

SPECIAL INSPECTION PROGRAM  
GUIDELINES

**TABLE OF CONTENTS**

I. INTRODUCTION TO SPECIAL INSPECTION GUIDELINES ..... i

II. REVIEWING PLANS FOR SPECIAL INSPECTION REQUIREMENTS ..... ii

III. PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL  
INSPECTION ..... iii

IV. SPECIAL INSPECTION AND TESTING AGREEMENT ..... 1

\*\*\*\*\*

## FOREWORD

*A note from the authors to potential users of this Guideline:*

The intent of this guideline is bring a simple, usable Special Inspection guideline for jurisdictions in the Sacramento Valley area and beyond. The authors have compiled forms and inspection information to help jurisdiction staff, architects, engineers, inspectors, owners and contractors understand the reason for special inspection and how it can successfully be enforced.

This document is intended as a guideline, and a such should be used only after studying the contents and incorporating any unique jurisdictional requirements into the procedures. For those jurisdictions without a written special inspection procedure, this guideline can function as the basis for such a program. Jurisdictions which already have a program in place may find these guidelines contain information useful for reviewing existing inspection procedures.

Our thanks to the building officials, engineers and inspection representatives who contributed their time and effort to this project. The Ad-Hoc Committee on Special Inspection with the Sacramento Valley Chapter of ICBO was formed to provide a simple, useful special inspection guideline; we hope you will find use for the information contained inside.

*The Ad-Hoc Committee on Special inspection  
Sacramento Valley Chapter of ICBO*

October 27, 1992

## **I. INTRODUCTION TO SPECIAL INSPECTION GUIDELINES**

The Sacramento Valley Chapter of ICBO has compiled this informational booklet on special inspection which has been adopted by policy of the Yuba City Building Inspection Division. As special inspection is meant to augment the general inspections performed by building department staff, it is crucial to have a well defined and documented system of enforcing and administering special inspection. By informing the applicant and related project managers of the special inspection program and instructing building department staff in its proper enforcement, the intent of special inspection to provide increased building quality can be realized.

The following guidelines present a base format of special inspection procedures which will be used to formulate a building department's special inspection policy. As each jurisdiction has its own specific administrative concerns and staff constraints, modification to these guidelines will likely be needed to meet those needs. Also, the building official must coordinate the implementation of this policy with existing ordinances and policies. However, the more closely these guidelines are followed and forms kept in their original format as presented in this booklet, the more uniform the policies of each jurisdiction become. This uniformity translates into a greater familiarity of special inspection procedures by all parties involved and will reduce the time and budget an individual jurisdiction must spend in explaining and enforcing its particular inspection program.

Contained in this booklet are Special Inspection and Testing program forms, methods for reviewing and approving special inspection agencies and individuals, technical guidelines on specific special inspection and testing items, plan review guidelines for identifying special inspection items and sample documentation formats to be used in the field for reporting inspection and testing information.

As with any code issue, the requirements for special inspection change over time for both building departments and special inspectors. As these changes occur, this document will require modification to keep pace with those changes. Building departments using this procedure are encouraged to relate any questions, problems or comments concerning this guideline to Sacramento Valley Chapter/ICBO to assist in keeping these guidelines current, usable and effective.

## **II. REVIEWING PLANS FOR SPECIAL INSPECTION REQUIREMENTS**

Special inspection requirements per UBC 1701 must be identified on the construction documents of all projects. Although UBC 106.3.2 mandates that the responsible architect or engineer identify each item requiring special inspection, it is good practice to review the items listed for special inspection to their accuracy with the building design calculations (for material strengths) and check that the format on the construction documents corresponds with the items as listed in section 1701 of the Uniform Building Code.

As a matter of uniformity, the items requiring special inspection should be listed by the architect/engineer on the project plans. The list of special inspection may also be found in the project specifications. By having the special inspection list on the plans (having the list on the front sheet of the plans or on the first sheet of the structural plans are common locations), the inspectors will have a better opportunity to identify special inspection concerns on an unfamiliar project. The Special Inspection and Testing Agreement forms (found later in this guideline) are intended to accompany the approved plans as supplemental special inspection information.

