GUIDELINES FOR SPECIAL INSPECTION IN CONSTRUCTION

PREPARED FOR THE BUILDING INDUSTRY

by

CALIFORNIA COUNCIL OF TESTING AND INSPECTION AGENCIES

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ORIGINS OF
CALIFORNIA COUNCIL OF TESTING AND INSPECTION AGENCIES

The California Council of Testing and Inspection Agencies' (CCTIA) roots go back to approximately 1970 when several San Francisco Bay Area testing and inspection firms (materials engineering laboratories) decided to unite their efforts in an attempt to achieve more uniform guidelines for, and enforcement of, what was then Section 305 of the Uniform Building Code (UBC) dealing with "Special Inspection." At that time, the public agencies' use and enforcement of code-dictated special inspection varied from zero to total "by-the-book" requirements. Thus, materials engineering laboratories often faced major uncertainties as to how strictly they must adhere to UBC "requirements." This, in turn, created substantial inequities in levels of effort, especially confusing to clients that built in more than one jurisdiction.

Early efforts were encouraging enough that the organization, originally formed as the Association of Northern California Testing and Inspection Agencies (ANCTIA) survived many years and achieved substantial progress, as exhibited by the following achievements:

- Created a "Tests and Inspection" (T & I) checklist prototype for use on commercial/private construction projects
- Established inspection guidelines
- Established criteria for issuance of inspector identification cards, signed by Professional Engineers, and listing individuals' areas of expertise.

After some time, activities slowed down only to be revived again about 1987, for most of the same reasons that resulted in the original formation, i.e., lack of uniform use and enforcement of special inspection code requirements. This time ANCTIA became even more proactive, with such projects as:

- Updated the T & I checklist
- Established minimum standards for member firms
- Revised minimum standards for inspectors
- Promoted the active use of inspector identification cards
- Interacted with ICC (formerly ICBO) and local building officials

The organization subsequently grew to represent the industry throughout the State of California. In 1994, it reorganized as the California Council of Testing and Inspection Agencies (CCTIA).

As with its predecessor, CCTIA is a non-profit public benefit corporation dedicated to fostering, promoting, and encouraging through education the practice and profession of materials testing and inspection services. The Council influences code development, training programs, and minimum inspector and agency qualification standards through its member firms' representation in many other organizations, including:

- International Code Council (ICC) (including various Chapters throughout the State of California)
- International Accreditation Services (IAS)
- Structural Engineers Association of California (SEAOC)
- American Council of Independent Laboratories (ACIL)
- American Concrete Institute (ACI)
- American Construction Inspectors Association (ACIA)
- American Society for Testing and Materials (ASTM)
- ASTM E36 Committee on Laboratory Accreditation
- American Society of Foundation Engineers (ASFE)
- American Society of Civil Engineers (ASCE)
- California Division of State Architect (DSA)

In its efforts to promote public safety, the Council participates in and supports many more organizations, too numerous to include within this document.

Questions and inquiries concerning CCTIA membership may be made by contacting any member firm.

INTRODUCTION

"Guidelines for Special Inspection in Construction" has been prepared by the member firms of the California Council of Testing and Inspection Agencies' (CCTIA) Standard of Practice Committee to illustrate the services available in some of the more common categories of special inspection and testing. The Guideline has been revised to bring it in compliance with the 2007 California Building Code. The model "Guidelines of Special Inspection and Structural Observation," published by Structural Engineers Association of Northern California, was used with their permission as a reference to assist in the development of this Guide.

A basic objective of this Council (CCTIA) is to provide information that will assist clients to better understand the relationship between testing and inspection agencies (materials engineering laboratories) and specific requirements of the various building codes. Of particular importance is the capability of such agencies to satisfy the Special Inspection requirements of the California Building Code, other local codes, and the typical requirements of project specifications.

The guidelines are not meant to imply that all of these services will be required on any specific project, or that the agency has been directed to perform all of the available services within a category. It is also recognized that special requirements of specific projects or governing agencies may require more or less stringent procedures than those outlined in these guidelines.

Inspection is the observation of construction for general conformance with the approved design drawings and specifications. It should not be relied upon by others as acceptance or as guarantee of work, nor should it in any manner relieve any contractor, or any other party, from their obligations and responsibilities under either the construction contract or generally accepted industry custom.

It is important to note that qualified materials engineering laboratories may provide testing, inspection and materials engineering services in many fields other than those selected for this publication. In addition, a qualified laboratory should comply with state and local auditing and/or accreditation criteria.

CALIFORNIA BUILDING CODE AND STATEMENT OF SPECIAL INSPECTIONS

Certain types of construction shall have continuous inspection as specified in Section 1704 of the California Building Code (CBC). The level of special inspection (continuous or periodic), in addition to material testing requirements, should be identified in the Statement of Special Inspections, prepared by the registered design professional for each project. For the convenience of our clients, we have reproduced draft copies of the Statement of Special Inspections and Schedule of Structural Testing developed by Structural Engineers Association of Northern California (SEAONC).

GUIDELINES FOR SPECIAL INSPECTION IN CONSTRUCTION
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SECTION 1

SOILS (Grading, Excavation, and Filling)

OBJECTIVE

Earthwork as presented in this section includes, in general, those soils construction activities normally associated with special grading, excavation, and filling. The purpose of earthwork observation and testing is to verify that the work is done in compliance with the approved plans and specifications, and, in particular, with the recommendations of the project geotechnical report.

Soil is a highly variable material, is very sensitive to moisture fluctuations, and requires close attention to construction quality control in order to achieve the desired result. Many factors contribute to its suitability and effective performance. Identifying and properly controlling these factors can be divided into two general areas of activity. The first involves the observation or monitoring during construction with particular attention that placement and compaction operations are followed as specified in the contract documents and geotechnical report. The second involves tests to document the soils properties and to verify compliance to the quality specified.

Materials engineering laboratories that offer services in this field provide special expertise and equipment to verify the objectives of the design and project specifications. However, this is best accomplished when the design geotechnical consultant provides these construction-related services and can, in turn, achieve continuity and integration of the design-construct process. Without involvement of this geotechnical engineer, the constructed earthwork may not meet the performance requirements intended.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and the geotechnical engineer's report.
2. Note and record the equipment being used on site.

B. Verification

1. Verify materials below footings are adequate to achieve the desired bearing capacity.
2. Verify excavations are extended to proper depth and have reached proper material.
3. Perform classification and testing of controlled fill materials.
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill.
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.

C. Sampling of Materials

1. Sample and verify that the following materials are delivered to the Materials Engineering Laboratory for any required testing:
   a) Subgrade materials;
   b) Native-fill materials;
   c) Imported materials; and
   d) Additive materials (lime, cement, sand, pozzolan, etc.).

D. Testing

1. Perform soils classification and properties tests as required on native and/or imported soils.
2. Perform laboratory moisture-density relationship tests or other structural property tests as required.
3. Where applicable, conduct a laboratory testing program to determine soils' properties resulting from admixtures such as cement or lime.
4. In the field, conduct in-place field density and moisture tests using procedures specified in the contract documents. Frequency of testing should be predetermined to allow for representative coverage of each lift, while interfering as little as possible with the earthwork operation's schedule.
5. Conduct testing in a timely manner to avoid having to retest previously covered work. Similarly, test methods should be predetermined so as to take into account the Contractor's procedures and soil types.
6. Periodically sample materials in the field to verify continued compliance with specification requirements (recommended).

E. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work.

SECTION 2

FOUNDATIONS (Piles and Piers)

PILES

OBJECTIVE

The observation of driven piles is a specialized discipline that requires the oversight of a design geotechnical engineer. Interpretation of pile capacity is achieved through knowledge of the anticipated soil types and the types of pile-driving equipment being used to install the piles. Materials engineering laboratories should only perform this service under the supervision and oversight of the design geotechnical engineer.

If this inspection is not performed by the geotechnical engineer of record, it is recommended that the geotechnical engineer at least monitor the work of the special inspector to ensure that the inspector has the knowledge, experience, and all pertinent information needed.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and the geotechnical engineer's report.
2. Note and record the equipment being used on site.

B. Verification

1. Verify that pile materials, sizes, and lengths comply with the requirements.
2. Determine capacities of test piles and conduct additional load tests, as required under the supervision of the design geotechnical engineer.
3. Observe driving operations and maintain complete and accurate records for each pile.
4. Verify locations of piles and their plumbness.
   a) Confirm type and size of hammer.
   b) Record number of blows per foot of penetration.
   c) Determine required penetrations to achieve design capacity.
   d) Record tip and butt elevations and record any pile damage.
5. For steel piles, perform additional inspections in accordance with Section 1704.3.
6. For concrete piles and concrete-filled piles, perform additional inspection in accordance with Section 1704.4
7. For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.
8. For augered uncased piles and caisson piles, perform inspections in accordance with Section 1704.9.

C. Testing

1. Determine capacities of test piles and conduct additional load tests, as required *(CBC Table 1704.8)*.

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work.

