be available for review by the EOR. Certain items are of a nature that submittal of substantial volumes of documentation is not practical, and therefore it is acceptable to have these documents reviewed at the fabricator's or erector's facility by the engineer or designee, such as the QA agency. Additional commentary on some of the documentation listed in this section follows:

- (1) This section requires documentation to be available for the fastening of deck. For deck fasteners, such as screws and power fasteners, catalog cuts and/or manufacturers installation instructions are to be available for review. There is no requirement for certification of any deck fastening products.
- (2) Because the selection and proper use of welding filler metals is critical to achieving the necessary levels of strength, notch toughness, and quality, the availability for review of welding filler metal documentation and welding procedure specifications (WPS) is required. This allows a thorough review on the part of the engineer and allows the engineer to have outside consultants review these documents, if needed.
- (3) The fabricator and erector maintain written records of welding personnel qualification testing. Such records should contain information regarding date of testing, process, WPS, test plate, position, and the results of the testing. In order to verify the six-month limitation on welder qualification, the fabricator and erector should also maintain a record documenting the dates that each welder has used a particular welding process.
- (4) The fabricator should consider AISC Code of Standard Practice Section 6.1, in establishing material control procedures for structural steel.

N4. INSPECTION AND NONDESTRUCTIVE TESTING PERSONNEL

1. Quality Control Inspector Qualifications

The fabricator or erector determines the qualifications, training and experience required for personnel conducting the specified inspections. Qualifications should be based on the actual work to be performed and should be incorporated into the fabricator's or erector's QC program. Inspection of welding should be performed by an individual who, by training and/or experience in metals fabrication, inspection and testing, is competent to perform inspection of the work. This is in compliance with AWS DI.I/D1.1M clause 6.1.4 (AWS, 2015). Recognized certification programs are a method of demonstrating some qualifications but they are not the only method nor are they required by Chapter N for QC inspectors.

2. Quality Assurance Inspector Qualifications

The QA agency determines the qualifications, training and experience required for personnel conducting the specified QA inspections. This may be based on the actual work to be performed on any particular project. AWS DI.I/D1.1M clause 6.1.4.1(3) states "An individual who, by training or experience, or both, in

metals fabrication, inspection and testing, is competent to perform inspection of the work." Qualification for the QA inspector may include experience, knowledge and physical requirements. These qualification requirements are documented in the QA agency's written practice. AWS B5.1 (AWS, 2013) is a resource for qualification of a welding inspector. The use of assistant welding inspectors under direct supervision is as permitted in AWS D1.1/D1.1M clause 6.1.4.3.

3. NDT Personnel Qualifications

NDT personnel should have sufficient education, training and experience in those NDT methods they will perform. ASNT SNT-TC-1a (ASNT, 2011a) and ASNT CP189 (ASNT, 2011b) prescribe visual acuity testing, topical outlines for training, written knowledge, hands-on skills examinations, and experience levels for the NDT methods and levels of qualification. As an example, under the provisions of ASNT SNT-TC-1a, an NDT Level II individual should be qualified to set up and calibrate equipment and to interpret and evaluate results with respect to applicable codes, standards and specifications. The NDT Level II individual should be thoroughly familiar with the scope and limitations of the methods for which they are qualified and should exercise assigned responsibility for on-the-job training and guidance of trainees and NDT Level I personnel. The NDT Level II individual should be able to organize and report the results of NDT tests.

N5. MINIMUM REQUIREMENTS FOR INSPECTION OF STRUCTURAL STEEL BUILDINGS

1. Quality Control

The welding inspection tasks listed in Tables N5.4-1 through N5.4-3 are inspection items contained in AWS D1.1/D1.1M (AWS, 2015), but have been organized in the tables in a more rational manner for scheduling and implementation using categories of before welding, during welding and after welding. Similarly, the bolting inspection tasks listed in Tables N5.6-1 through N5.6-3 are inspection items contained in the RCSC Specification (RCSC, 2014), but have been organized in a similar manner for scheduling and implementation using traditional categories of before bolting, during bolting and after bolting. The details of each table are discussed in Commentary Sections N5.4 and N5.6.

Typical model building codes, such as the 2015 International Building Code (IBC) (ICC, 2015) or NFPA 5000 (NFPA, 2015), make specific statements about inspecting to "approved construction documents"—the original and revised design drawings and specifications as approved by the building official or authority having jurisdiction (AHJ). AISC Code of Standard Practice Section 4.2(a) (AISC, 2016a) requires the transfer of information from the contract documents (design drawings and project specifications) into accurate and complete shop and erection drawings. Therefore, relevant items in the design drawings and project specifications that must be followed in fabrication and erection should be placed on the shop and erection drawings or in typical notes issued for the project. Because of this provision, QC inspection may be performed using shop drawings and erection drawings, not the original design drawings.

The applicable referenced standards in construction documents are commonly this standard, the AISC Code of Standard Practice, AWS D1.1/D1.1M, and the RCSC Specification.

2. Quality Assurance

AISC Code of Standard Practice Section 8.5.2 contains the following provisions regarding the scheduling of shop fabrication inspection: "Inspection of shop work by the Inspector shall be performed in the Fabricator's shop to the fullest extent possible. Such inspections shall be timely, in-sequence, and performed in such a manner

as will not disrupt fabrication operations and will permit the repair of nonconforming work prior to any required painting while the material is still in-process in the fabrication shop." Similarly, AISC Code of Standard Practice Section 8.5.3 states "Inspection of field work shall be promptly completed without delaying the progress or correction of the work."

AISC Code of Standard Practice Section 8.5.1 states "The Fabricator and the Erector shall provide the Inspector with access to all places where the work is being performed. A minimum of 24 hours notification shall be given prior to the commencement of work." However, the inspector's timely inspections are necessary for this to be achieved, while the scaffolding, lifts or other means provided by the fabricator or erector for their personnel are still in place or are readily available.

IBC Section 2203.1 (ICC, 2015) states "Identification of structural steel members shall comply with the requirements contained in AISC 360 Steel that is not readily identifiable as to grade from marking and test records shall be tested to determine conformity to such standards."

AISC Code of Standard Practice Section 6.1 states "Identification of Material. The fabricator shall be able to demonstrate by a written procedure and actual practice a method of material identification, visible up to the point of assembling members..." AISC Code of Standard Practice Section 8.2 states "Material test reports shall constitute sufficient evidence that the mill product satisfies material order requirements. The Fabricator shall make a visual inspection of material that is received from the mill," AISC Code of Standard Practice Sections 5.2 and 6.1 address the traceability of material test reports to individual pieces of steel, and the identification requirements for structural steel in the fabrication stage.

Model building codes, such as the IBC or NFPA 5000 (NFPA, 2015), make specific statements about inspecting to "approved construction documents" and the original and revised design drawings and specifications as approved by the building official or the authority having jurisdiction (AHJ). Because of these IBC provisions, the QAI should inspect using the original and revised design drawings and project specifications. The QAI may also use the shop drawings and erection drawings to assist in the inspection process

3. Coordinated Inspection

Coordination of inspection tasks may be needed for fabricators in remote locations or distant from the project itself, or for erectors with projects in locations where inspection by a local firm or individual may not be feasible or where tasks are redundant.

