

**Checklists for Seismic Inspection and Design
FEMA 389 – Primer for Design Professionals (2004)**

CHECKLIST TO FACILITATE ARCHITECT/ENGINEER INTERACTION			
Item	Minor Issue	Major Issue	Significant Issue
Goals			
Life Safety			
Damage Control			
Continued Function			
Site Characteristics			
Near Fault			
Ground Failure Possibility (landslide, liquefaction)			
Soft Soil (amplification, long period)			
Building Configuration			
Height			
Size Effects			
Architectural Concept			
Core Location			
Stair Locations			
Vertical Discontinuity			
Soft Story			
Set Back			
Offset Resistance Elements			
Plan Discontinuity			
Re-entrant Corner			
Eccentric Mass			
Adjacency-Pounding Possibility			
Structural System			
Dynamic Resonance			
Diaphragm Integrity			
Torsion			
Redundancy			
Deformation Compatibility			
Out-Of-Plane Vibration			
Unbalanced Resistance			
Resistance Location			
Drift/Interstory Effect			
Strong Column/Weak Beam Condition			
Structural System			
Ductility			
Inelastic Demand Constant or Degrading			
Damping			
Energy Dissipation Capacity			
Yield/Fracture Behavior			
Special System (e.g., base isolation)			
Mixed System			
Repairability			
Nonstructural Components			
Cladding, Glazing			
Deformation Compatability			
Mounting System			
Random Infill			
Ceiling Attachment			
Partition Attachment			
Rigid			
Floating			
Replaceable Partitions			
Stairs			
Rigid			
Detached			
Elevators			
MEP Equipment			
Special Equipment			
Computer/Communications Equipment			

Figure 12-2 Checklist for Architect/Engineer Interaction. (from Elssesser, 1992)

Applied Technology Council

Job Aid:

Inspection Checklist for Wood Frame Shear Walls

1. **■ Verify from the structural framing plans and architectural floor plans the location and length of all shear walls**

2. **■ Verify the nailing of the sheathing agrees with the shear wall schedule**
 - Nail Type (common, galvanized box);
 - Nail Diameter (8d or 10d);
 - Nail Length (minimum penetration into framing 12 times nail diameter)
 - Spacing Along Each Edge of Each Piece of Sheathing (6", 4", 3" etc.)
 - Nail Head Shape (clipped heads not permitted)
 - Nail Placement
 - ___ Driven flush but not overdriven
 - ___ Minimum 3/8" from sheathing edge to center of nail
 - ___ View the stud side to check for nails that missed framing
 - ___ Staggered along edges where spacing is 3 inches o.c. or less
 - ___ Edge nails into hold-down post

3. **■ Verify sheathing material agrees with the structural notes**
 - Type (Plywood or OSB);
 - Grade (APA Rated Panel or APA Rated Panel - Structural I) and
 - Thickness (3/8", 15/32")
 - Number of Plys (If specified for plywood)

4. **■ Verify lumber size and grade agrees with the structural notes**
 - Framing Grade of Studs & Posts (Stud, Construction, No. 2, No. 1);
 - Lumber Species (Douglas Fir Larch, Hem-Fir)
 - Framing Size (3x studs, sill at heavily nailed edges, 2-2x, 4x or 6x at HD posts)

5. **■ Verify bottom of wall shear transfer (sill/sole plate) connection is based on the structural notes or specific sections and details**
 - Nailing size and spacing of wall sole plate to floor framing below from shear wall schedule; verify nails penetrate framing below
 - Foundation sill bolt diameter and spacing from shear wall schedule or notes
 - Bolts not less than 7 bolt diameters from ends of sill piece; not more than 12 inches from ends; not less than 1 inch from edge of sill plate; not less than 1 1/2 inches to edge of concrete foundation.
 - Verify square plate washer is used on bolts.
 - Verify bolt hole in sill plate is not more than 1/16" larger than bolt diameter.

Job Aid: Inspection Checklist for Wood Frame Shear Walls (continued)

6. ■ Verify top of wall shear transfer connection by looking at the shear wall schedule and typical sections at roof and floor level

- Location of edge nail row along top plate of lower wall and sole plate of upper wall, and if required, along the rim joist or blocking
- Size and spacing of framing clips, when required, from top plate to floor or roof framing, with all nail holes filled
- Where 10 d nails are required for the sheathing, and when edge nailing is required into the rim member, the minimum rim member thickness is 1³/₄ inch. Therefore a nominal 2x is NOT sufficient.