SECTION 2

FOUNDATIONS (Piles and Piers) (continued)

PIERS (Cast-In-Drilled-Hole CIDH)

OBJECTIVE

Drilled pier (CIDH) observation requires experience with soil and rock identification and with interpretation of design soil and embedment requirements. Materials engineering laboratories engaging in this service should do so only under the direct supervision and oversight of the design geotechnical engineer. Minor drilled pier foundations for non-structural improvements may be observed without the oversight of the design geotechnical engineer. Additionally, CIDH piles deriving their support in friction for lightly loaded structures can be observed by special inspection personnel provided a design geotechnical engineer is reviewing and accepting the work. CIDH piers for major structures, for critical structures such as schools and hospitals, for any pier constructed underwater using the tremmie method, or for any pier requiring an interpretation of end-bearing capacity or embedment into a specific soil or rock type should only be performed under the supervision of an engineer or geologist.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and the geotechnical engineer's report.
2. Note and record the equipment being used on site.

B. Verification

1. Observe drilling operations and maintain complete and accurate records for each pier.
2. Verify locations of piers and their plumbness. Confirm pier diameters, bell diameters (if applicable), lengths, log of soil types embedment into bedrock (if applicable), and adequate end strata bearing capacity.
3. For concrete piers, perform additional inspections in accordance with Section 1704.4.
4. For masonry piers, perform additional inspections in accordance with Section 1704.5.

C. Sampling of Materials

1. Obtain samples of soil and rock if required by the geotechnical engineer of record for confirmation of classification or strength testing.

D. Testing

1. Perform testing of continuity of pier defects using geophysical methods if required by design professionals.

E. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work.

SECTION 3

ASPHALT CONCRETE

OBJECTIVE

The performance of Hot Mix Asphalt (HMA) and Rubberized Hot Mix Asphalt (RHMA) pavement is as much affected by the careful construction of the subgrade and base as it is by the control of the mix itself. Therefore, the paving inspector must also be knowledgeable in soils. The purpose of observation and testing of HMA and RHMA paving is to verify that paving contractors and their suppliers are exercising adequate quality control in their operations and are providing a finished product that complies with the project plans and specification requirements. This is also to be accompanied by adequate sampling of HMA and RHMA for acceptance testing in accordance with the Quality Assurance Plan.

This objective can best be achieved by qualified special inspectors performing the following duties under the direct supervision of the materials engineering laboratory.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans and specifications, and meet with contractor and suppliers before construction to discuss project and to verify that requirements for testing and observation are well understood.
2. Review material certificates and test reports for compliance with job specifications.
3. Review Job Mix Formula (JMF) submittals for compliance to project requirements.

B. Sampling of Materials

1. Sample and perform preliminary tests on proposed aggregates and asphalt cement (virgin asphalt cement, Rubberized Asphalt Binder, or Asphalt Rubber Binder) to verify JMF (gradation, sand equivalent, abrasion, air voids, etc.)

C. Subgrade and Base

1. Confirm that sources of materials have been sampled and approved.
2. Verify that materials delivered are of uniform quality.
3. Verify that control testing of subgrade materials is being performed and recorded as required.
4. Verify that subbase and base courses are of the source, type, thickness and density specified.
5. Verify that soil stabilization is provided, if required.
6. Refer to Section 1, Earthwork, for additional details.

D. Plant (Drum Mix or Batch)

1. The inspector should become familiar with the appearance and physical characteristics of the mix to be used by observing visually the finished mixture so that unsatisfactory conditions may be readily recognized.
2. Check the plant facilities prior to production of HMA or RHMA.
3. Check aggregates in stockpile to verify conformance to materials utilized in the design.
4. Check the temperature and weights of the aggregate fractions and asphalt cement.
5. Check the mixing temperature and the temperature of the mixed batches on the truck.
6. Conduct sampling of the asphalt cement and blended aggregates (and RAP, if any) to verify the (cold feed or hot-bins, whichever is applicable) job mix formula is within tolerance.
7. Before loading, truck beds should be checked for cleanliness and absence of materials that might be detrimental to the mix (such as cleaning solvents). Ensure the trucks are tarped after loading.
8. Coordinate with the job site inspector to obtain a uniform and consistent HMA.

E. Spreading and Paving

1. The field inspector should contact the plant inspector promptly should the observed conditions during placement and spreading operations suggest a need for change at the plant. The following items should be addressed prior to and during placement operations:
   a) Area to be paved, cleaned, crack sealed and properly primed, or tack coated.
   b) Leveling course installed where required.
   c) Suitability of spreading and paving equipment.
   d) Ambient and Base temperature to be noted.
   e) Mix temperature when delivered, during placement, and after final rolling is within limits required.
   f) Density tests by nuclear gauge during rolling (when applicable).
   g) Thickness control by adequate placement and compaction.
   h) Sampling of HMA or RHMA at jobsite during placement for laboratory testing (asphalt content, air voids, etc.).
   i) Core samples taken for verification of thickness and in-place density of the mat.
   j) Application of seal coat and curing in accordance with specification requirements, if required.

F. Verification Tests

1. Stability and air voids.
2. Asphalt content and gradation by extraction (solvent or ignition oven).
3. Physical properties of the asphalt cement: penetration, viscosity, softening point, resilience, ductility, and specific gravity (when applicable).
4. Aggregate quality: gradation, LA abrasion, and equivalent, fractured faces, uncompacted voids, etc.
5. Thickness and Field density of core samples.
6. Smoothness tolerance.

G. Reports

1. Submit written reports describing the observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all deviations from plans or specifications.

SECTION 4

REINFORCING STEEL

OBJECTIVE

The purpose of reinforcing steel observation (continuous or periodic) is to give assurance that the supplier is exercising satisfactory control over production, fabrication, and placing of reinforcing steel so that it meets the project specifications and applicable codes and industry standards.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved shop drawings.
2. Review applicable sections of referenced codes, such as: the California Building Code (ICC); the Building Code Requirements for Reinforced Concrete (ACI-318) by the American Concrete Institute (ACI); the Manual of Standard Practice of the Concrete Reinforcing Steel Institute (CRSI); the Reinforcing Steel Welding Code (AWS D1.4) by the American Welding Society (AWS).

B. Mill Test Reports

1. Verify reinforcing steel mill test reports (when available) for mill markings and test data, checking against project requirements.
2. Sample material for tests directly from unopened bundles when required by specifications.

C. Fabrication

1. Check each shipment of reinforcing steel for the following:
   a) Bar sizes and grades are as specified.
   b) Mill marking is in conformance with mill test reports.
   c) Corrosion, contaminants, surface cracks, and bars damaged in shipment.
   d) Shop bends for specified radius and cracks.

D. Placement

1. During placement of reinforcing, check for proper bar locations, alignment, laps, ties, form and ground clearance, supports, field bend radii and cracks, gouges or tack welds causing stress concentrations, removal of contaminants, and hardened concrete.
2. If welding of reinforcing is required, it should be observed as defined in CBC Table 1704.3(5b), with particular emphasis on joint configuration, suitability of low hydrogen electrodes, preheat and interpass temperatures, and interpass slag removal. Check for welding and procedures for conformance to AWS D1.4.
3. Prior to concrete placement, check for complete installation and notify contractor of any variations from plans and specifications. If variations are not corrected prior to start of concreting, immediately notify the design team representative and the building office for appropriate action.
4. During concrete placement, check that reinforcing stays in place and is adequately supported. Check for removal of dirt, concrete spatter, grease, or other contaminants.
5. Check embedded items, including anchorages, inserts, and bolts installed in concrete for compliance to project documents. Verify they are solidly cast in place during placement of concrete.

E. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 5

CONCRETE BATCH PLANT

OBJECTIVE

The purpose of batch plant observation is to verify that the concrete supplier is exercising adequate quality control to produce concrete that will meet the project requirements for materials, their batch proportions, and mixing and adjustment for moisture.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Verify that the class of concrete ordered is being delivered and conforms to approved mix designs.

B. Equipment

1. Check the trucks for worn out or damaged fins, for excessive buildup of hardened concrete, and for the presence of wash water from the previous delivery.
2. Check the National Ready-mix Concrete Manufacturers Association truck rating plate and verify that load capacities are not exceeded.
3. Check the current "weights and measures" seal on scales.
4. Verify that the moisture-metering device is operable.
5. Verify that the scales start at and return to zero after each weighing operation.
6. Verify that the metering devices for admixtures have been calibrated recently and are operating.

C. Materials, Storage, and Handling

1. Visually check the sand and coarse aggregate for method of storage, handling, source, grading, cleanliness, and moisture condition.
2. Obtain samples of aggregates when specified or when it appears that they may not conform to the required gradation or cleanliness.
3. Obtain grab samples of cement and pozzolanic materials when required by project specifications.
4. Check cement temperature when required.
5. For lightweight aggregates, check loose moist unit weight regularly and verify whether the plant is making proper adjustments to batch weights to compensate for variations in weight as well as in moisture.

D. Batching of Materials

1. Record the volume in cubic yards for each class of concrete delivered. Verify that each mix proposed for delivery is of the proper designation and proportions approved for the project. Where discrepancies occur, request that the dispatcher clarify with the general contractor.
2. Verify that the specified materials are dispensed to the weigh hopper and record the adjusted batch weights for all ingredients in the desired proportions of the concrete mix.
3. Verify that the proper adjustments have been made for variations in moisture of aggregates.
4. Record the mixing time and check whether it is sufficient.
5. Visually estimate the slump of the concrete and report immediately to the operator any slumps outside of specified tolerance.
6. Coordinate with the job site and verify the "as delivered" slump, air content, unit weight, mix temperature, general workability, and preparation of test samples.

E. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 6

CONCRETE

OBJECTIVE

Many factors interact to affect the ultimate quality of concrete. To deal properly with these factors, quality assurance is divided into two recognized phases.