The approval of both the AHJ and EOR is required for quality assurance to rely upon quality control, so there must be a level of assurance provided by the quality activities that are accepted. It may also serve as an intermediate step short of waiving QA as described in Section N6.

4. Inspection of Welding

AWS D1.1/D1.1M requires inspection, and any inspection task should be done by the fabricator or erector (termed contractor within AWS D1.1/D1.1M) under the terms of clause 6.1.2.1, as follows:

Contractor's Inspection. This type of inspection and test shall be performed as necessary prior to assembly, during assembly, during welding, and after welding to ensure that materials and workmanship meet the requirements of the contract documents. Fabrication/erection inspection and testing shall be the responsibility of the Contractor unless otherwise provided in the contract documents.

This is further clarified in clause 6.1.3.3, which states:

Specification for Structural Steel Buildings, July 7, 2016
AMERICAN INSTITUTE OF STEEL CONSTRUCTION

Inspector(s). When the term inspector is used without further qualification as to the specific inspector category described above, it applies equally to inspection and verification within the limits of responsibility described in 6.1.2.

The basis of Tables N5.4-1, N5.4-2 and N5.4-3 are inspection tasks, as well as quality requirements, and related detailed items contained within AWS D1.1/D1.1M. Commentary Tables C-N5.4-1, C-N5.4-2 and C-N5.4-3 provide specific references to clauses in AWS D1.1/DLIM. In the determination of the task lists, and whether the task is designated "observe" or "perform," the pertinent terms of the following AWS D1.1/D1.1M clauses were used:

6.5 Inspection of Work and Records

6.5.1 Size, Length, and Location of Welds. The Inspector shall ensure that the size, length, and location of all welds conform to the requirements of this code and to the detail drawings and that no unspecified welds have been added without the approval of the Engineer.

6.5.2 Scope of Examinations. The Inspector shall, at suitable intervals, observe joint preparation, assembly practice, the welding techniques, and performance of each welder, welding operator, and tack welder to ensure that the applicable requirements of this code are met.

6.5.3 Extent of Examination. The Inspector shall examine the work to ensure that it meets the requirements of this code. ... Size and contour of welds shall be measured with suitable gages. ...

"Observe" tasks are as described in clauses 6.5.2 and 6.5.3. Clause 6.5.2 uses the term "observe" and also defines the frequency to be "at suitable intervals." "Perform" tasks are required for each weld by AWS D1.1 /DLIM, as stated in clause 6.5.1 or 6.5.3, or are necessary for final acceptance of the weld or item. The use of the term "perform" is based upon the use in AWS DI. 1/D1. 1M of the phrases "shall examine the work" and "size and contour of welds shall be measured"; hence, "perform" items are limited to those functions typically performed at the completion of each weld

Inspection Tasks Prior to Welding	Clauses
Welding procedure specifications (WPS) available	6.3
Manufacturer certifications for welding consumable available	6.2
Material identification (type/grade)	6.2
Welder identification system	6.4 (welder qualification) (identification system not required by AWS D1.1/D1.1M)
Fit-up of groove welds (including joint geometry)	6.5.2
• Joint preparation	5.22
• Dimensions (alignment, root opening, root face, bevel)	5.14 5.17
• Cleanliness (condition of steel surfaces)	5.9,5.21.1.1
• Tacking (tack weld quality and location)	
• Backing type and fit (if applicable)	

Fit-up of CJP groove welds of HSS T-, Y- & K-joints without backing (including joint geometry) <ul style="list-style-type: none"> • Joint preparation • Dimensions (alignment, root opening, root face, bevel) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location) 	9.11.2
Configuration and finish of access holes	6.5.2, 5.16 (also see section J1.6)
Fit-up of fillet welds <ul style="list-style-type: none"> • Dimensions (alignment, gaps at root) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location) 	5.21.1 5.14 5.17
Check welding equipment	6.2, 5.10

The words "all welds" in clause 6.5.1 clearly indicate that all welds are required to be inspected for size, length and location in order to ensure conformity. Chapter N follows the same principle in labeling these tasks "perform," which is defined as "Perform these tasks for each welded joint or member."

The words "suitable intervals" used in clause 6.5.2 characterize that it is not necessary to inspect these tasks for each weld, but as necessary to ensure that the applicable requirements of AWS D1.1/D1.1M are met. Following the same principles and terminology, Chapter N labels these tasks as "observe," which is defined as "Observe these items on a random basis."

TABLE C-N5.4-2 Reference to AWS D1.1/D1.1M (AWS, 2015) Clauses for Inspection Tasks During Welding	
Inspection Tasks During Welding	Clauses
Use of qualified welders	6.4
Control and handling of welding consumables <ul style="list-style-type: none"> • Packaging • Exposure control 	6.2 5.3.1 5.3.2 (for SMAW), 5.3.3 (for SAW)
No welding over cracked tack welds	5.17
Environmental conditions <ul style="list-style-type: none"> • Wind speed within limits • Precipitation and temperature 	5.11.1 5.11.2
WPS followed <ul style="list-style-type: none"> • Settings on welding equipment • Travel speed • Selected welding materials • Shielding gas type/flow rate • Preheat applied • Interpass temperature maintained (mm/max.) • Proper position (F, V, H, OH) 	6.3.3, 6.5.2, 5.5, 5.20 5.6, 5.7
Welding techniques <ul style="list-style-type: none"> • Interpass and final cleaning • Each pass within profile limitations • Each pass meets quality requirements 	6.5.2, 6.5.3, 5.23 5.29.1

The selection of suitable intervals as used in AWS D1.1/D1.1M is not defined within AWS D1. 1/D1.1M, other than the AWS statement "to ensure that the applicable requirements of this code are met." The establishment of "at suitable intervals" is dependent upon the quality control program of the fabricator or erector, the skills and knowledge of the welders themselves, the type of weld, and the importance of the weld. During the initial stages of a project, it may be advisable to have increased levels of observation to establish the effectiveness of the fabricator's or erector's quality control program, but such increased levels need not be maintained for the duration of the project, nor to the extent of inspectors being on site. Rather, an appropriate level of observation intervals can be used which is commensurate with the observed performance of the contractor and their personnel. More inspection may be warranted for weld fit-up and monitoring of welding operations for complete-joint-penetration (CJP) and partial-joint-penetration (PIP) groove welds loaded in transverse tension, compared to the time spent on groove welds loaded in compression or shear, or time spent on fillet welds. More time may be warranted observing welding operations for multi-pass fillet welds, where poor quality root passes and poor fit-up may be obscured by subsequent weld beads, when compared to single pass fillet welds.