When reviewing plans and calculations for verification of special inspection, it is good practice to use the list in the Building Code section 1701 as a checklist for potential building components requiring such inspection. Any questions a plans examiner might have concerning stresses used in the structural design (concrete, masonry, welds, high strength bolts, bolts in concrete) can be addressed to the structural designer as a part of the plan review process. Specific special inspection items should be identified to the designer for the designer's verification. Reference to UBC 1701 and 106.3.5 should be made if there is any question in the designer's mind as to the inspection items responsibility of identifying special inspection items.

There are several items not structurally related which require special inspection and testing, primarily spray applied fireproofing and smoke removal systems for high rise buildings and atria. For projects involving these life safety systems, the building design professional shall further specify on the plans testing requirements for these life safety systems.

Ultimately, the building code places the responsibility of special inspection identification on the designers. The plans examiner should verify all items requiring special inspection are clearly identified on the plans, special inspection documentation necessary to enforce the jurisdiction's inspection policy is completed, inspectors identified and approved and questions concerning the jurisdiction's inspection policy answered for the applicant.

The following is a brief description of special inspection items along with plan review and inspection highlights.

*Note: the 1994 UBC w/California Amendments is used as the reference document in the preparation of this list.*

### **1. Special Grading, Excavation and Filling:**

Special Inspection for earthwork involves the monitoring and verification of special soil preparation techniques and grading contours as required in the engineering design.

#### **PLAN REVIEW**

Earthwork operations which require engineered fill, special soil preparation or grading require inspection for proper material use, compaction and other earthwork operations. If a soils/geotechnical report is associated with a project, special inspection is often required to field check the assumptions used in the soils report and verify soil preparation techniques are properly carried out at the site.

#### **INSPECTION**

Proper inspection and control of earthwork can be divided into two areas of activity. The first involves the observation and/or monitoring of the earthwork during construction, paying particular attention to soil preparation, placement and compaction operations. Also, the Inspector should note and act on any unusual soil conditions which were not anticipated in the preparation of the soils report. The second activity involves soils testing to verify the quality of the earthwork agrees with the project specifications.

### **2. Piling, Drilled Piers and Caissons:**

Due to the special techniques required for proper deep foundation construction, special inspection for piling, piers and caissons is required.

#### **PLAN REVIEW**

The use of these types of foundation systems requires verification of proper load capacity data (piles), size and depth of drilled piers (piers and caissons). Also, a review of requirements contained in the project geotechnical report should be done to note any special conditions or limitations placed on the use of such foundation systems.

#### **INSPECTION**

The inspection of these foundation systems involves the verification of acceptable subsurface conditions (often as established in the geotechnical report), type of pile being used, and confirming the depth, diameter and load capacity as required by the type of installation. This type of construction often involves the coordination of other special inspection items (i.e.

concrete/reinforcement, prestressing, soil preparation, welding, etc.); the jurisdiction's inspector should work with the contractor in identifying these tasks so the operation can be performed without inspection delay.

### **3.Reinforcing Steel and Prestressing Steel:**

These sub-components of concrete construction require special inspection when mandated by the structural design stresses.

#### **PLAN REVIEW**

All operations for placing reinforcing steel and prestressed steel require special inspection of the design stresses of the concrete in which the steel is placed requires special inspection under item 5. Note that continuous inspection is not required for the placing operations if conformance to plans is verified prior to placing concrete. All prestressing operations require special inspection. .

#### **INSPECTION**

Reinforcement size, material specification (grade) and placement are verified during the inspection process. Proper prestressing forces are confirmed during prestressing operations. Attention to lap splices and other reinforcement detailing requirements are also of major importance.

### **4.Bolts Cast in Concrete:**

Proper performance of concrete embedded bolts depends on a correct bolt installation. Special inspection is required where bolt loads dictate a high level of accuracy in their use.

#### **PLAN REVIEW**

Check the calculations for the allowable loads used in the design of cast-in-place anchor bolts. Section 1925 and Table 19-E (service load design) establish allowable loads for bolts with or without special inspection. Strength design of bolts in concrete mandates increased load factor values if special inspection is not provided. Check calculations for these multipliers if strength design is used.