The first involves collecting evidence from standard tests to verify that the delivered concrete was produced to the standards specified.

The second involves verifying that proper construction practices are followed during placement, finishing, and curing.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans and specifications.
2. Verify that the class of concrete ordered is being delivered and conforms to specifications, drawings, and/or code requirements and approved mix design.

B. Observation Procedures

1. Verify formwork is of proper size and shape.
2. Verify that the location and preparation of construction joints comply to approved plans, specifications, and building code requirements.
3. Check forms for cleanliness and proper treatment prior to placement.
4. Visually estimate the slump of each batch delivered and perform slump tests regularly.
5. Determine concrete temperature, number of mixing revolutions, and/or length of time since batching.
6. Observe placement procedures for evidence of segregation, possible cold joints, displacement of reinforcing or forms, and proper support of embedded items, anchor bolts, etc.
7. Observe methods used for compaction/consolidation.
8. When specified, verify that concrete is protected from temperature extremes, and that proper curing is initiated.
9. When specified, verify maintenance of cure temperature and techniques.

C. Sampling and Testing Duties

1. Sample and test fresh concrete for the following (or as stipulated by plans and specifications):
   a) Slump
   b) Temperature
   c) Entrained air, when required
   d) Wet unit weight, when required
2. Sample concrete and prepare test cylinders in accordance with ASTM C31.
3. Field sampling and testing of concrete should be performed by a qualified technician, certified by ACI as a Concrete Field Testing Technician – Grade 1 (or approved equal)

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 7

SHOTCRETE

OBJECTIVE

The purpose of special observation for shotcrete is to verify that the materials, processes, and the particularly unique application techniques conform to the project documents. The process moves rapidly in often noisy and congested environments; it relies heavily on experienced working crews.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and contractor submittals for applications process used.
2. Verify crew qualifications.
3. Verify material sources and approved mix design.
4. Verify test methods and sample procedure.

B. Observation Procedures

1. Verify main and auxiliary equipment for compliance, capacity, pressures, and proper functioning.
2. Check for hot or cold weather limitations and precautions.
3. Verify reinforcing is proper type, grade, and size; free of oil, dirt, and rust; properly coated and/or sheathed as specified; located within acceptable tolerances and adequately supported; and will allow for minimum shotcrete cover.
4. Verify that placement of reinforcing steel (or ducts) complies with spacing, profile, and quantity requirements.
5. Verify hooks, bends, ties, stirrups, and supplemental reinforcement are fabricated and placed as specified.
6. Verify required non-contact lap lengths.
7. Verify proper installation of approved mechanical connections and/or bolts.
8. Ensure all welds of reinforcing steel and other weldments are as specified and have been inspected and approved by welding inspector.
9. Verify formwork is proper size and shape; location of all construction joints; and penetrations and embeds are correct and adequately supported.
10. Check for ground wires or other thickness gauging control method.
11. Verify the nozzleman has suitable shooting positions and access to achieve placement with minimal rebound.
12. Review mixing and placing procedures with crew before commencement of application.
13. Verify that batch tickets indicate delivery of the approved mix as specified.
14. Observe placement for:
    a) Consistency
    b) Consolidation
    c) Coverage
    d) Rebound
    e) Finish
15. Check completed job for defects and corrective action.
16. Verify protection from temperature extremes and determine proper curing is initiated.

C. Sampling and Testing

1. Determine required type, quantity, and frequency of tests on fresh and hardened shotcrete.
2. When required, observe preparation of preconstruction test panel(s), simulating job conditions as closely as possible. The panel(s) thickness and reinforcing should represent:
    a) Most congested area specified in the structural design.
    b) Shot at the same angle, using the same nozzleman, and with the same mix design that will be used.
    c) Same equipment to be used during construction, unless substitution has been approved by the Building Official.
3. During construction, observe preparation of a test panel (either 18” x 18” or 12” x 12” based on aggregate size), or as otherwise specified, to obtain suitable cores for testing. Arrange correct positioning of sample panel to represent job shotcrete. Prearrange with nozzleman the correct timing of the test sample preparation and verify that it is representative of job placement, finish, and cure. Refer to ACI 506 for further guidance.
4. Strength testing requires not less than three specimens from each panel. Specimens shall be either 3” diameter cores or 3” cubes when maximum-size aggregate is larger than 3/8”. Specimens shall be at least 2” diameter cores or 2” cubes when maximum-size aggregate is 3/8” or smaller.
5. Mark panel with specimen identification, protect for curing period, and arrange for transportation to the testing laboratory.

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 8

PRE-TENSIONED CONCRETE

OBJECTIVE

Because the quality of materials used in prestressed construction is more closely controlled than normal concrete construction, there has developed a strong quality system program by plant manufacturers. As a result, the purpose of pre-tensioned concrete plant observation is to verify the actual control program and to check its effectiveness.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved shop detail drawings.
2. Verify that concrete mix designs, tensioning data, and calculations for stressing have been approved by the reviewing authority.
3. Verify that jacking equipment has been calibrated.

B. Mill and Plant Test Reports

1. Check conformance of all materials to project specifications. Verify steel mill test reports for prestressing steel and deformed bar steel. Verify mill markings and tags. Verify cement mill test reports and certification.
2. Check fabricator's testing facility and reporting of tests performed under fabricator's quality control program.

C. Sampling

1. Sample and deliver or ship to the laboratory for testing the following when independent tests are required by project specifications:
   a) Concrete aggregates
   b) Prestressing strand or wire
   c) Reinforcing steel
   d) Steel used for structural steel embedded items

D. Steel Fabrication of Embedded Items

1. Verify that qualified welders are employed to perform welding of structural steel using welding procedures qualified in accordance with AWS Structural Welding Code.

E. Pre-Placement Observations

1. Bed layout and form cleanliness.
2. Quantity and spacing of reinforcing and stressing steel.
3. Location of inserts and embedded items.
4. Profile of stressing steel.
5. Witness tensioning of prestressing elements, measure elongation of strand, and record gauge pressure.

F. Tests and Observation During Casting

1. Perform batch plant observations.
2. Conduct slump, air, and unit weight tests. Request adjustments as necessary.
3. Cast compression test specimens.
4. Observe placement and vibration of concrete in forms.
5. Observe finishing treatment.

G. Post-Placement Tests and Observations

1. Observe curing procedures, temperatures, and curing cycles.
2. Monitor compressive strength results for specified release strength.
3. Witness stress transfer.
4. Identify member by component and date cast.

H. Field Erection

1. Check members for damage during storage or shipment.
2. Check field installation and structural connections.

I. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 9

POST-TENSIONED CONCRETE

OBJECTIVE

Post-tensioned concrete is normally constructed onsite rather than fabricated in plants. As a result, more responsibility is placed on the independent inspection agency to verify that quality control meets acceptable standards.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved placing and stressing drawings furnished by the post-tensioning contractor.
2. Review the reinforcing steel placing drawings to check whether they have been coordinated with the stressing drawings.

B. Mill Test Reports

1. Check that reinforcing steel and post-tensioning steel supplied to job is properly identified and mill test reports show conformance to project specifications.

C. Sampling of Materials

1. Sample and deliver to the laboratory for testing the following materials when required by project specifications:
   a) Concrete aggregates and cement
   b) Prestressing strand, rods, or wire
   c) Reinforcing steel
   d) Steel used for structural inserts

D. Steel Fabrication of Embedded Items

1. Visit fabrication plant.
2. Verify that qualified welders only are welding in accordance with AWS Structural Welding Code.
3. Verify that only qualified welding procedures are being used.
4. Observe the welding operations and the finished product for defects and verify that corrections are made, if necessary.

E. Pre-Placement Observations

1. Check the general layout, size, spacing, and profile of all reinforcing steel and post-tensioning steel.
2. Observe all anchorages, inserts, embedded items, blockouts, conduits, etc.
3. Calibrate or review current calibration data on the proposed stressing equipment.

F. Observation During Placement of Concrete

1. Observe batch plant operations when required.
2. Observe concrete placement and report any damage or misalignment of any embedded components (with particular emphasis at end anchorages).
3. Cast compression test specimens.
4. Test slump, air content, and unit weight. Request adjustment as necessary.

G. Stressing

1. Verify that the concrete compressive strength meets the minimum required strength prior to post-tensioning.
2. Check the stressing sequence and verify the required post-tensioning forces.
3. Call to the attention of the structural engineer any out of tolerance discrepancy in force-elongation relationship, spelled concrete, broken tendons, or anchorage slippage.
4. Verify friction losses where applicable.
5. When using bonded tendons, observe grouting procedure.

H. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 10

MASONRY

OBJECTIVE

The purpose of special observation (level 1 or 2) for masonry is to verify that the workmanship and materials meet the minimum standards required by code and by the approved project plans and specifications. This is particularly difficult in masonry work where so much is dependent upon the capabilities of the individual mason. This requires the inspector to rely on knowledge, experience and judgment while applying the requirements of the applicable code to the particular condition.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and Statement of Special Inspections with the masonry contractor and architect's representative in a preconstruction meeting.
2. Verify whether high lift or low lift procedures have been approved and documented for use.

B. Mill Test Reports

1. Verify that mill test certifications for unit masonry, cement, reinforcing steel, and embedded anchors have been furnished by supplier and are acceptable to the architect/engineer.