TABLE C-N5.4-3 Reference to AWS D1.1/D1.1M (AWS, 2015) Clauses for Inspection Tasks After Welding	
Inspection Tasks After Welding	Clauses*
Welds cleaned	5.29.1
Size, length and location of welds	6.5.1
Welds meet visual acceptance criteria • Crack prohibition • Weld/base-metal fusion • Crater cross section • Weld profiles • Weld size • Undercut • Porosity	6.5.3 Table 6.1(1) Table 6.1(2) Table 6.1(3) Table 6.1(4), 5.24 Table 6.1(6) Table 6.1(7) Table 6.1(8) Arc
Arc strikes	5.28
k-area*	Not addressed in AWS
Weld access holes in rolled heavy shapes and built-up heavy shapes	5.16, 6.5.2 (see also Section J1.6) Backing
Backing removed and weld tabs removed (if required)	5.9, 5.30
Repair activities	6.5.3, 5.25
Document acceptance or rejection of welded joint or member	6.5.4, 6.5.5
*k-area issues were identified in AISC (1997b). See Commentary Section A3.1c and Section J10.8.	

The terms "perform" and "observe" are not to be confused with the terms "periodic special inspection" and "continuous special inspection" used in the IBC for other construction materials. Both sets of terms establish two levels of inspection. The IBC terms specify whether the inspector is present at all times or not during the course of the work. Chapter N establishes inspection levels for specific tasks within each major inspection area. "Perform" indicates each item is to be inspected and "observe" indicates samples of the work are to be inspected. It is likely that the number of inspection tasks will determine whether an inspector has to be present full time but it is not in accordance with Chapter N to let the time an inspector is on site determine how many inspection tasks are done.

AWS D1.1/D1.1M clause 6.3 states that the contractor's (fabricator/erector) inspector is specifically responsible for the WPS, verification of prequalification or proper qualification, and performance in compliance with the WPS. Quality assurance inspectors monitor welding to make sure QC is effective. For this reason, Tables N5.4-1 and N5.4-2 maintain an inspection task for the QA for these functions. For welding to be performed, and for this inspection work to be done, the WPS must be available to both welder and inspector. A separate inspection for tubular T-, Y-, K-connections was added to recognize the separate fit-up tolerances for these joints in AWS D1.1/D1.1M Table 9.8 and their importance to achieving an acceptable root.

Material verification of weld filler materials is accomplished by observing that the consumable markings correspond to those in the WPS and that certificates of compliance are available for consumables used.

The footnote to Table N5.4-1 states that "The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type." AWS D1.1/D1.1M does not require a welding personnel identification system. However, the inspector must verify the qualifications of welders, including identifying those welders whose work "appears to be below the requirements of this code." Also, if welds are to receive nondestructive testing (NDT), it is essential to have a welding personnel identification system to reduce the rate of NDT for good welders and increase the rate of NDT for welders whose welds frequently fail NDT. This welder identification system can also benefit the contractor by clearly identifying welders who may need additional training.

Table N5.4-3 includes requirements for observation that "No prohibited welds have been added without the approval of the engineer." AWS D1.1/D1.1M clause 5.17 includes specific provisions for tack welds incorporated into final welds, tack welds not incorporated into final welds, and construction aid welds.

AWS D1.1/D1.1M clause 7 on Stud Welding includes requirements regarding the stud welding materials and their condition, base metal condition, stud application qualification testing, pre-production welding inspection and bend testing, qualification of the welding operator, visual inspection of completed studs and bend testing of certain studs when required, and the repair of nonconforming studs. For manually welded studs, special requirements apply to the stud base and the welding procedures.

The proper fit-up for groove welds and fillet welds prior to welding should first be checked by the fitter and/or welder. Such detailed dimensions should be provided on the shop or erection drawings, as well as included in the WPS. Fitters and welders must be equipped with the necessary measurement tools to ensure proper fit-up prior to welding.

AWS D1.1/D1.1M clause 6.2 on Inspection of Materials and Equipment states that, "The Contractor's Inspector shall ensure that only materials and equipment conforming to the requirements of this code shall be used." For this reason, the check of welding equipment is assigned to QC only and is not required for QA.

5. Nondestructive Testing of Welded Joints

5a. Procedures

Buildings are subjected to static loading unless fatigue is specifically addressed as prescribed in Appendix 3. Section J2 provisions contain exceptions to AWS D1.1/D1.1M.

5b. CJP Groove Weld NDT

For statically loaded structures, AWS D1.1/D1.1M and the Specification have no specific nondestructive testing (NDT) requirements, leaving it to the engineer to determine the appropriate NDT method(s), locations or categories of welds to be tested, and the frequency and type of testing (full, partial or spot), in accordance with AWS D1.1/D1.1M clause 6.15.

The Specification implements a selection of NDT methods and a rate of ultrasonic testing (UT) based upon a rational system of risk of failure. If based upon a model building code such as the International Building Code (ICC, 2015) or NFPA 5000 (NFPA, 2015), the applicable building code will assign every building or structure to one of four different risk categories. Where there is no applicable building code, then Section AI requires that the risk category be assigned in accordance with ASCE/SEI 7 (ASCE, 2016).

Complete-joint-penetration (CJP) groove welds loaded in tension applied transversely to their axis are assumed to develop the capacity of the smaller steel element being joined, and therefore have the highest demand for quality. CJP groove welds in compression or shear are not subjected to the same crack propagation risks as welds subjected to tension. Partial-joint-penetration (PJP) groove welds are designed using a limited design strength when in tension, based upon the root condition, and therefore are not subjected to the same high stresses and subsequent crack propagation risk as a CJP groove weld. PJP groove welds in compression or shear are similarly at substantially less risk of crack propagation than CJP groove welds.

Fillet welds are designed using limited strengths, similar to PJP groove welds, and are designed for shear stresses regardless of load application, and therefore do not warrant NDT.

The selection of joint type and thickness ranges for ultrasonic testing (UT) are based upon AWS D1.1/D1.1M clause 6.19.1, which limits the procedures and standards as stated in Part F of AWS D1.1/D1.1M to groove welds and heat affected zones between the thicknesses of 5/16 in. and 8 in. (8 mm and 200 mm), inclusive. The requirement to inspect 10% of CJP groove welds is a requirement that the full length of 10% of the CJP groove welds shall be inspected.

5c. Welded Joints Subjected to Fatigue

CJP groove welds in butt joints so designated in Appendix 3 Table A-3.1, Sections 5 and 6.1, require that internal soundness be verified using ultrasonic testing (UT) or radiographic testing (RT), meeting the acceptance requirements of AWS D1.1/D1.1M clause 6.12 or 6.13, as appropriate.

5e. Reduction of Ultrasonic Testing Rate

For statically loaded structures in risk categories III and IV, reduction of the rate of UT from 100% is permitted for individual welders who have demonstrated a high level of skill, proven after a significant number of their welds have been tested.

5f. Increase in Ultrasonic Testing Rate

For risk category H, where 10% of CJP groove welds loaded in transverse tension are tested, an increase in the rate of UT is required for individual welders who have failed to demonstrate a high level of skill, established as a failure rate of more than 5%, after a sufficient number of their welds have been tested. To implement this effectively, and not necessitate the retesting of welds previously deposited by a welder who has a high reject rate established after the 20 welds have been tested, it is suggested that at the start of the work, a higher rate of UT be performed on each welder's completed welds.

