

**DEVELOPMENT SERVICES – BUILDING INSPECTION****INSPECTION REQUIREMENTS:  
POST TENSION SLAB****INSPECTION CODE: 211****SCOPE: RESIDENTIAL AND COMMERCIAL****APPLICABLE CODES: 2016 CBC, CRC, CPC, CMC, CEC, CALGreen, CEnC, and PAMC**

*The information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.*

**WARNING**

- Failure to complete the items below prior to the City of Palo Alto (CPA) inspection will result in a re-inspection fee.
- Gas and electric utilities will be removed if found to be unsafe at time of inspection. (CBC 3303.6)

**PRE-INSPECTION****DEFERRED SUBMITTALS**

- When post tension slabs are a deferred submittal, shop drawings and calculations shall be submitted to the city for review, approval and inclusion with project drawings. (CBC 107.3.4.1)
- Prior to submittal, shop drawings must be reviewed by the Engineer of Record and bear their stamp and signature. (BCP 5536.1(a))
- Approved shop drawings shall be on-site at the time of city inspection. (CBC 107.3.1)

**DRAWINGS AND SHOP DRAWINGS**

- Drawings and shop drawings shall include the following:
  - Details for both ends (stressing and dead end)
  - Provide closure strip detail and number of days to remain open
  - Number of strands to be bundled; the maximum is five
  - The spacing of tendons
  - Height of chair or strand above the deck
  - As a recommendation by the Post-Tensioning Institute (PTI), add a note for the contractor to stamp the slab with the following: POST TENSIONED SLAB – DO NOT DRILL, CUT, OR CORE

**SPECIAL INSPECTION REQUIREMENTS**

- Special inspection agencies and inspectors must be pre-approved by City of Palo Alto prior to inspection. (CBC 1703.1)
  
- All special inspection activities shall be performed and written field reports complete prior to the arrival of the Building Inspector. (CBC 1704.2.4)
  - o All results of special inspections, field reports, and surveys shall be addressed to the City of Palo Alto with job address and permit number for inclusion in City records.
  
- All pad certification information shall be provided to include elevation, location, and compaction of soil (including re-compaction of plumbing trenches). (CBC 107.1, PAMC 18.12.040)
  
- At the request of the Building Inspector, the Special Inspector shall provide the Building Inspector with a copy of his/her most current ICC current certificate and photo identification card.
  - o The City of Palo Alto does not accept ID card from the testing agency certifying the special inspector, so it must be the Special Inspector’s ICC card). (CBC 1704.2.1)
  - o See the table below for required ICC certifications.

**CBC Table 1705.3 – Required Special Inspections and Tests of Concrete Construction**

<b>WORK REQUIRING SPECIAL INSPECTION (CBC TABLE 1705.3)</b>	<b>FREQUENCY</b>	<b>ACCEPTED CERTIFICATIONS</b>
1. Inspect reinforcement, including prestressing tendons, and verify placement.	Periodic	ICC Reinforced Concrete/ACI Concrete Construction Special Inspector
9. Inspect prestressed concrete for: a. Application of prestressing forces; and b. Grouting of bonded prestressing tendons	Continuous	ICC Reinforced Concrete/ACI Concrete Construction Special Inspector
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs	Periodic	ICC Reinforced Concrete/ACI Concrete Construction Special Inspector

**INSPECTION**

**GENERAL REQUIREMENTS**

- See the “Foundation” inspection checklist for all general requirements.
  
- Verify that the Demolition permit has been signed off.
  
- When in a flood zone, verify that Public Works signed off on the base flood elevation (BFE) prior to pour.
  
- Verify all underground plumbing has been inspected and signed off.
  
- Approved plans, shop drawings and permit shall be on-site at the time of CPA Inspection. (See the “Drawings and Shop Drawings” section for additional information.)