C. Sampling of Materials

1. Sample and verify that the following materials are delivered to laboratory for testing when required:
   a) Concrete block or brick
   b) Aggregates and cement for mortar and grout
   c) Reinforcing steel as delivered

D. Storage of Materials

1. Verify cement, lime, block, and brick are supported on pallets and covered to protect from exposure to excessive moisture or drying.
2. Verify aggregates for mortar and grout are stored free from contamination and in such a manner as to minimize segregation.
3. Verify reinforcement, ties, and metal accessories are stored off the ground and in a manner to prevent permanent distortions.

E. Preparation for Lay-Up

1. Verify size and spacing of reinforcing dowels.
2. Verify length of dowel protruding from footing is of sufficient length to allow for the splicing of vertical reinforcing steel as required.
3. Verify that foundation concrete is clean and prepared as required by specifications.

F. Lay-Up or Placing of Masonry Units

1. Verify that cleanouts are provided for first course of each pour, if high lift method is used.
2. Verify plumb and lay-up configuration.
3. Verify moisture condition of masonry units.
4. Verify that proper mortar ingredients and batching techniques are being used and prepare mortar compression test specimens.
5. Verify mortar time on board.
6. Verify that head joints are the same thickness as face shells or that full head joints are used when specified.
7. Verify that mortar extrusions (fins) are cleaned off inside.
8. Verify whether joints are tooled as specified.
9. Verify required frequency of masonry wall prisms and observe construction of same as specified.
10. Observe horizontal and vertical reinforcing steel to verify:
    a) Reinforcing steel is of specified size and grade.
    b) Reinforcing steel is located and spliced as specified.
    c) Lap splices are staggered in bond beams and corners as required.
    d) Hooks are specified size and bent as required.
    e) Ties are specified size, spacing, and bent as required.
    f) Reinforcing steel is properly secured and minimum clearances are as required.
11. Verify embedded items are:
    a) Placed at proper location and secured.
    b) Proper size and clearances are as required.
12. Verify masonry is protected from weather:
    a) When ambient or CMU temperature falls below 40°F.
    b) When ambient temperature exceeds 100°F or 90°F (wind velocity greater than 8 mph).

G. Pre-grouting Tasks

1. Verify that cells and starting beds are clean.
2. Verify dowels, anchor bolts, and inserts are all in place, particularly at rooflines, floor lines, and intersecting wall lines.
3. Verify installation of cleanout closures.

H. Grouting Observations

1. Verify grout mix for conformance to approved mix design.
2. Verify slump is in accordance with the specifications.
3. If low lift grouting, verify maximum masonry height is in accordance with the code before grouting.
4. Verify consolidation (mechanical vibrating or puddling) during placement, and later during reconsolidation.
5. Monitor time since batching of grout.
6. Monitor flow of grout throughout wall and each grout pour height for conformance to specifications.
7. Preparation of any required grout specimens and/or prisms shall be observed. Note mortar specimens are no longer required.
8. Verify grout is stopped below top for keying where required.
9. Verify curing requirements are being followed.

I. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 11

STRUCTURAL STEEL

OBJECTIVE

The customary practice of fabrication of steel in the shop prior to erection conveniently allows division of observation of structural steel into two basic categories, shop and field. While the purpose is to assure that proper quality control is exercised at each location, the environment differs. Often the shop is fabricating other projects concurrently and may operate two or three shifts per day. The shop work is closely related to mass production, while the fieldwork relates closer to handcrafting. Proper scheduling and coordination by the general contractor is paramount to proper inspections in both venues.

The Statement of Special Inspections (SSI), prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective. To better achieve the objective of quality assurance, it is wise to use only one agency to fulfill the duties of both shop and field observation.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans and specifications, and review the approved shop drawings.
2. Review applicable sections of referenced codes, particularly the American Welding Society Structural Welding Code (AWS D1.1) and the Manual and Specifications of the American Institute of Steel Construction (AISC).
3. Review all welding procedures (qualified and prequalified) per governing code.

B. Mill Test Reports

1. Review mill test reports and check heat numbers with material as received. Verify that proper identification of steel is maintained during fabrication.

C. Sampling and Testing

1. When required by project specifications, mark sample location with steel stamp on each piece tested.
2. Record sample number and location and check that sample identification is maintained as samples are delivered to laboratory and tested.
3. When steel members are delivered to finish length and no "crop ends" are available for sample cutting, coordinate cutting and patching requirements with architect/engineer and fabricator.

D. Welding Observation (Applicable to Shop and Field)

1. Check all welders' certifications and verify that they work only as covered by their certification.
2. Keep a written record of all welders by name, their identifying steel mark, and the percentage of rejectable welds.
3. Upon detection of a rejectable weld (either visually or by nondestructive test), the inspector will notify the foreman for verification of defect. The inspector will observe removal of defects and repairs to check whether acceptable procedures were used.
4. Inspect joints for proper preparation, including bevel, root faces, root opening, etc.
5. Check the type and size of electrodes to be used for the various joints and positions. Check the storage facilities to see if they are adequate to keep the electrodes dry.
6. Observe the technique of each welder periodically with the use of a welding inspection shield.
7. Verify the use of Welding Procedure Specifications (WPS).
8. Observe multi-pass welds continuously. Continuous observation is defined as follows: The inspector is present in the welding area at all times. The extent of inspection of individual welds will depend on the number of operators welding.
9. Observe single pass fillet welds periodically (in accordance with CBC Section 1704.3.2), after determining that the operator is capable of producing the welds required.
10. If straightening or restraining of weldments is necessary, verify that approved methods will be used.
11. Tag or stamp accepted weldments with the inspector's identification stamp.

E. Workmanship

1. Check straightening and bending procedures.
2. Check cut edges, including those flame cut, sheared, or milled.
3. Check bolt holes for diameter size in major connections.

F. Additional Duties (if required by the SSI)

1. Verify that the welding sequence complies with approved construction documents.
2. Check steel frame joint details for compliance with approve construction documents, including details such as bracing and stiffening, member locations, and application of joint details at each connection.
3. During adverse weather conditions, check that adequate steps are taken to prevent moisture penetration at welding location.

F. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 12

HIGH STRENGTH BOLTING

OBJECTIVE

The purpose of high strength bolting observation (continuous or periodic) is to provide assurance that the proper bolt type(s) and installation procedures are used to meet the project specifications and applicable codes and industry standards.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors should diligently perform those duties while under the direct supervision of the materials engineering laboratory.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved shop drawings.
2. Review applicable sections of referenced codes, particularly American Institute of Steel Construction (AISC) 360.

B. Mill Test Reports

1. Review mill test reports and check identification markings with material as received.

C. Sampling and Testing

1. Sample high strength bolts, washers, and nuts for testing from the lots in the shop or on the jobsite, if required.
2. Record sample information from each lot and check that sample identification is maintained as samples are delivered to laboratory and tested.

D. High Strength Bolting Observation

1. Review type of joint specified (i.e., slip-critical, bearing-type).
2. Check bolts, nuts, and washers for compliance to project specifications.
3. Review the procedure for installation of bolts. The amount and type of inspection during installation will depend on the method used (i.e., turn-of-nut calibrated wrench, twist-off bolts, direct tension-indicator washers).
4. Check joint surfaces to verify that they are free of burrs, dirt, etc.
5. Observe preinstallation testing and calibration procedures when required.
6. Verify all plies of connected materials have been drawn together and properly snugged.
7. Monitor the installation of bolts to verify the selected installation procedure is properly used to tighten bolts.
8. For joints requiring only snug-tight condition, verify connected materials have been drawn together and properly snugged.

E. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 13

NONDESTRUCTIVE TESTING (NDT)

OBJECTIVE

The purpose of nondestructive testing is to verify that structural steel and/or completed welds are sound with respect to the given project criteria. Visual observation may not detect hidden fusion defects, cracking, and lamellar tearing. Therefore, it is important that all means necessary be available to the special inspector for reasonable verification of sound welds. Proper scheduling and coordination by the general contractor is paramount to proper inspections.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified NDT special inspectors performing standard test methods under the direction of the materials engineering laboratory can best achieve this objective. Since NDT tests are indirect (relying on a probing medium to disclose defects), accurate evaluation depends upon experienced, qualified personnel who are thoroughly trained in theory and applications.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved shop drawings.
2. Review applicable sections of referenced codes, particularly CBC Section 1708.4 and Section 6 of the AWS Structural Welding Code D1.1.
3. Where applicable, review welding procedures and sequences.

B. Personnel

1. All NDT personnel shall be qualified in accordance with the American Society for Nondestructive Testing, Recommended Practice SNT-TC-1A, (also CP189) and the supplement applicable to the method to be used. Only Level II and III inspectors, or Level I inspectors working under the direct supervision of a Level II or III inspector, are permitted to conduct the tests.

C. Method Selection

1. Method to be used shall be as prescribed by project specifications, building codes, or as recommended by the materials engineering laboratory under the direction of the design professional.
2. Effective use of NDT depends on utilizing the proper test method and techniques. Where field conditions or sequences affect the specified methods, the materials engineering laboratory will contact the project architect or engineer for suitable approved methods or techniques.

D. Tests

1. Perform tests as prescribed by contract documents, for welds, laminations, or lamellar tearing.
2. Upon detection of a defect, mark the defect and notify the foreman.
3. Keep written records of pieces, welds, welder identification marks, length and location of defects, method and date of repair, number of retests, records of performance of each welder (percent of rejected welds), and sampling rate.

E. Reports

1. Submit written progress reports describing the tests and observations made, their location, and any corrective actions taken.
2. Report the current percent of rejectable welds.