6. Inspection of High-Strength Bolting

The RCSC Specification (RCSC, 2014), like the referenced welding standard, defines bolting inspection requirements in terms of inspection tasks and scope of examinations. The RCSC Specification uses the term "routine observation" for the inspection of all pretensioned bolts, further validating the choice of the term "observe" in this chapter of the Specification.

Table N5.6-1 includes requirements for observation of "Fasteners marked in accordance with ASTM requirements." This includes the required package marking of the fasteners and the product marking of the fastener components in accordance with the applicable ASTM standard. As an example, ASTM F3125 Grade A325 requires the following items for package marking: ASTM designation and type; size; name and brand or trademark of the manufacturer; number of pieces; lot number; purchase order number; and country of origin. ASTM F3 125 Grade A325 also requires manufacturer identification and grade identification on the head of each bolt.

Snug-tightened joints are required to be inspected to ensure that the proper fastener components are used and that the faying surfaces are brought into firm contact during installation of the bolts. The magnitude of the clamping force that exists in a snug-tightened joint is not a consideration and need not be verified.

Pretensioned joints and slip-critical joints are required to be inspected to ensure that the proper fastener components are used and that the faying surfaces are brought into firm contact during the initial installation of the bolts. Pre-installation verification testing is required for all pretensioned bolt installations, and the nature and scope of installation verification will vary based on the installation method used. The following provisions from the RCSC Specification serve as the basis for Tables N5.6-1, N5.6-2 and N5.6-3. In the following, underlining has been added for emphasis of terms:

9.2.1. Turn-of-Nut Pretensioning: The inspector shall observe the preinstallation verification testing required in Section 8.2.1. Subsequently, it shall be ensured by routine observation that the bolting crew properly rotates the turned element relative to the unturned element by the amount specified in Table 8.2. Alternatively, when fastener assemblies are matchmarked after the initial fit-up of the joint, but prior to pretensioning; visual inspection after pretensioning is permitted in lieu of routine observation.

9.2.2. Calibrated Wrench Pretensioning: The inspector shall observe the pre-installation verification testing required in Section 8.2.2. Subsequently, it shall be ensured by routine observation that the bolting crew properly applies the calibrated wrench to the turned element. No further evidence of conformity is required.

9.2.3. Twist-Off-Type Tension Control Bolt Pretensioning: The inspector shall observe the pre-installation verification testing required in Section 8.2.3. Subsequently, it shall be ensured by routine observation that the splined ends are properly severed during installation by the bolting crew.

9.2.4. Direct-Tension Indicator Pretensioning: The inspector shall observe the pre-installation verification testing required in Section 8.2.4. Subsequently, but prior to pretensioning, it shall be ensured by routine observation that the appropriate feeler gage is accepted in at least half of the spaces between the protrusions of the direct tension indicator and that the protrusions are properly oriented away from the work.

The presence of the inspector is dependent upon whether the installation method provides visual evidence of completed installation. Turn-of-nut installation with matchmarking, installation using twist-off bolts, and installation using direct tension indicators provides visual evidence of a completed installation, and therefore "observe" is stated for these methods. Turn-of-nut installation without matchmarking and

calibrated wrench installation provides no such visual evidence, and the inspector is to be "engaged" onsite, although not necessarily watching every bolt or joint as it is being pretensioned.

The inspection provisions of the RCSC Specification rely upon observation of the work, hence all tables use "observe" for the designated tasks. Commentary Tables C-N5.6- 1, C-N5.6-2 and C-N5.6-3 provide the applicable RCSC Specification references for inspection tasks prior to, during and after bolting.

7. Inspection of Galvanized Structural Steel Main Members

Cracks have been observed on the cut surfaces of rolled shapes, plates and on the corners of hollow structural sections (HSS) that have been galvanized. The propensity for cracking is related to residual and thermal stresses, geometric stress concentrations, and a potential for hydrogen or liquid metal assisted cracking. These characteristics can be modified, but no provisions have been found that eliminate all potential for cracking. Inspection should be focused near changes in direction of the cut surface, at edges of welded details, or at changes in section dimensions. In HSS, indications may appear on the inside corner near the exposed end. The word "exposed" in this section is intended to mean cut surface that is not covered by weld or a connected part.

8. Other Inspection Tasks

IBC requires that anchor rods for steel be set accurately to the pattern and dimensions called for on the plans. In addition, it is required that the protrusion of the threaded ends through the connected material be sufficient to fully engage the threads of the nuts, but not be greater than the length of the threads on the bolts.

TABLE C-N5.6-1 Reference to RCSC Specification (RCSC, 2014) Sections for Inspection Tasks Prior to Bolting	
Inspection Tasks Prior to Bolting	Sections
Manufacturer's certifications available for fastener materials	2.1, 9.1
Fasteners marked in accordance with ASTM requirements	Figure C-2.1, 9.1 (also see ASTM standards)
Correct fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)	2.3.2, 2.7.2, 9.1
Correct bolting procedure selected for joint detail	4, 8
Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	3, 9.1, 9.3
Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	7, 9.2
Protected storage provided for bolts, nuts, washers, and other fastener components	2.2, 8, 9.1

TABLE C-N5.6-2	
Reference to RCSC Specification (RCSC, 2014)	
Sections for Inspection Tasks During Bolting	
Inspection Tasks During Bolting	Sections
Fastener assemblies placed in all holes and washers (if required) are positioned as required	7.1(1), 8.1, 9.1
Joint brought to the snug-tight condition prior to the pretensioning operation	8.1, 9.1
Fastener component not turned by the wrench prevented from rotating	8.2, 9.2
Fasteners are pretensioned in accordance with a method approved by RCSC and progressing systematically from most rigid point toward free edges	8.2, 9.2

TABLE C-N5.6-3	
Reference to RCSC Specification (RCSC, 2014)	
Sections for Inspection Tasks After Bolting	
Inspection Tasks After Bolting	Sections
Document acceptance or rejection of bolted connections	not addressed by RCSC

AISC Code of Standard Practice, Section 7.5.1, states that anchor rods, foundation bolts, and other embedded items are to be set by the owner's designated representative for construction. The erector is likely not on site to verify placement, therefore it is assigned solely to the quality assurance inspector (QAI). Because it is not possible to verify proper anchor rod materials and embedment following installation, it is required that the QAI be onsite when the anchor rods are being set.

N6. APPROVED FABRICATORS AND ERECTORS

IBC Section 1704.2.5.1 (ICC, 2015) states that:

Special inspections during fabrication are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection.

Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved agency.

An example of how these approvals may be made by the building official or authority having jurisdiction (AHJ) is the use of the AISC Certification program. A fabricator certified to the AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures (AISC, 2006), meets the criteria of having a quality control manual, written procedures, and annual onsite audits conducted by AISC's independent auditing company, Quality Management Company, LLC. Similarly, steel erectors may be an AISC Certified Erector or AISC Advanced Certified Steel Erector. The audits confirm that the company has the personnel, knowledge, organization, equipment, experience, capability, procedures and commitment to produce the required quality of work for a given certification category.