- At the time of inspection, provide the CPA inspector with the following documentation:
  - A copy of the Special Inspector's ICC certification card and photo ID. (CBC 1704.2.1)
  - Special Inspector's field report for reinforcement and tendons. (CBC 1704.2.4)
  - Survey letter (see the "Survey Letter Requirements" checklist for additional information). (CBC 107.1, PAMC 18.12.040)
    - Contractor to stake and string property lines and foundation
  - Waterproofing letter from the manufacturer's field representative. (CRC R406.1)
  - Engineer of Record's observation letter, if required. (CBC 1704.2.3)
  - Soils certification/report for pad. (CBC Table 1705.6)

### SETBACKS

- Verify property line markers/setbacks (property lines shall be set and lines strung). (CBC 107.1, PAMC 18.12.040)

### ELECTRICAL

- Verify that new structures and remodels have at least one of the following primary grounding electrode systems:
  - A Ufer that is made up of 20' of #4 rebar (CEC 250.52 (A)(3))
    - Make sure that ground clamps, install on rebar, are marked as "RB", which means that they are listed for rebar (CEC 110.3 (B))
  - 20' of minimum 4AWG bare copper wire (placed 3" from the bottom of the footing)
  - Two 5/8" by 8' ground rods spaced a minimum of 6' apart (CEC 250.3 (A)(3))
    - Exception: Accessory structures and detached garages require only one ground rod or an Ufer connection when the main electric service is on the main house.
    - Both ground rods should be placed at the service location whenever possible

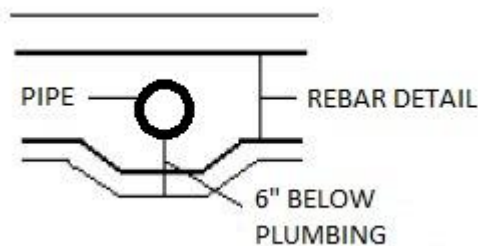
### FORMS AND WOODEN STAKES

- Forms shall be substantial and sufficiently tight to prevent leakage of mortar. (ACI 318 26.11.1.2(c))
- Forms shall be properly braced or tied together to maintain position and shape. (ACI 318 26.11.1.2(d))
- Design of formwork shall include (ACI 318 26.11.1.2(a)):
  - Method of concrete placement
  - Rate of concrete placement
  - Construction loads, including vertical, horizontal, and impact
  - Avoidance of damage to previously constructed members
  - For post-tensioned members, allowance for movement of the member during application of the pre-stressing force without damage to the member
- In determining the time for removal of formwork, consideration should be given to the construction loads, in-place strength of concrete, and possibility of deflections greater than acceptable to the licensed design professional. (ACI 318 R26.11.2.1)

- Wooden stakes are not allowed at any foundation inspection when embedded in concrete. (PAMC 16.04.340)
  - Warning: If wood stakes or forms are not removed, they shall be drilled and treated with copper green.

### UNDERSLAB AND SLAB PLUMBING

- Drain, waste, and vent (DWV) system shall be tested with no less than 10' of head water above the system for 15 minutes or 5 psi air test for 15 minutes. (CPC 712.2)
- Verify that under-slab/under-ground plumbing has been approved. !
- All piping shall be protected against direct contact with concrete. (CPC 312.2)
  - Piping shall be wrapped with snap-on insulation, such as imco-lock or armaflex, a minimum of 1" thick or properly sleeved. !
- Concrete shall not bear directly on plumbing lines. Concrete shall extend 6" minimum below plumbing pipes. !