F. Standards

1. Many nondestructive testing standards and codes are presently available for information and reference. Most standards and codes specify equipment and personnel requirements, operational steps, and acceptance standards tied to the end-use function. Following is a partial list of the more common standard test methods.
   a) Radiography—AWS D1.1, ASTM E94 and E99, ASME Section V.
   b) Ultrasonic Testing—AWS D1.1, AWS D1.8, ASTM E164, ASME Section V.
   c) Magnetic Particle Testing—ASTM E109, ASME Section V.
   d) Penetrant Testing—ASTM E165, ASME Section V.

SECTION 14

FIRE-RESISTANT MATERIALS

Sprayed

OBJECTIVE

The purpose of spray-applied fire-resistant materials observation is to verify that the application of material is in accordance with the project specifications, applicable codes, and manufacturer's recommendations. Proper scheduling and coordination by the general contractor is imperative.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and manufacturer's recommendations.
2. Review applicable sections of referenced codes and standards (CBC Section 1704.10, AWCI 12-A).

B. Observation Procedures

1. Verify substrate condition for cleanliness prior to application.
2. Verify application in accordance with code, referenced standard, and specifications.

C. Testing and Sampling Duties

1. Measure thickness of spray-applied fire-resistive material in accordance with specifications, CBC Section 1704.10 and AWCI 12-A.
2. Remove and deliver samples to materials engineering laboratory for unit weight tests.
3. Perform cohesive/adhesive bond strength tests per ASTM E736.
4. Re-inspect areas repaired due to insufficient thickness or damage by sampling, tenant improvements, panel placement, rain, etc. (This work must be scheduled and coordinated by the general contractor.)

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

Mastic & Intumescent

OBJECTIVE

The purpose of mastic and intumescent fire-resistant coatings observation is to verify that the application of material is in accordance with the project specifications, applicable codes, and manufacturer's recommendations. Proper scheduling and coordination by the general contractor is imperative.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and manufacturer's recommendations.
2. Review applicable sections of referenced codes and standards (CBC Section 1704.11, AWCI 12-B).

B. Observation Procedures

1. Verify substrate condition for cleanliness prior to application.
2. Verify application in accordance with code, referenced standard, and specifications.

C. Testing Duties

1. Measure thickness of mastic or intumescent coating in accordance with specifications, CBC Section 1704.11 and AWCI 12-B.
2. Re-inspect areas repaired due to insufficient thickness or damage by sampling, tenant improvements, panel placement, rain, etc. (This work must be scheduled and coordinated by the general contractor.)

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 15

GLU LAM AND TRUSS JOISTS

OBJECTIVE

The fabrication of most glu lam and truss joist products is conducted in controlled plant conditions that are designed for a mass-produced product. The primary purpose of observing the product at the plant is to check the critical operations, such as gluing, and to provide verification that the quality control exercised by the fabricator is adequate.

To best achieve this objective, an experienced timber technician should be employed performing the following duties under the direct control of the materials engineering laboratory.

GLU LAM TIMBER OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and approved shop drawings.
2. Review applicable sections of referenced codes, particularly the Timber Construction Manual by the American Institute of Timber Construction (AITC) and reference standards of the California Building Code (CBC).
3. Verify that the proposed lumber grades, combinations, adhesive, and end joint details meet with code requirements.

B. Materials

1. Verify certifications on lumber grading, adhesives, and preservatives.
2. Verify lumber grade marks on the pieces being used.

C. Observation Requirements - Preliminary

1. Verify that shop drawings have been reviewed and stamped by architect/engineer and general contractor.
2. Verify that spacing of joints meets job and code requirements.
3. Measure moisture content of lumber and verify with acceptance range specified.
4. Check appearance grade requirements.
5. Verify preservative treatment requirements.

E. Observation of Sub-Assemblies (End Joints)

1. Verify lumber grade at end joints.
2. Gluing and curing procedure, verification of following:
   a) Lumber moisture, temperature, and cross-section
   b) Workroom humidity and temperature
   c) Adhesive certification, lot, and temperature
   d) Joint match and separation
   e) Assembly temperature, pressure, and time
   f) Sample and test representative joints

F. Laminating (Gluing)

1. Recheck lumber grades, combinations and faces, moisture, and temperature.
2. Record workroom temperature and humidity.
3. Adhesive certification, lot verification, and temperature.
4. Verify camber assembly.
5. Gluing and curing:
   a) Observe glue spread and check for skips.
   b) Record open time prior to clamping.
   c) Record clamping pressure.
   d) Record curing temperature and time.
   e) Sample and test (block shear, core shear, cyclic delamination).

G. Finishing

1. Recheck joint spacing and cross-sectional dimensions.
2. Observe repairs for appearance.
3. Record and inspect surface treatment.
   a) Preservative
   b) Sealer
   c) Primer or paint
4. Hammer-brand each member, prepare shipping certificate.
5. Observe and record wrapping.

G. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

TRUSS-TYPE JOIST CONSTRUCTION

A. Chord Fabrication

1. Perform all requirements of "Glu Lam Timber Observation Duties."
2. Check end joint spacing at panel points.
3. Check drilling and routing for webs.

B. Web Fabrication

1. Structural Steel:
   a) Review specification requirements.
   b) Review mill certification, steel, and coating.
   c) Sample and test, when specified.
2. Fabrication:
   a) Verify web wall thicknesses and diameters at specified locations.
   b) Check for splitting at flattened ends.
   c) Check alignment edge distance and pin placement.
   d) Check bridging clips, bearing clips, and ridge connector.
   e) Check truss dimensions.
   f) Check connector welding, if performed.

C. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 16

POST INSTALLED ANCHORS and DOWELS

OBJECTIVE

Post installed anchors and dowels involve those systems installed typically into concrete or masonry after it is hardened. Most of these anchor systems require drilling or coring to accomplish the installation. Many of these systems specify special inspection and/or testing to qualify them for certain load capacity.

Anchor installation inspection occurs during the installation process to verify the required procedures were followed. Anchor proof load testing occurs after the installation and may be specified for tension (pull-out) or torque (with wrench). Project requirements may require installation inspection or proof load testing and some may require both.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES FOR ANCHOR/DOWEL INSTALLATION

A. Documents

1. Review the approved plans, specifications, and other appropriate project documents.
2. Review applicable sections of referenced codes and standards, particularly the product manufacturers specifications and, if available, the ICC Evaluation Service (ES) Reports.

B. Materials

1. Verify brand or manufacturer of anchor.
2. Verify brand or manufacturer of epoxy or grout.
3. Verify the expiration dates on epoxies

C. Sampling of Materials

1. If required sample the materials in accordance with specified standards required.
2. Refer to the material engineering laboratory for direction in sampling procedures and specimen.

D. Observations Procedures

1. Identity the substrate as standard concrete, lightweight concrete, CMU, or brick.
2. Report the design strength of the concrete and age if known.
3. Report the orientation of the hole.
4. Check the anchor for size (diameter) and length
5. Check the epoxy for approved use
6. Check epoxy is proper for application
7. Verify drill or core size meets manufacture specs
8. Check diameter of hole and depth of holes
9. Check cleanliness of hole
10. Check holes spacing for compliance to specifications
11. Check holes after placement of inserts to verify fullness of epoxy contact.
12. Record ambient temperature and note if outside of specified range.

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OBSERVATION DUTIES FOR PROOF LOAD TESTING OF INSTALLED ANCHORS/DOWELS

A. Documents

1. Review the approved plans, specifications, and other appropriate project documents.
2. Verify the type of test load that is required (tension or torque).
3. Verify the frequency of tests that are required.
4. Verify the test load value is specified and approved as required. The special inspector is not authorized to determine the test value if it is not specified.
5. Review applicable sections of referenced codes and standards, particularly the production manufacturers specifications and, if available, the ICC Evaluation Service (ES) Reports.

B. Materials

1. Record the type of anchor system and epoxy reported as being used, and identify to source of this information. The anchor system cannot be verified unless the installation was witnessed.

C. Observations Procedures

1. Record the proof load equipment being used: rams, gauges, torque wrenches.
2. Verify the proof load equipment has been calibrated and record expiration date if available.
3. Identify any proof loading fixtures being used (load frames) and how they were set up.
4. Describe the anchor type, make, and model reported including diameter and length.
5. Record the testing location within the structure.
6. Record the proposed use of the anchor.
7. Record the quantity of anchors tested (passed and failed).
8. Record the quantity of anchors that were retested (passed and failed).
9. Record the percent anchor tested within that particular location of the structure.
10. Anchors which fail need to include remarks indicating what is being done about them in the future.
11. Record how the tested anchors were marked (pass–green, fail–red) or not.
12. Identity who was notified of the results of the testing.
13. Identify where the specified test loads were obtained.

D. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

SECTION 17

SHEAR WALLS AND FLOOR SYSTEMS USED AS HIGH LOAD DIAPHRAGMS

OBJECTIVE

The California Building Code is now requiring special inspection during the construction of the wood structural panel sheathing (plywood) shear walls and floor systems used as high load (shear) diaphragms. These are critically important elements to the structural integrity of the building, and are therefore considered appropriate for special inspection.

This guideline is intended for use in site-built structural wood assemblies. Prefabricated wood structural elements and assemblies require special inspection as specified in CBC Section 1704.2.