7. ■ Verify top plate splice connections along shear wall lines, not only those occurring directly above the shear wall

- Check for a detail or note on framing plans calling for typical or special plate splices.
- Verify the strap size (gage thickness and length) number of rows of nails, and total number of nails per the product manufacturer's catalogue
- Verify straps are centered on the splice and have all nail holes filled.
- Splices are needed anywhere that top plates are interrupted (by perpendicular beams or headers in the plane of the wall)

8. ■ Verify Hold-Down Installation

- Confirm locations per Framing and Foundation Plans (usually, but not always, are hold-downs required at each end of a shear wall)
- Verify minimum Post Size and Lumber Grade
- Verify equal number of nails to upper and lower wall framing for Nailed Strap Type Hold-downs Spanning Floor Framing
- Verify bolt hole diameter through posts is not more than 1/16 inch larger than the actual bolt diameter.
- Verify bolts heads or nuts are not counter-sunk into the post, unless specifically permitted
- Verify a washer is installed under the nut on side of the post opposite the HD
- Verify nuts are tight on all bolts, including the anchor bolt into the foundation and the ends of threaded rods spanning between floor levels.
- Anchor bolts and threaded rods should not be bent. HD location should be installed to minimize the length of threaded rods.
- Verify all bolt diameters are as specified either by the hold-down product manufacturer's catalogue or as specified on the drawings.
- Verify prior to concrete pour the length of embedment of anchor bolts and the embedded end condition (e.g., L-hook, J-hook, nut and square plate washer, hex headed bolt) match the drawings
- Verify anchor bolt clearance from edges and ends of footings as specified on the drawings.

Job Aid: Checklist for Design of Masonry

■ Structural Notes

1. Applicable code specified (city and date).
2. Applied loads shown including wind, seismic and live loads.
3. Is the masonry strength f_m specified?
4. Is the method to verify the f_m specified? (Unit strength method).
5. Is type S mortar specified?
6. Is high or low lift grouting specified?
7. Are cleanouts required?
8. Is special inspection required? Are prism tests required?
9. Have full allowable stresses been used in the design?

■ Design

10. Is h/t less than 30? If not, verify calculations.
11. Is the wall laterally supported with straps or other methods capable of resisting at least 420 lb/ft?
12. Does the bar fit in the cell?
13. Are locations of laps shown (Min. 48 dia.)? Are they in locations where stresses are less than 80% of the allowable?
14. Are dowel laps sufficient (Min. 48 dia.)?
15. Is there continuous horizontal reinforcement at the window, and door head?
16. Is there continuous horizontal reinforcement at the floor?
17. Are window and door connections designed and shown on the drawings?
18. Are there expansion joints at the corners?
19. Are there provisions made in connections to accommodate thermal movement? (Steel roof rigidly attached at a masonry corner)?
20. Is the brick masonry confined between other materials without expansion joints?

■ Specifications

21. Is a color, pattern and workmanship panel required?
22. Is a grouting demonstration panel required?
23. Are materials specified in accordance with the correct standards? Brick?
 Is the Hollow clay brick of sufficient strength? Cement? Lime? Sand?
 Grout? Mortar? Is the mortar specified by proportions?
 Reinforcement? Is weldable steel required?
24. Are there requirements for handling and storage of materials?
25. Is there a requirement for a preconstruction meeting?
26. Are shop drawings required?
27. Are control joint size and materials specified?
28. Are sealant compatibility tests required?
29. Are the cleaning methods included?
30. Does the specification require wetting of the brick?
31. Are the joint finished specified? If raked joints are used is this in the analysis?
32. Are weep holes and fill materials specified?
33. Is the sealing procedures and materials specified?
34. Are cold weather and hot weather construction provisions included?
35. Are requirements for protecting the work included?
36. Is it required to verify dimensions prior to laying the masonry?
37. Is a written quality control procedure required?
38. Are prism test requirements included both prior to construction and during construction?