#### **INSPECTION**

The purpose of anchor bolt placement inspection is to confirm the bolt type and placement in accordance with the approved plans and code requirements. Additionally, proper consolidation of concrete around the anchor bolt(s) during concrete placement operations is monitored.

The scope of this inspection item does not include bolts installed after concrete placement, such as drilled expansion anchors or grouted/epoxied anchors. These types of bolt installations may require special inspection under a separate listing.

## **III.PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL INSPECTION (cont'd)**

### **5.Concrete:**

Structural concrete often requires close monitoring to insure the mixing and placement operations are done according to the approved documents.

#### **PLAN REVIEW**

All structural concrete requires special inspection except for foundation concrete using design strengths ( $f_c$ ) no greater than 2500 psi and conventionally designed and constructed footings for R-3 and M-1 occupancies built in accordance with UBC Table 18-1-D. Other exceptions include nonstructural slabs on grade and other earth supported site concrete (sidewalks, patios, driveways, etc.).

#### **INSPECTION**

Special inspection of concrete entails many inspection and testing procedures. Of primary concern are the verification of proper materials used in the concrete mix, observing the handling and placement of the wet mix, and verifying through testing the strength properties of the placed concrete.

#### **6. Structural Masonry**

In situations where masonry is used for significant structural strength, special inspection verifies proper construction practices are used in assembling the various components of a structural masonry element.

#### **PLAN REVIEW**

Special inspection is required for all structural masonry unless the structural design stresses have been halved in accordance with Chapter 24. Structural calculations must be reviewed to determine and verify these stress levels.

#### **INSPECTION**

Continuous special Inspection, including observation of lay up, verification of reinforcing steel, proper grouting procedures, and material testing (i.e. prism tests, grout sampling, etc.) is required for structural masonry. Periodic Inspection may be approved by the building official when certain construction techniques and masonry strengths are used.

#### **7. Welding:**

As a general rule, all structural welding requires special inspection unless done in a shop of an "Approved Fabricator" possessing current certification approved by the building official.

### **III. PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL INSPECTION (cont'd)**

#### **PLAN REVIEW**

Whenever structural welding is called for on a project, special inspection is required. Noncontinuous (periodic) inspection may be permitted on single pass, half-stressed welds (to be verified in design calculations) and metal floor/roof composite decks. Check calculations and plans for structural and/or reinforcing steel welding.

## **INSPECTION**

The special inspector will verify the welding process, procedure and welder qualifications are in accordance with the approved documents. Components arriving at the jobsite prewelded should be identified as being welded by an " Approved Fabricator" shop in accordance with the UBC section 1701.7.

### **8.High Strength Bolts:**

The proper use of high strength bolts in steel bolted connections requires attention to bolt material and installation procedures. Special inspection monitors these items.

## **PLAN REVIEW**

Whenever ASTM A325 or A490 bolts are used in design and specified on plans their installation, torquing and thread location require special inspection. Plans and calculations should be reviewed for bolt stresses and connection type used. Periodic inspection is permitted in certain installations where design uses bolt stresses for bearing type connections with threads permitted in the shear plane (i.e. A325N/A490N). A307 bolts do not require special inspection.

## **INSPECTION**

The primary function of special inspection is to verify the proper grade bolts are used, bolted joint conditions are in accordance with the design and when necessary, proper tensioning is achieved after installation.

### **9.Special Moment Resisting Concrete Frames (Concrete SMRF's)**

Due to the special detailing required on this type of concrete construction, a special inspector having experience with concrete SMRF's is required to monitor the construction and report to the structural designer on the progress of the construction.

## **PLAN REVIEW**

The determination of the design base shear (V) for a SMRF involves the use of an  $R_w$  factor of 12. Also involved are special joint and frame strength requirements detailed in section 1921 of the UBC. The plans reviewer should closely examine the design to check these special provisions.

## **III.PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL INSPECTION (cont'd)**

## **INSPECTION**

An inspector versed in the construction of concrete SMRF's is required to act as an interface between the structural designers and the contractor. This inspection is required to be continuous and will be in addition to other special inspection and testing requirements for concrete and reinforcement.