The Statement of Special Inspections, prepared by the responsible design professional, will define the special inspection task(s) required. Qualified special inspectors who diligently perform the duties listed below while under the direct supervision of the materials engineering laboratory can best achieve this objective.

OBSERVATION DUTIES

A. Documents

1. Review the approved plans, specifications, and other appropriate project documents.
2. Review applicable sections of referenced codes and standards, particularly the Timber Construction Manual by the American Institute of Timber Construction (AITC) and the California Building Code (CBC).

B. Materials

1. Verify material grades.
2. Verify nail type and size.

C. Sampling of Materials

1. Sample and deliver to the laboratory for testing the following materials when required by project specifications:
   a) Structural panel sheathing (i.e., plywood, gypsum, fiberboard, or particleboard)
   b) Framing lumber
   c) Fasteners used in attaching the sheathing including nails and screws.

E. Observation Procedures

1. Check nail spacing, penetration, and edge distance, and verify nail size.
2. Check for proper plywood thickness and grade.
3. Check for installation of blocking, when blocked edges are required.
4. Check the receiving members for spacing, size, and resistance to splitting.
5. Check for proper plywood layout per project requirements.
6. Check for “shiners” (nails penetrating structural panel sheathing only).
7. Verify that critical members have received the nail specified.

F. Gluing Operations

1. Materials
   a) Verify certifications on lumber grading, adhesives, and preservatives.
   b) Verify lumber grade marks on the pieces being used.
2. Observation Requirements - Preliminary
   a) Verify that spacing of joints meets job and code requirements.
   b) Measure moisture content of lumber and verify with acceptance range specified.
   c) Check appearance grade requirements.
   d) Verify preservative treatment requirements.
3. Observation of Sub-Assemblies
   a) Verify lumber grade at end joints.
   b) Gluing and curing procedure, verification of following:
      - Lumber moisture, temperature, and cross-section
      - Workroom humidity and temperature
      - Adhesive certification, lot, and
      - temperature
      - Joint match and separation
      - Assembly temperature, pressure, and time
4. Laminating (Gluing)
   a) Recheck lumber grades, combinations and faces, moisture, and temperature.
   b) Record workroom temperature and humidity.
   c) Adhesive certification, lot verification, and temperature.
   d) Gluing and curing:
      - Observe glue spread and check for skips.
      - Record open time prior to clamping.
      - Record clamping pressure.
      - Record curing temperature and time.

G. Reports

1. Submit written progress reports describing the tests and observations made and showing the action taken to correct nonconforming work. Itemize any changes authorized by architect/engineer. Report all uncorrected deviations from plans or specifications.

GUIDELINES FOR ISSUING IDENTIFICATION CARDS FOR SPECIAL INSPECTORS

INTRODUCTION

Background

In the interest of uniformity of enforcement of the California Building Code (CBC) Section 1704 (Special Inspections) requirements, as well as uniformity of qualifications of personnel to perform those functions, it became necessary to establish minimum standards for inspectors performing "special inspection" as defined in CBC.

The California Council of Testing and Inspection Agencies (CCTIA), a non-profit professional association of testing and inspection companies, was formed for the specific purpose of engendering uniformity in code enforcement inspection activities. CCTIA recommends the following as minimum standards. These standards are based on consensus deliberations as to the qualifications necessary to satisfactorily perform the duties prescribed by CBC.

Definition

"SPECIAL INSPECTOR" [Reference CBC Section 1704.1].

The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the building official, for inspection of the particular type of construction or operation requiring special inspection.

Identification

In order to ensure uniformity of inspector qualifications in a manner that would be verifiable by the Public Agency Building Official, the minimum qualification standards will become the basis for issuing identification cards for Special Inspectors.

OBJECTIVE

To institute a standard for minimum inspector qualifications which will serve as a guideline for issuing, in a controlled manner, official identification cards to Special Inspector(s) by the respective testing and inspection agency(ies).

A. General Requirements

1. Identification card (similar to sample following) must be signed by the Responsible Professional Engineer who is a full-time employee of an approved testing/inspection agency. Special Inspector must be an employee of the testing/inspection agency that issued the identification card.
2. Special Inspector shall have demonstrated ability to read plans and specifications commensurate with inspection duties.
3. Special Inspector shall be knowledgeable of the California Building Code (CBC) and applicable Standards (i.e. American Concrete Institute [ACI], American Welding Society [AWS], etc.).
4. Special Inspector shall observe the work assigned for conformance with the approved plans and specifications, and other approved documents.
5. Special Inspector shall furnish inspection reports, when requested, to the building official, the engineer or architect of record, and other designated persons. All discrepancies shall be brought to the immediate attention of the contractor for correction; then, if uncorrected, to the proper design authority and to the building official.
6. Special Inspector shall report whether the work requiring special inspection was, to the best of his/her knowledge, in conformance with the approved plans and specifications and the applicable workmanship provision of CBC.
7. Special inspection shall not be relied upon by others as acceptance of work, nor shall it in any manner relieve any contractor, or any other party, from their obligations and responsibilities under the construction contract, or generally accepted industry custom.

B. Experience

1. In order for experience to count toward qualification, it must be based on verifiable work directly related to the category or type of inspection involved.
2. An engineering degree (BS) plus appropriate in-house training may be substituted for not more than one year of experience. An engineering technology degree (AA) plus appropriate in-house training may be substituted for not more than six months experience.
3. Five or more years experience as a qualified Special Inspector in one or more categories of work may fulfill up to half of the experience requirements in any category, at the discretion of the Responsible Professional Engineer.

C. Certification

1. Certification, when specified, is intended to mean successful completion of an examination appropriate to the category of work involved and in accordance with the requirements of the certifying agency.

D. Special Inspector in Training

1. The intent of this provision is to provide practical opportunities for an inspector to gain the needed experience to qualify as a Special Inspector.
2. An inspector who does not meet the qualifications for Special Inspector may be allowed to perform "Special Inspection," at the discretion of the Responsible Professional Engineer, provided one or more of the following conditions are met:
   a) Individual is working under direct and continuous supervision of a Special Inspector fully qualified for the type of work involved.

b) Individual is working under indirect or periodic supervision of a Special Inspector and the scope of work is minor and/or routine and within the capabilities of the individual.

c) Individual is specifically approved by the Building Official.

GUIDELINES FOR ISSUING IDENTIFICATION CARDS FOR SPECIAL INSPECTORS (continued)

E. Minimum Qualifications for Work Categories of the "Special Inspector"

1. Reinforced Concrete
   a) Minimum one year experience, and
   b) Certification by ACI (Field Tech - Grade 1), and
   c) Certification in this Category.
2. Ductile Concrete
   a) Minimum six months experience plus three years experience in Category 1, and
   b) Certification in Category 1.
3. Prestressed Concrete
   a) Minimum six months plus three years experience in Category 1, and
   b) Certification by ACI (Field Tech - Grade 1), and
   c) Certification in this Category.
4. Shotcrete
   a) Minimum three months experience, and
   b) Certification in Category 1.
5. Welding
   a) Minimum three years experience, and
   b) Certification in this Category.
6. NDT (Structural Steel)
   a) Experience per ASNT-TC-1A guidelines
7. High Strength Bolting
   a) Minimum six months experience, or qualified in Category 5, and
   b) Certification in this Category.
8. Structural Masonry
   a) Minimum one year experience, or six months plus qualified in Category 1, and
   b) Certification in this Category.
9. Reinforced Gypsum and Insulating Concrete
   a) Qualified in Category 1.
10. Fire-resistant Materials Sprayed/Mastic/Intumescent)
    a) Minimum six months experience, or three months plus qualified in Category 1 or 5, and
    b) Certification in this Category.
11. Piling, Drilled Piers and Caissons
    a) Concrete Work Qualified in Category 1.
    b) Soil Work Qualified in Category 12.
12. Soils (Grading, Excavation and Filling)
    a) Minimum three years experience,
    b) Certification optional.
13. Post-Installed Anchors and Dowels (Installation and proofload testing)
    a) Minimum three months
    b) Certification not required
14. Structural Wood and Glu Lam
    a) Minimum two years experience,
    b) Certification optional.
15. Asphaltic Concrete
    a) Minimum one year experience,
    b) Certification optional.
16. Roofing
    (b) Minimum one year experience,
    (c) Certification optional.
17. Field Sampling and Field Testing in Any Category
    a) Minimum three months experience,
    b) Certification by ACI (Field Tech – Grade 1 required for concrete.
18. Special Inspector in Training
    a) In training for experience, and
    b) No certifications required.

F. Reference Abbreviations & Recognized Certifying Agencies

1. AA Associate of Arts
2. AASHTO American Association of State Highway and Transportation Officials
3. ACI American Concrete Institute
4. ACIA American Construction Inspectors Association
5. ASTM American Society for Testing and Materials
6. ASNT American Society for Nondestructive Testing
7. AWS/ACWI American Welding Society/Associate Certified Welding Inspector
8. AWS/CWI American Welding Society/Certified Welding Inspector
9. BS Bachelor of Science
10. CBC California Building Code
11. DSA Division of the State Architect
12. IAS International Accreditation Service
13. ICC International Code Council
14. NICET National Institute for Certification of Engineering Technologists
15. NRCA National Roofing Contractors Association
16. OSHPD Office of Statewide Health Planning and Development
17. PCI Precast Concrete Institute
18. PTI Post-Tensioning Institute

SAMPLE ID CARD

Front

Company Logo

EMPLOYEE IDENTIFICATION CARD

Control No. _____

This is to certify that

_____

is duly qualified to perform the duties of special inspector as indicated on the reverse side of this card.