Granting a waiver of QA inspections in a fabrication shop does not eliminate the required NDT of welds; instead of being performed by QA, such inspections are instead performed by the fabricator's QC. Even when QA inspection is waived, the NDT reports prepared by the fabricator's QC are available for review by a third party QA.

APPENDIX C

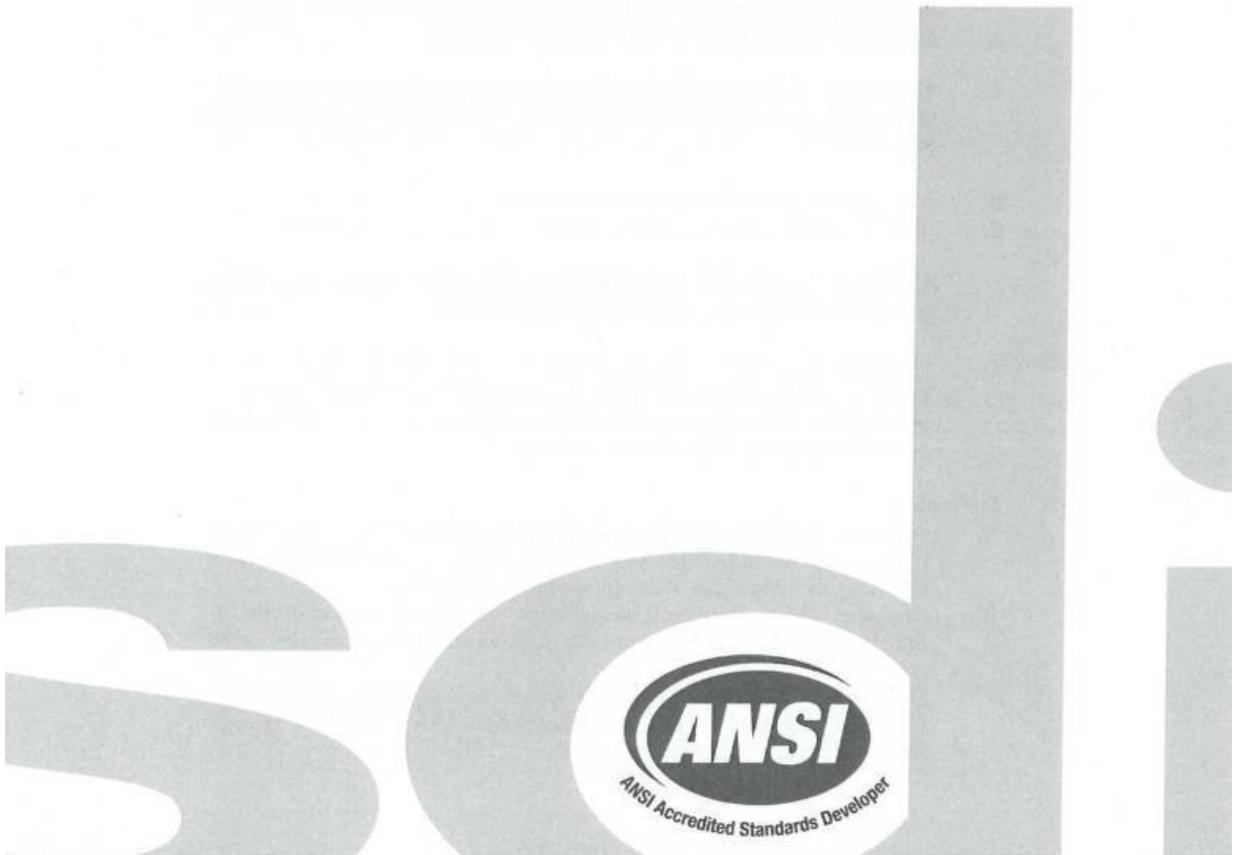
QA/QC – 2011 Standard for Quality Control and Quality Assurance for Installation of Steel Deck



AMERICAN NATIONAL STANDARDS INSTITUTE/ STEEL DECK INSTITUTE

QA/QC - 2011 Standard for

Quality Control and Quality Assurance for Installation of Steel Deck





1. General

1.1 Scope:

- A. This Standard for Quality Control and Quality Assurance for Installation of Steel Deck, hereafter referred to as the Standard, shall govern the minimum requirements for quality control and quality assurance for material control and installation of cold formed steel deck and deck accessories used for floor and roof applications in buildings and other structures, where other structures are defined as structures designed, fabricated, and erected in a manner similar to buildings, with building-like vertical and lateral load resisting-elements.

User Note: This Standard does not apply to the manufacture of steel deck or accessories by the deck manufacturer, other than material control, nor to manufacture of mechanical fasteners or welding consumables. This Standard does not address quality control or quality assurance for concrete, concrete reinforcing steel, welded wire reinforcing, discontinuous fiber reinforcement for concrete, steel anchors, or placement of concrete.

User Note: Quality Control/Quality Assurance provisions for structural steel and steel anchors are found in Section N of AISC 360 and Section J of AISC 341.

- B. The Appendices shall be part of the Standard.
C. The User Notes and Commentary shall not be part of the Standard.

User Note: User Notes and Commentary are intended to provide practical guidance in the use and application of this Standard.

- D. Quality Control (QC) as specified in this Standard shall be provided by the installer. Quality Assurance (QA) as specified in this Standard shall be provided by others when required by the Authority Having Jurisdiction, the applicable building code, Owner, or Designer.

1.2 Definitions

- A. Authority Having Jurisdiction (AHJ): Organization, political subdivision, office or individual charged with the responsibility of administering and enforcing the provisions of the applicable building code.
B. Designer: The licensed professional responsible for the content of the drawings and specifications from which the steel deck is to be constructed.

User Note: The Designer is usually the structural engineer-of-record, however it may be the architect or other licensed professional acting within the scope of their license.



- C. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit, which have been approved in accordance with the requirements of the applicable building code.
- D. Design Documents: The design drawings and the specifications.
- E. Design Drawings. Graphic and pictorial documents prepared by the Designer, showing the design, location and dimensions of the steel deck and accessories. These documents generally include plans, sections, details, schedules, diagrams and notes.
- F. Installation Drawings: Field-installation drawings that are prepared to show the deck finish, size and type, and location and attachment of the deck and accessories.
- G. Inspect: When used in conjunction with quality control and quality assurance, it shall mean the systematic examination and review of the work for compliance with the appropriate documents, with appropriate subsequent documentation.
- H. Owner's Designated Representative for Construction: The owner or the entity that is responsible to the owner for the overall construction of the project, including its planning, quality, and completion.

User Note: The Owner's Designated Representative for Construction is usually the general contractor, the construction manager or similar authority at the job site.