Job Aid: Inspection Checklist for Masonry Construction

- **Plans**
- 1. Is continuous inspection necessary?
- Are called inspections necessary?
- **Materials**
- 2. **Concrete masonry units:**
 - Type and quality
 - Strength of the masonry complies with plans
 - Is a laboratory test required?
 - Correct size and type, (per UBC Standard Nos. 21-4, 21-5).
 - Curing (UBC Standard Nos. 214, 21-5)
 - Cleanliness.
 - Soundness (UBC Standard Nos. 21-4, 21-5)
 - Are required inspection holes provided?
- 3. **Sand:**
 - Cleanliness
 - Quality and fineness
 - Compliance with code requirements (ASTM C144)
- 4. **Cement:**
 - Meets requirements of the UBC Standards (UBC Standard No. 21-15).
- 5. **Aggregates:**
 - Meet the requirements of UBC Standards (ASTM C144 and C404).
- 6. **Lime:**
 - Conforms to the UBC Standards (UBC Standard No. 21-13).
- 7. **Water:**
 - Is clean and free from harmful substances.
- 8. **Plasticizing agents:**
 - Conform to Standards.
- 9. **Admixtures conform to the following requirements:**
 - Have been approved.
 - Are of right quantity.
 - Are not used with plastic cement.
- 10. **Reinforcing steel:**
 - Kind and grade.
 - Max. Size (UBC No. 2107.2.2. 1)
- **Workmanship**
- 11. Sample panels have been provided and approved, if required.
- 12. **Mortar:**
 - Proportions of the mortar mix and time Of mixing.
 - Consistency of mortar.
 - Clean water is used
 - Mortar is properly handled in mixing
 - Mortar is not excessively retempered.
 - Work is kept dry at all times.
 - Mortar classified by type and use (UBC Table No. 21-A)
- 13. **Grout:**
 - Proportions (UBC Table No. 21-B).
 - Consistency.
 - Compressive strength (UBC Standard No. 21-19).
 - Handling.
 - Segregation.
- **Construction**
- 14. **Bearing on solid masonry:**
 - Suitability of bearing masonry
 - Size of bearing masonry
 - Location of bolt ties (UBC No. 2106.3.7)
 - Size, length, placement and embedment of connectors.
- 15. **Masonry on concrete:**
 - Width and depth of footing excavations.
 - Anchorage around main steel
 - Grouting and metal inserts
 - Type, spacing and material of ties.
 - Embedment of ties or connection to main steel.
- 16. Proper sill material and anchorage of supporting members to footings.
- 17. **Head, bed, end and wall joints:**
 - Correct size and type
 - Buttered where required
 - Joints where fresh masonry is joined to set masonry.
 - Properly filled with mortar. (Exception: UBC No. 2104.4.4).
 - Watertight (bug holes filled).

Job Aid: Inspection Checklist for Masonry Construction (continued)

■ Construction (continued)

18. **Reinforced hollow unit masonry:**
- Vertical alignment and continuity of cells
 - Requirements when work is stopped for one hour or longer.
 - Leakage of grout.
 - Cleanout openings for pours over 5 ft. (15 m) (UBC No. 2104.6. 1).
 - Overhanging mortar.
 - Sealing of cleanout cells.
 - Position of reinforcement.
 - Reinforcing hooks and splices (UBC Nos. 2107.2.2.5, 2107.2.2.6).
19. Racking and toothing at wall intersections.
20. Corners and returns.
21. **Reinforcing steel:**
- Clearances.
 - Deformation.
 - Additional steel around openings (UBC No. 2106.1.12.3 Item 3)
 - Placed within allowable tolerances (UBC No. 2104.5).
22. **Connections:**
- Size and location of joist anchors.
 - Size, location and number of bolts
 - Size and location of dowels
 - Location of stirrups.
 - Veneer ties (if any)
23. Separation between buildings.
24. Thickness of the walls.
25. Size of bond beams.
26. Placement of headers and lintels of material other than masonry.
27. Wall ties.
28. **Unprotected steel supporting members:**
- Correct location of mechanical installation supports.
 - Size and location of bolts and connections.
 - Size and spacing of bracing connections.
 - Size and alignment of connection holes.
 - Shims and dry packing.
 - Location and size of stiffeners.
 - Size and alignment of base plates.
29. **Anchoring of wood floor joists to supporting masonry members:**
- Required size of ledges.
 - Required size, spacing and length of bolts and joist anchors.
30. **Where floor joists are parallel to the wall:**
- Placing of required blocking.
 - Type of anchors required.
 - Use of proper connections to anchors.
31. **Floor joists tying to a masonry wall:**
- Required size, spacing and bearing of joists
 - Required air space around joists
 - Required anchors
 - Required bridging and/or blocking
 - Connection to ledger
 - Required connectors for anchors
32. **Where fire-resistant floors are required.**
- Proper material for fire resistance
 - Required thickness of floor slab
 - Required supports
 - Required reinforcing
 - Required time for supports and forms to remain in place for concrete floors
33. Contraction joints and control joints are located and provided as indicated or required.
34. Weepholes are provided if required.
35. **Chases.**
- Location and spacing on approved plans.
 - Purpose.
 - Maximum permitted depth.
 - No reduction of the required strength and fire resistance of the wall.
36. **Where there is a change of thickness in non-bearing walls**
- Locate the position on plans.
 - Required top plates comply
 - location of ties, anchors, bolts and blocking.
37. **Corbeling:**
- Maximum projections
 - Bonding and anchorage
 - Required temporary supports
 - Required reinforcing.
38. Pointing, replacement of defective units, and repair of other defects are promptly performed.
39. Waterproofing of walls is performed as required.
40. Methods of final cleaning are as required.