Member of CCTIA

Employee's Photo

Issued date or
Expiration date: _____

_____

Authorized Professional Engineer's Signature

Company Address/Phone

Back

CONCRETE
____ Reinforcing/Embeds
____ Placement
____ Batch Plant
____ Prestressing
____ Ductile Moment
____ Shotcrete
____ Proofloading Anchor
____ Post-Installed Anchor
____ Sample/Test

MASONRY
____ Reinforcing
____ Placement/Grouting
____ Sample/Test

ASPHALT CONCRETE
____ Placement
____ Batch Plant
____ Sample/Test

ROOFING
____ Placement
____ Sample/Test

OTHER (specify)

STRUCTURAL STEEL
_____ Fabrication/Erection
_____ Visual Welding
_____ High Strength Bolting
_____ Sample/Test

Nondestructive Testing
MT ____ PT ____ UT ____ RT ____

FIREPROOFING
_____ Placement
_____ Sample/Test

STRUCTURAL WOOD
_____ Plant Fabrication
_____ Truss Joist Fabrication
_____ Glu Lam Fabrication
_____ Shear Diaphragms
_____ Sample/Test

SOILS
_____ Excavation, Grading, Piling
_____ Drilled Piers, Caissons
_____ Pile Placement
_____ Nuclear Density
_____ Sample/Test

Back (simplified)

ICC _____RC_____PC_____SM_____SSW_____HSB_____FP

AWS_____CWI_____

NDT _____MT_____UT_____RT_____DP_____AWS/CWI

_____ ACI
_____ Soils
_____ AC
_____ Roofing

_____ DSA Mas
_____ DSA Shot
_____ Fire/Life Safety
_____ CalTrans

_____ Haz/Mat
_____ ICC E/M/P
_____ ICC Bldg.
_____ Nuc. Gauge

NOTE: On the line to the left, mark applicable special inspection and/or testing items based on the employee's conformance with the experience and certification criteria noted above. An "**X**" should be used to indicate the employee is qualified; "**SIIT**" should be used to indicate in-training status. The ID Card format is only a sample and is not intended to be mandatory.

STATEMENT
OF
SPECIAL INSPECTIONS
AND
SCHEDULE
OF STRUCTURAL TESTING
In Accordance with the 2007 CBC

Prepared by

SEAONC Construction Quality Assurance Committee
2010

Statement of Special inspections, 2007 CBC

Project: .....

Location: .....

This Statement of Special Inspections is submitted in fulfillment of the requirements of CBC Sections 1704 and 1705. Included are:

- Schedule of Special Inspections and tests applicable to this project:
  - ☐ Special Inspections per Sections 1704 and 1705
  - ☐ Special inspections for Seismic Resistance
  - ☐ Special inspections for Wind Resistance
- List of the Testing Agencies and other special inspectors that will be retained to conduct the tests and inspections.

Special Inspections and Testing will be performed in accordance with the approved plans and specifications, this statement and CBC sections 1704, 1705, 1707, and 1708.

The Schedule of Special Inspections summarizes the Special Inspections and tests required. Special Inspectors will refer to the approved plans and specifications for detailed special inspection requirements. Any additional tests and inspections required by the approved plans and specifications will also be performed.

Interim reports will be submitted to the Building Official and the Registered Design Professional in Responsible Charge in accordance with CBC Section 1704.1.2

A Final Report of Special Inspections documenting required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy (Section 1704.1.2). The Final Report will document:

- Required special inspections.
- Correction of discrepancies noted in inspections.

The Owner recognizes his or her obligation to ensure that the construction complies with the approved permit documents and to implement this program of special inspections. In partial fulfillment of these obligations, the Owner will retain and directly pay for the Special Inspections as required in CBC Section 1704.1.

This plan has been developed with the understanding that the Building Official will:

- Review and approve the qualifications of the Special Inspectors who will perform the inspections.
- Monitor special inspection activities on the job site to assure that the Special Inspectors are qualified and are performing their duties as called for in this Statement of Special Inspection.
- Review submitted inspection reports.
- Perform inspections as required by the local building code.

Prepared by:

Registered Design Professional in Responsible Charge

Signature Date

Owner's Authorization:

Owner

Signature Date

Building Official's Acceptance:

Building Official

Signature Date

Schedule of Inspection, Testing Agencies, and Inspectors

The following are the testing agencies and special inspectors that will be retained to conduct tests and inspection on this project.

Responsibility	Firm	Address, Telephone, E-mail
1. Special Inspection (except for geotechnical)	*To Be Determined*	
2. Material Testing	*To Be Determined*	
3. Geotechnical Inspections	*To Be Determined*	
4.	*To Be Determined*	

Seismic Requirements (Section 1705.3.1)

Description of seismic-force-resisting system and designated seismic systems subject to special inspections as per Section 1705.3:

The extent of the seismic-force-resisting system is defined in more detail in the construction documents.

Wind Requirements (Section 1705.4.1)

Description of main wind-force-resisting system and designated wind resisting components subject to special inspections in accordance with Section 1705.4.2:

The extent of the main wind-force-resisting system and wind resisting components is defined in more detail in the construction documents.

SCHEDULE OF SPECIAL INSPECTION

Notation Used in Table :

Column headers:

- C — Indicates continuous inspection is required.
- P — Indicates periodic inspections are required. The notes and or contract documents should clarify.

Box entries:

- X — Is placed in the appropriate column to denote either "C" continuous or "P" periodic inspections.
- --- — Denotes an activity that is either a one-time activity or one whose frequency is defined in some other manner.

Additional detail regarding inspections and tests are provided in the project specifications or notes on the drawings.

Verification and Inspection	C	P	Notes
1704.2.1 – Inspect fabricator's fabrication and quality control procedures.	---	---	
Table 1704.3 – Steel			
1. Material verification of high-strength bolts, nuts, and washers.			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		X	
b. Manufacturer's certificate of compliance required.		X	
2. Inspection of high-strength bolting:			
a. Bearing-type connections.		X	
b. Slip-critical connections	X	X	
3. Material verification of structural steel:			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	---	---	
b. Manufacturer's mill test reports	---	---	
4. Material verification of weld filler materials:			
a. Identification markings to conform to AWS designation listed in the WPS.	---	---	
b. Manufacturer's certificate of compliance required.	---	---	
5. Inspection of welding:			
a. Structural steel			
1) Complete and partial penetration groove welds.	X		
2) Multi-pass fillet welds.	X		
3) Single-pass fillet welds > 5/16".	X		
4) Single-pass fillet welds ≤ 5/16".		X	

Verification and Inspection	C	P	Notes
5) Floor and roof deck welds.		X	
b. Reinforcing steel			
1) Verification of weldability of reinforcing steel other than ASTM A706.		X	
2) Reinforcing steel-resistin g flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls, and shear reinforcement.	X		
3) Shear reinforcement.	X		
4) Other reinforcing steel		X	
6. Inspection of steel frame joint details for compliance with approved construction documents: a. Details such as bracing and stiffening. b. Member locations. c. Application of joint details at each connection.		X	
1704.3 – Welded studs when used for structural diaphragms.		X	
1704.3 – Welding of cold-formed sheet steel framing members.		X	
1704.3 – Welding of stairs and railing systems.		X	
Table 1704.4 – Concrete			
1. Inspection of reinforcing steel, including prestressing tendons and placement.		X	
2. Inspection o f reinforcing steel welding in accordance with Table 1704.3 Item 5b.	---	---	
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X		
4. Verifying use of required design mix.		X	
5. At time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests and determine the temperature of the concrete.	X		
6. Inspection of concrete and shotcrete placement for proper application techniques.	X		
7. Inspection for maintenance of specified curing temperature and techniques.		X	
8. Inspection of prestressed concrete.			
a. Application of prestressing forces.	X		
b. Grouting of bonded prestressing tendons in the seismic force-resisting system.	X		
9. Erection of precast concrete members.		X	
10. Verification of 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	

Verification and Inspection	C	P	Notes
11. Inspect formwork for shape, location, and dimensions of the concrete member being formed.		X	
Table 1704.5.1 – Level 1 Masonry Inspections.			
1. At the start of masonry construction verify the following to ensure compliance:			
a. Proportions of site-prepared mor tar.		X	
b. Construction of mortar joints.		X	
c. Location of reinforcement, connectors, prestressing tendons, and anchorages.		X	
d. Prestressing technique.		X	
e. Grade and size of prestressing tendons and anchorages.		X	
2. Verify:			
a. Size and location of structural elements.		X	
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.		X	
c. Specified size, grade, and type of reinforcement.		X	
d. Welding of reinforcing bars.	X		
e. Protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).		X	
f. Application and measurement of prestressing force.		X	
3. Prior to grouting verify the following to verify compliance.			
a. Grout space is clean.		X	
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.		X	
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.		X	
d. Construction of mort ar joints.		X	
4. Verify grout placement to ensure compliance with code and construction document provisions.	X		
a. Observe grouting of prestressing bonded tendons.	X		
5. Observe preparation of required grout specimens, mortar specimens, and/or prisms.	X		
6. Verify compliance with required inspection provisions of the construction documents and the approved submittals.		X	
Table 1704.5.3 – Level 2 Masonry Inspections			
1. From the beginning of masonry construction the following shall be verified to ensure compliance:			