- I. Quality Assurance (QA): Inspection as herein required of the materials, installation, fabrication, erection or placement of components and connections, performed by an agency, individual or firm other than the installer, requiring special expertise to confirm compliance with construction documents and referenced standards.
- J. Quality Assurance Inspector (QAI): Individual or agency designated to provide quality assurance inspection for the work being performed.
- K. Quality Control (QC): Controls and inspections implemented by the installer to confirm that the material provided and work performed meet the requirements of the construction documents, installation drawings, shop drawings, design documents and referenced standards.
- L. Quality Control Inspector (QCI). Individual or agency designated to perform quality control inspection tasks for the work being performed.
- M. Quality Control Program (QCP). A written practice describing the material controls and inspection procedures used by the installer to confirm conformance with the construction documents and referenced standards.
- N. Shop Drawings: Drawings, diagrams, or schedules depicting the steel deck and accessories produced for the specific project.
- O. Specifications: Written documents prepared by the Designer, containing the requirements for materials, standards and workmanship from which the steel deck is to be constructed.



- P. Terms not defined in this standard, AISI S100 or AISI/AISC shall have the ordinary accepted meaning for the context for which they are intended.

1.3 Reference Codes, Standards, and Documents:

- A. Codes and Standards: The following documents or portions thereof are referenced in this standard.
1. American Iron and Steel Institute (AISI)
 - a. AISI S100-07, North American Specification for the Design of Cold-Formed Steel Structural Members, with Supplement 2, dated 2010.
 - b. AISI/AISC, Standard Definitions for Use in the Design of Steel Structures, 2007 edition.
 2. American Welding Society (AWS)
 - a. AWS B5.1:2003, Specification for the Qualification of Welding Inspectors
 - b. AWS D1.1:2010, Structural Welding Code-Steel
 - c. AWS D1.3:2008, Structural Welding Code-Sheet Steel
 3. Steel Deck Institute (SDI)
 - a. SDI C-2011, Standard for Composite Steel Floor Deck-Slabs
 - b. SDI NC-2010, Standard for Noncomposite Steel Floor Deck
 - c. SDI RD-2010, Standard for Steel Roof Deck

User Note: The following standards and documents are referenced within the user notes:

1. American Institute of Steel Construction (AISC)
 - a. AISC 341-10, Seismic Provisions for Structural Steel Buildings
 - b. AISC 360-10, Specification for Structural Steel Buildings
2. American Iron and Steel Institute (AISI)
 - a. AISI S100-07, North American Specification for the Design of Cold-Formed Steel Structural Members, with Supplement 2, dated 2010.
3. American Welding Society (AWS)
 - a. AWS D1.1:2010, Structural Welding Code-Steel
4. Steel Deck Institute (SDI)
 - a. SDI-MOC, Manual of Construction with Steel Deck, 2nd Edition

2. Required Submittals

- 2.1 The following documents shall be submitted to the Designer and Owner's Designated Representative for Construction for approval prior to the installation of the steel deck:
- A. Installation drawings showing deck layout and all accessories, including installation details.
 - B. Catalogue data or independent evaluation reports on deck(s), including profile, thickness, physical properties and finish.

User Note: Deck profile, thickness, physical properties, and finish may be shown on the installation drawings instead of on submitted catalogue sheets.

- 2.2. The following documents, as applicable, shall be made available in electronic or printed form to the Designer and the Owner's Designated Representative for Construction for review prior to installation of the steel deck, unless otherwise required by the Designer to be submitted.
- A. Manufacturer's installation instructions and product data sheets, catalogue data, or independent evaluation reports for mechanical fasteners.
 - B. Manufacturer's product data for welding consumables.
 - C. Manufacturer's product data sheets or catalog data for welding filler metals and fluxes to be used. The data sheets shall describe the product, limitations of use, recommended or typical welding parameters, and storage and exposure requirements, including baking, if applicable.
 - D. Mill certification of sheet steel used for deck.
 - E. Welding procedure specifications (WPS).
 - F. Procedure qualification records (PQR) for WPS that are not prequalified in accordance with AWS D1.1 or AWS D1.3, as applicable.
 - G. Welding personnel performance qualification records (WPQR)
 - H. Installer's written quality control program (QCP).
 - I. Installer's QC Inspector qualifications.

User Note: Documents related to mechanical fasteners are required only when mechanical fasteners are being installed. Documents related to welding are required only when welding of steel deck is being performed. At the time of initial submittals, the specific steel coil to be used is not known, therefore the mill certification should not be expected to be made available until after delivery of the deck to the job site. While it is possible to track a coil to a specific deck bundle, once bundles are broken, it is usually not possible to track a coil to a specific deck sheet with absolute certainty. Specific welders may not be known until deck installation begins, therefore WPQR's may not be made available until immediately before deck installation begins.

3. Inspection and Testing Personnel

3.1 Quality Control Inspector Qualifications

- A. Quality Control (QC) welding inspection personnel shall be qualified to the satisfaction of the installer's QCP, as applicable, and in accordance with one of the following:
 1. Associate Welding Inspector (AWI) or higher as defined in AWS B5.1; or
 2. Qualified by training or experience, or both, in deck installation, inspection, or testing and competent to perform inspection of the work.

User Note: Qualification by training or experience is permitted by AWS D1.1, Section 6.1.4.1(3)



- B. Quality Control (QC) mechanical fastener inspection personnel shall be qualified to the satisfaction of the installer's QCP on the basis of training and experience in installation of like or similar fasteners and shall be competent to perform inspection of the work.

3.2 Quality Assurance Inspector Qualifications

- A. The Quality Assurance Inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the AHJ and satisfy the Quality Assurance Inspector Qualifications contained in Section 3.2.B and 3.2.C.
- B. Quality Assurance (QA) welding inspection personnel shall be qualified in accordance with the quality assurance agency's written practice and with either of the following:
 1. Welding Inspector (WI) or higher as defined in AWS B5.1, except Associate Welding Inspectors (AWI) shall be permitted to be used under the direct supervision of WI's or higher who are on the premises and available when weld inspection is being conducted; or
 2. Qualified by training or experience, or both, in deck installation, inspection, or testing and competent to perform inspection of the work.

User Note: Qualification by training or experience is permitted by AWS D1.1, Section 6.1.4.1(3)

- C. Quality Assurance (QA) mechanical fastener inspection personnel shall be qualified in accordance with the quality assurance agency's written practice on the basis of training and experience in inspection of like or similar fasteners and shall be competent to perform inspection of the work.

4. Requirements for Inspection of Steel Deck Installation

4.1 Quality Control

- A. Quality control tasks shall be performed by the installer's Quality Control Inspector (QCI).
- B. For quality control inspection, the construction documents, installation drawings, shop drawings, design documents and the applicable referenced standards shall be utilized.

User Note: QC documentation is an internal record for the installer to record that the work has been performed and that the work is in accordance with the construction documents. Depending upon the installer's QCP, the method of documentation may vary.