### **10.Reinforced Gypsum Concrete**

Material tests and placement of gypsum concrete is required where height strengths are specified.

Material tests and placement of gypsum concrete is required where height strengths are specified.

#### **PLAN REVIEW**

The structural calculations and plans for gypsum concrete structural systems (roof and floor slabs) should be reviewed for stress levels used. If Class B gypsum concrete is used, special inspection is required.

#### **INSPECTION**

Testing and inspection procedures of gypsum concrete are similar to regular concrete. This inspection item involves the monitoring of the gypsum concrete material only and does not involve reinforcement of inserts.

### **11.Insulating Concrete Fill**

Where concrete fill is used as part of a structural system, special inspection is required.

#### **PLAN REVIEW**

Any concrete topping slab being used as a part of the load resisting system by design, special inspection should be noted for its use.

#### **INSPECTION**

Special inspection for this item is similar to concrete placement and testing to verify the strengths specified are achieved in the field.

### **12.Spray Applied Fireproofing**

A critical life safety item, proper spray applied fireproofing offers structural protection in the event of fire and heat.

## **III. PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL INSPECTION (cont' d)**

#### **PLAN REVIEW**

Wherever spray applied materials are used for fire resistance (most often in steel construction), the plans examiner should review the plans and specifications to check that an approved (i.e. ICBO Research

Report or UL listing) fire proofing system is being specified. Because these systems are proprietary, the materials used and related thicknesses will vary depending on what is specified. It is important the specific fireproofing information be made available by the designer and reviewed for its proper application.

## **INSPECTION**

The special inspector will monitor proper material mixing (density), application techniques, qualified equipment apertures and final applied fireproofing thickness based on an approved plan or specification.

### **13. Shotcrete**

Structural uses of shotcrete (pneumatically placed concrete) requires inspection of materials used and placing techniques.

## **PLAN REVIEW**

Plans should be reviewed for areas where shotcrete application is specified. Applications where shotcrete is applied directly to earth and little structural strength is required may be exempted from special inspection if approved by the building official.

## **INSPECTION**

Inspection on the shotcrete mix, equipment setup, operator qualifications and application technique are the responsibility of the special inspector.

### **14. Smoke Control Systems**

Smoke control systems used in atria and high rise applications represent an important life safety feature of the building and must be verified as effective prior to occupancy.

## **PLAN REVIEW**

Smoke control systems are required in atria (UBC chapter 4) and certain high rise structures (UBC Chapter 4). As design of these systems relies on various mechanical, electrical and control systems, their proper function requires system testing prior to occupancy. Air intake and exhaust flows are specified in the code and should be reviewed in the mechanical design.

## **III. PLAN REVIEW AND INSPECTION GUIDELINES FOR SPECIAL INSPECTION (cont'd)**

## **INSPECTION**

The end result of smoke control testing is that the mechanical system is effective in removing smoke from the required areas. Smoke generating devices are discharged into the space and the removal of the test

smoke is observed for proper performance. Often the performance guidelines are specific to a project and must be reviewed for proper application.

### **15.Special Cases**

The Building Official has the option of identifying and requiring special inspection for portions of projects which in the Official' s opinion present an unusual hazard or condition and are not specifically mentioned in the items above. ICBO Research Reports (NER's, etc.) often require special inspection as a condition of a product's use; check the " findings" section of the report and design tables for such requirements. Unique structural rehabilitation work is another area where special attention is needed to construction techniques.

### **16. Structural Observation**

Certain hazardous and special occupancy classifications and essential facilities require periodic site visits by the design engineer or a designated representative. These observation visits are intended to allow the engineer an opportunity to visually observe progress of the construction intended and comment as necessary on the accuracy of the work. Any deficiencies noted by the structural observer should be documented and addressed as to their resolution. Any required structural observation program should be defined on the approved plans.

#### **NOTE ON PERIODIC SPECIAL INSPECTION:**

The use of periodic special inspection in correlation with UBC 1701.6.2 should be done after consultation with the building designers, architects and engineers. Such lessening of special inspection requirements should be done with caution.