Verification and Inspection	C	P	Notes
a. Proportions of site-prepared mortar, grout, and prestressing grout for bonded tendons.		X	
b. Placement of masonry units and construction of mortar joints.		X	
c. Placement of reinforcement, connectors, and prestressing tendons and anchorages.		X	
d. Grout space prior to grouting.	X		
e. Placement of grout.	X		
f. Placement of prestressing grout.	X		
2. Verify:			
a. Size and location of structural elements.		X	
b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, and other construction.	X		
c. Specified size, grade, and type of reinforcement.		X	
d. Welding of reinforcing bars.	X		
e. Protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).		X	
f. Application and measurement of prestressing force.	X		
3. Preparation of any required grout specimens, mortar specimens, and/or prisms shall be observed.	X		
4. Compliance with required provisions of construction documents and the approved submittals shall be verified.		X	
1704.6 – Inspect prefabricated wood structural elements and assemblies in accordance with Section 1704.2	---	---	
1704.6 – Inspect site built assemblies.	---	---	
1704.6.1 – Inspect high-load diaphragms:			
1. Verify grade and thickness of sheathing.	---	---	
2. Verify nominal size of framing members at adjoining panel edges.	---	---	
3. Verify: a. Nail or staple diameter and length, b. Number of fastener l ines, c. Spacing between fasteners in each line and at edge margins.	---	---	
Table 1704.7 – Inspection of Soils			
1. Verify materials below footings are adequate to achieve the desired bearing capacity.		X	
2. Verify excavations are extended to p roper depth and have reached proper material.		X	
3. Perform classification and testing of controlled fill materials.		X	

Verification and Inspection	C	P	Notes
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill.	X		
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.		X	
Table 1704.8 - Pile Foundations			
1. Verify pile materials, sizes, and lengths comply with the requirements.	X		
2. Determine capacities of tes t piles and conduct additional load tests, as required.	X		
3. Observe driving operations and maintain complete and accurate records for each pile.	X		
4. Verify locations of piles and their plumbness a. Confirm type and size of hammer. b. Record numb er of blows per foot of penetration. c. Determine required penetrations to achieve design capacity. d. Record tip and but elevations and record any pile damage.	X		
5. For steel piles, perform additional inspections in accordance with Section 1704.3.	---	---	
6. For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	---	---	
7. For augered uncased piles and caisson piles, perform inspections in accordance with Section 1704.9.	---	---	
Table 1704.9 – Pier Foundations			
1. Observe drilling operations and maintain complete and accurate records for each pier.	X		
2. Verify locations of piers and their plumbness Confirm: a. Pier diameters, b. Bell diameters (if applicable), c. Lengths, embedment into bedrock (if applicable), d. Adequate end strata bearing capacity.	X		
1704.10 – Sprayed Fire-Resistant Materials			
1. Inspect surface for accordance with the approved fire-resistance design and the approved manufacturer's written instructions.	---	---	
2. Verify minimum ambient temperature before and after application.	---	---	
3. Verify ventilation of area during and after application.		X	
4. Measure average thickness per ASTM E605 and Section 1704.10.3.	---	---	

Verification and Inspection	C	P	Notes
5. Verify density of material for conformance with the approved fire-resistant design and ASTM E605.	---	---	
6. Test cohesive/adhesive bond strength per Section 1704.10.5.	---	---	
1704.11 – Mastic and Intumescent Fire-Resistant Coating	---	---	
1704.12 – Exterior Insulation and Finish Systems (EIFS)	---	---	
1704.13 – Alternate Materials and Systems	---	---	
1704.14 –- Smoke Control System	---	---	
1705.3 – Seismic Resistance			
1705.3 [4.3] – Suspended ceiling systems and their anchorage.	---	---	
1705.4 – Wind Resistance			
1705.4.2 1. Roof cladding and roof framing connections.	---	---	
2. Wall connections to roof and floor diaphragms and framing.	---	---	
3. Roof and floor diaphragm systems, including collectors, drag struts, and boundary elements.	---	---	
4. Vertical wind-force-resisting systems, including braced frames, moment frames, and shear walls.	---	---	
5. Wind-force-resisting system connections to the foundation.	---	---	
6. Fabrication and installation of systems or components required to meet the impact resistance requirements of Section 1609.1.2.	---	---	
Special Inspections for Seismic Resistance			
1707.2 – Special inspection for welding in accordance with AISC 341.	X		
1707.3 – Structural Wood			
1. Inspect field gluing operations of elements of the seismic-force-resisting system.	X		
2. Inspect nailing, bolting, anchoring, and other fastening of components within the seismic-force-resisting system, including: a. wood shear walls, b. wood diaphragms, c. drag struts, braces, d. shear panels, e. hold-downs.		X	
1707.4 – Cold-Formed Steel Framing			
1. Welding of elements of the seismic-force-resisting system.		X	
2. Inspection of screw attachments, bolting, anchoring, and other fastening of components within the seismic-force-resisting system including struts, braces, and hold-downs.		X	

Verification and Inspection	C	P	Notes
1707.5 – Pier Foundations			
1. Placement of reinforcing		X	
2. Placement of concrete	X		
1707.6 – Anchorage of storage racks and access floors 8 feet or greater in height.		X	
1707.7 – Architectural Components			
1. Inspect erection and fastening of exterior cladding weighing more than 5 psf.		X	
2. Inspect erection and fastening of interior and exterior non-bearing walls weighing more than 15 psf.		X	
3. Inspect erection and fastening of interior and exterior veneer weighing more than 5 psf.		X	
1707.8 – Mechanical and Electrical Components			
1. Inspect anchorage of electrical equipment for emergency or stand-by power systems.		X	
2. Inspect anchorage of non -emergency electrical equipment.		X	
3. Inspect installation of piping systems and associated mechanical units carrying flammable, combustible, or highly toxic contents.		X	
4. Inspect installation of HVAC ductwork that contains hazardous materials.		X	
5. Inspect installation of vibration isolation systems where required by Section 1707.8.		X	
1707.9 – Verify that the equipment label and anchorage or mounting conforms to the certificate of compliance when mechanical and electrical equipment must be seismically qualified.	---	---	
1707.10 – Seismic isolation system: Inspection of isolation system per ASCE 7 – Section 17.2.4.8		X	
1708.1 – Masonry Testing for Seismic Resistance			
1708.1.1 – Verify certificates of compliance prior to construction.	---	---	
1708.1.2 – Verification of f'_m and f'_{AAC} prior to construction.	---	---	
1708.1.2 – Verification of f'_m and f'_{AAC} every 5000 square feet during construction.		X	
1708.1.4 – Verification of proportions of materials in mortar and grout as delivered to the site.	---	---	
1708.3 – Obtain mill certificates for reinforcing steel, verify compliance with approved construction documents, and verify steel supplied corresponds to certificate.	---	---	
1708.4 – Structural Steel: Invoke the QAP Quality Assurance requirements in AISC 341.	---	---	
1708.5 – Obtain certificate that equipment has been tested per Section 1708.5.	---	---	
1708.6 – Obtain system tests as required by ASCE 7 Section 17.8.	---	---	

SCHEDULE OF STRUCTURAL TESTING

Table Notes :

1. Additional detail regarding tests is provided in the project specifications or notes on the drawings.
2. Only tests to be performed by the Owner's testing agency are listed.

Test			Notes
Structural Steel			
1. Non-destructive testing of weld s *(CBC Sectior 1708.4, AISC 341 Appendix Q, AWS D1.1)*:			
a. Ultrasonic testing (UT)			
b. Magnetic particle testing (MT)			
2. Ultrasonic testing of base metal greater than 1.5 inches in thickness *(CBC Section 1708.4)*			
3. Coupon tests for material v erification of unidentified steel *(CBC Section 2203)*:			
a. Structural steel sections			
b. High-strength bolts			
b. Welded studs			
4. Special moment-resisting frame connections that are not prequalified per AISC *(AISC 341 Appendix S).*			
Concrete & Shotcrete			
1. Compressive tests of specimens taken during concrete placement *(CBC Section 1905.6, ACI 318 Section 5.6).*			
2. Shrinkage tests of specimens taken during concrete placement.			
3. Shotcrete preconstruction test panels *(CBC Section 1913.5)*.			
4. Shotcrete core specimens taken from production test panels *(CBC Section 1913.10*).			
5. Chemical tests of ASTM A615 reinforcing bars that are to be welded. *(CBC Table 1704.3, Item 5.b.1)*			
6. Tension/torque testing of post-installed anchors in concrete.			
Masonry			
1. Test masonry units to verify compressive strength f'_m *(CBC Section 2105.2)*.			
2. Compressive tests of grout and mortar specimens taken during placement*(CBC Section 2105.2)* .			
3. Test masonry prisms *(CBC Section 2105.3)*.			
4. Chemical tests of ASTM A615 reinforcing bars that are to be welded. *(CBC Table 1704.3, Item 5.b.1)*			
5. Testing of unidentified reinforcing steel *(CBC Section 2103.13.8)*.			

Test			Notes
6. Tension/torque testing of post-installed anchors in masonry.			
Soils			
1. Perform classification and testing of controlled fill materials *(CBC Table 1704.7).*			
Pile Foundations			
1. Determine capacities of test piles and conduct additional load tests, as required *(CBC Table 1704.8)*.			

CALIFORNIA COUNCIL OF TESTING AND INSPECTION AGENCIES

Additional copies of the Guideline may be requested at no cost from any CCTIA member agency