4.2 Quality Assurance

- A. Quality assurance inspection of the deck shall be made at the project site. The Owner's Designated Representative for Construction shall schedule this work with the QAI and the installer to minimize interruptions to the work of the installer.
- B. The QAI shall review the materials test reports and certifications listed in Section 2.2 for compliance with the construction documents.

- C. Quality assurance tasks shall be performed by the QAI.
 - D. Concurrent with the submittal of reports to the AHJ, Designer or Owner, the QAI shall submit to the Owner's Designated Representative for Construction and the installer lists of nonconforming items.
- 4.3 Where a task is to be performed by both QA and QC, it shall be permitted to coordinate inspection functions between the QCI and QAI so that the inspections are performed by only one party when approved in advance by the Owner, Designer, and AHJ. When QA tasks are performed only by the QCI, each inspection is to be documented in a report and the QAI shall periodically review the work of the QCI at an interval acceptable to the Owner, Designer, and the AHJ.
- 4.4 In the event that the requirements of the construction documents conflict with the installation drawings or shop drawings, the requirements of the construction documents shall govern.

User Note: It is not normally accepted practice for the Designer to change the requirements of the construction documents through the shop drawings or installation drawings without modifying the construction documents through a method acceptable to the AHJ.

5. Installer's Quality Control Program

- 5.1 The installer shall produce and maintain quality control procedures and perform inspection to confirm that their work is performed in accordance with this Standard, construction documents, installation drawings, shop drawings, design documents and the applicable referenced standards. All material control and installation procedures shall be monitored by the installer's Quality Control Inspector (QCI).
- 5.2 The installer's QCI shall inspect the following, as applicable:
- A. Field welding of deck in accordance with AWS D1.3, SDI C, SDI NC, and SDI RD.
 - B. Installation of mechanical fasteners in accordance with SDI C, SDI NC, SDI RD, and manufacturer's instructions.
 - C. Steel deck installation in accordance with the construction documents, installation drawings, shop drawings, design documents and applicable referenced standards.
 - D. Scope of inspections shall comply with Appendix 1 and the requirements of the AHJ.

User Note: SDI-MOC is a useful guide to appropriate deck placement and installation practice.

6. Quality Assurance Tasks

- 6.1 The QAI shall perform the following verifications and inspections, as applicable. Acceptance shall be based on conformance with the construction documents.
- A. Verify deck materials are represented by appropriate mill certifications.
 - B. Field welding of deck in accordance with AWS D1.3, SDI C, SDI NC, and SDI RD



- C. Installation of mechanical fasteners in accordance with SDI C, SDI NC, SDI RD, and manufacturer's instructions.
- D. Steel deck installation in accordance with the construction documents, installation drawings, shop drawings, design documents and applicable referenced standards.
- E. Scope of inspections shall comply with Appendix 1 and the requirements of the AHJ.

User Note: SDI-MOC is a useful guide to appropriate deck placement and installation practice.

7. Nonconforming material and workmanship:

- 7.1 Identification and rejection of materials and workmanship not in conformance with the construction documents shall be permitted at any time during progress of or following the completion of the work. However, this provision shall not relieve the Owner or the inspector of the obligation for timely, in-sequence inspections. Nonconforming material and workmanship shall be brought to the immediate attention of the Owner's Designated Representative for Construction and the deck installer. Nonconforming material or workmanship shall be brought into conformance, or made suitable for its intended purpose as determined by the Designer.



Appendix 1. Tables of Inspection or Execution Tasks

“Observe” shall mean to inspect these items on an intermittent basis. Operations need not be delayed pending these inspections. Frequency of observations shall be adequate to confirm that the work has been performed in accordance with the applicable documents. In the event that observations determine that the materials and/or workmanship are not in conformance with the applicable documents, additional inspections shall be performed to determine the extent of non-conformance.

“Perform” shall mean to perform these tasks prior to final acceptance for each item or element.

Within the listed tasks, “Document” shall mean the inspector shall prepare reports or other appropriate written documentation indicating that the work has or has not been performed in accordance with the construction documents.

User Note: The scope of inspections contained in Appendix 1 is considered to be adequate for most installations. At the option of the Designer or AHJ, the scope of inspections may be increased for specific structures or conditions.

Table 1.1. Inspection or Execution Tasks Prior to Deck Placement

	Task	QC	QA
A	Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness	Perform	Perform
B	Document acceptance or rejection of deck and deck accessories	Perform	Perform

Table 1.2. Inspection or Execution Tasks After Deck Placement

	Task	QC	QA
A	Verify compliance of deck and all deck accessories installation with construction documents	Perform	Perform
B	Verify deck materials are represented by the mill certifications that comply with the construction documents	N/A	Perform
C	Document acceptance or rejection of installation of deck and deck accessories	Perform	Perform

Table 1.3. Inspection or Execution Tasks Prior to Welding

	Task	QC	QA
A	Welding procedure specifications (WPS) available	Observe	Observe
B	Manufacturer certifications for welding consumables available	Observe	Observe
C	Material identification (type/grade)	Observe	Observe
D	Check welding equipment	Observe	Observe

**Table 1.4. Inspection or Execution Tasks During Welding**

	Task	QC	QA
A	Use of qualified welders	Observe	Observe
B	Control and handling of welding consumables	Observe	Observe
C	Environmental conditions (wind speed, moisture, temperature)	Observe	Observe
D	WPS followed	Observe	Observe

Table 1.5. Inspection or Execution Tasks After Welding

	Task	QC	QA
A	Verify size and location of welds, including support, sidelap, and perimeter welds.	Perform	Perform
B	Welds meet visual acceptance criteria	Perform	Perform
C	Verify repair activities	Perform	Perform
D	Document acceptance or rejection of welds	Perform	Perform

Table 1.6. Inspection or Execution Tasks Prior to Mechanical Fastening

	Task	QC	QA
A	Manufacturer installation instructions available for mechanical fasteners	Observe	Observe
B	Proper tools available for fastener installation	Observe	Observe
C	Proper storage for mechanical fasteners	Observe	Observe

Table 1.7. Inspection or Execution Tasks During Mechanical Fastening

	Task	QC	QA
A	Fasteners are positioned as required	Observe	Observe
B	Fasteners are installed in accordance with manufacturer's instructions	Observe	Observe

Table 1.8. Inspection or Execution Tasks After Mechanical Fastening

	Task	QC	QA
A	Check spacing, type, and installation of support fasteners	Perform	Perform
B	Check spacing, type, and installation of sidelap fasteners	Perform	Perform
C	Check spacing, type, and installation of perimeter fasteners	Perform	Perform
D	Verify repair activities	Perform	Perform
E	Document acceptance or rejection of mechanical fasteners	Perform	Perform

Commentary

Field Determination of Base Metal Thickness

The following information is provided to assist field inspectors in checking base metal thickness:

1. Allowable minimum base metal thickness is 95% of the design thickness, per AISI S-100, Section A2.4. Lesser thicknesses are permitted at bends and corners. Design thickness is as specified by the manufacturer.
2. Primer paint thickness is usually on the order of 0.30 to 0.40 mils per side (0.0003 to 0.0004 inches)
3. Galvanizing thicknesses (measured as the total of both sides of the sheet) are typically as follows:

G40	0.50 mils (0.0005 inches)
G60	0.90 mils (0.0009 inches)
G90	1.40 mils (0.0014 inches)

Use of this Standard for Purposes of Other Than Special Inspection

This Standard has been prepared specifically for providing requirements for Special Inspections as required by Chapter 17 of the International Building Code or other governing building code. However, this Standard may also be used for setting forth requirements for quality control and quality assurance for cases where Special Inspections are not required by the Code. In this instance, if a Designer wishes to incorporate this standard into project specifications as a contractual requirement, the following modifications to this specification are recommended.

Table C-1. Modifications to SDI QA/QC-2011

Section 2.2.D:	Delete this section.
Section 3.2.A:	Change "AHJ" to "Designer"
Section 4.2.D:	Delete reference to "AHJ"
Section 4.3:	Delete references to "AHJ"
Section 5.2.D:	Delete "and the requirements of the AHJ."
Section 6.1.A:	Delete this section.
Section 6.1.E:	Delete "and the requirements of the AHJ."
Appendix 1:	Delete task 1.2.B

A Designer may incorporate this Standard into the project specifications in a manner similar to the following:

"Quality Control and Quality Assurance for steel deck installation shall be in accordance with SDI QA/QC-2011, "Standard for Quality Control and Quality Assurance for the Installation of Steel Deck", as modified by Table C-1 contained in the Commentary to that Standard."

Alternately, the Designer may list any applicable changes to this Standard individually within the project specification.

APPENDIX D
Table 1. 18.2--- Level B Quality Assurance

MINIMUM TESTS				
Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5B.1.b.3 for self-consolidating grout				
Verification of f' m and f' AAC in accordance with Specification Article 1.4 B prior to construction, except where specifically exempted by this Code				
MINIMUM SPECIAL INSPECTION				
Inspection Task	Frequency (a)		Reference for Criteria	
	Continuous	Periodic	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/ ASCE 6
1. Verify compliance with the approved submittals		X		Art 1.5
2. As masonry construction begins, verify that the following are in compliance:				
a. Proportion of site-prepared		X		Art 2.1, 2.6A
b. Construction of mortar joints		X		Art 3.3 B
c. Grade size of prestressing tendons and anchorages		X		Art 2.4 B, 2.4 H
d. Location of reinforcement, connectors and prestressing tendons and anchorages		X		Art 3.4, 3.6 A
e. Prestressing techniques		X		Art 3.6 B
f. Properties of thin-bed mortar for AAC masonry	X (b)	X (c)		Art 2.1 C
3. Prior to grouting, verify that the following are in compliance:				
a. Grout space		X		Art 3.2 D, 3.2 F
b. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons, and anchorages		X	Sec. 6.1	Art. 2.4, 3.4
c. Placement of reinforcement, connectors, and prestressing and anchorages		X	Sec 6.1, 6.2.1, 6.2.6, 6.2.7	Art. 3.2 E, 3.4, 3.6 A
d. Proportions of site-prepared grout and prestressing grout for bonded tendons		X		Art. 2.6 B, 2.4 G.1.b
e. Construction of mortar joints		X		Art. 3.3 B
4. Verify during construction:				
a. Size and location of structural elements		X		Art. 3.3 F
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction		X	Sec. 1.2.1(e), 6.1.4.3, 6.2.1	
c. Welding of reinforcement	X		Sec. 8.1.6.7.2, 9.3.3.4 (c), 11.3.3.4(b)	
d. Preparation, construction, and protection of masonry during cold weather (temperature below °F °C) or hot weather (temperature above °F °C)		X		Art. 1.8 C, 1.8 D
e. Application and measurement of prestressing force	X			Art 3.6 B
f. Placement of grout and prestressing grout fir bonded tendons is in compliance	X			Art 3.5, 3.6 C
g. Placement of AAC masonry units and	X (b)	X (c)		Art. 3.3 B.9,

construction of thin-bed mortar joints				3.3 F.1.b
5. Observe preparation of grout specimens, mortar specimens, and/ or prisms		X		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4

- (a) Frequency refers to the frequency of Special Inspection, which may be continuous during the task listed or periodic during the listed task, as defined in the table.
- (b) Required for the first 5000 square feet (465 square meters) of AAC masonry.
- (c) Required after the first 5000 square feet (465 square meters) of AAC masonry.

Table 1. 18.3 ---- Level C Quality Assurance

MINIMUM TESTS				
Verification of f ' m and f ' AAC in accordance with Article 1.4 B prior to construction and for every 5,000 sq. ft. (464.5m ²) during construction				
Verification of proportions of materials in premixed or preblended mortar, prestressing grout and grout other than self-consolidating grout, as delivered to the site				
Verification of Slump flow and VSI as delivered to the site in accordance with Article 1.5B.1.b.3 for self-consolidating grout				
MINIMUM INSPECTION				
Inspection Task	Frequency		Reference for Criteria	
	Continuous	Periodic	TMS 402/ ACI 530/ ASCE 5	TMS 602/ ACI 530.1/
1. Verify compliance with the approved submittals		X		Art. 1.5
2. Verify that the following are in compliance:				
a. Proportions of site-prepared mortar, grout and prestressing tendons and anchorages		X		Art 2.1, 2.6 A, 2.6 B, 2.6 C, 2.4 G.1.b
b. Grade, type, and size of reinforcement and anchor bolts, prestressing tendons and anchorages		X	Sec. 6.1	Art. 2.4, 3.4
c. Placement of masonry units and construction of mortar joints		X		Art 3.3 B
d. Placement of reinforcement, connectors, prestressing tendons and anchorages	X		Sec. 6.1, 6.2.1, 6.2.6, 6.2.7	Art 3.2 E, 3.4, 3.6 A
e. Grout space prior to grouting	X			Art. 3.2 D, 3.2 F
f. Placement of grout and prestressing grout for bonded tendons	X			Art. 3.5, 3.6 C
g. Size and location of structural elements	X			Art. 3.3 F
h. Types, size, and location of anchors including other details of anchorage of masonry to structural members, frames or other construction	X		Sec. 1.2.1(e), 6.1.4.3, 6.2.1	
i. Welding of reinforcement	X		Sec. 8.1.6.72, 9.3.3.4 (c), 11.3.3.4(b)	
j. Preparation, construction and protection of masonry during cold weather (temperature below 40 F °C) or hot weather (temperature above 90°F (32.2 C))		X		Art 1.8 C, 1.8 D
k. Application and measurement of prestressing force	X			Art 3.6 B
l. Placement of AAC masonry units and construction of thin-bed mortar joints	X			Art 3.3 B.9, 3.3 F.1.b
m. Properties of thin-bed mortar for AAC masonry	X			Art. 2.1 C.1
3. Observe preparation of grout specimens. Mortar specimens and /or prisms	X			Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B4

(a) Frequency refers to the frequency of Special Inspection, which may be continuous during the task listed or periodic during the listed task, as defined in the table.