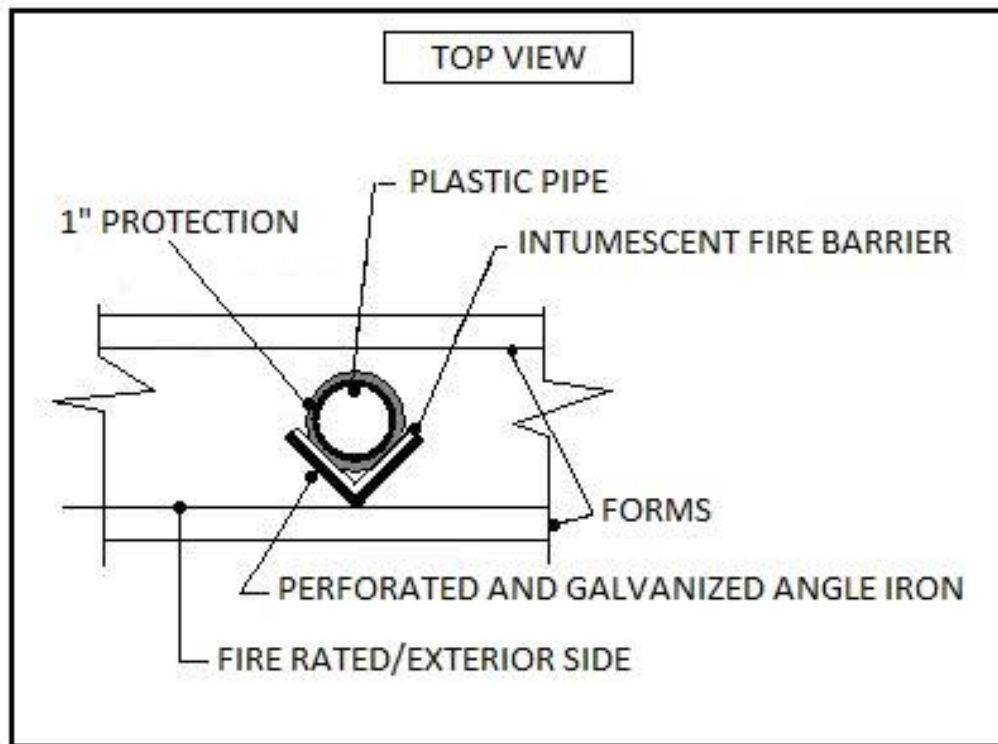


**Figure CPA 022 – Plumbing in Slab or Footings**

- Pipes, conduits, and sleeves embedded in concrete walls and beams shall not impair significantly the strength and fire protection rating. (ACI 318 20.7.2)
- Reinforcement is required to be placed perpendicular to pipe embedments. (ACI 318 26.8.1 (b))
- Pipes shall not be spaced closer than 3 diameters or widths on center.
  - Example: (2) 2" pipes shall be spaced no closer than 6" from center to center of pipe. !
- Engineer of Record shall specify concrete cover for pipe embedments with their fittings. (ACI 318 26.8.1 (c))
  - Maintain ¾" min. concrete coverage over plumbing pipes and pipe wrap in foundation. !
- Pipes and fittings not shown in the construction documents, shall be designed to resist effects of the material, pressure, and temperature to which they will be subjected. (ACI 318 26.8.2 (c))
- Conduit and piping shall be fabricated and installed so that cutting, bending, or displacement of reinforcement from its specified location is not required. (ACI 318 26.8.1 (f))

**FIRE RATED WALLS**

- Plastic pipe in foundation stem walls of fire rated separation and attached garage sides shall be protected by intumescent barriers and metal plates. Metal plate shall be attached to forms prior to inspection or use cast iron pipe. See the illustration below.



CPA Figure 027 – Piping in Fire-Rated Walls

**EMBEDMENTS AND ANCHOR BOLTS**

- All hold-down bolt embedments, anchor bolts, and dowels shall be in place. Wet setting is not allowed. (ACI 318 2.3)
- Verify support bars; 2 #4 bars at each anchor. (ACI 318-14 25.9.4.4.6)

**CHAIRS/SUPPORTS**

- Verify tendon height from deck.
- Verify tendons are adequately supported along their lengths (support bars per plans).
- Chairs shall be secured to deck (stapled) to avoid dislocation during placing concrete.

**DAMAGED TENDONS**

- Tears in tendon sheathing shall be greased and taped (PTI-FP 4.12).

**TENDON LAYOUT**

- Verify number of tendons in a bundle, if required.
- No more than 4 bars shall be bundled together unless permitted on plans. (PTI-FP 4.17)
- Tendon profile shall be smooth in elevation and not show excessive wobble. (PTI-FP 4.14)
- No more than 4 tendons shall be bundled together or 5, if so permitted on plans. (PTI-FP 4.17)
  - Exception: tendons bundled in beams
- Provide hair pins at curvature when cover is more than 3/4".
- Tendons at curvature shall be separated by a maximum of 2".
- Where tendon length exceeds 250', a construction joint with intermediate stressing shall be provided.

**STRESSING ENDS**

- The most common cause of breakage is improperly installed stressing anchors, so device/pocket formers must be properly secured to edge of form.
- The stressing anchor device shall be placed mid-depth of slab, unless noted otherwise on plans.
- Tendon shall extend 12" beyond concrete form (PTI FP 4.3-1)
- Provide (2) #4 backup bars. Bars shall be offset (PTI FP 4.3-19).
- When tendons are banded (closer than 12" on center), provide #3 hairpins with (2) #4 backup bars inside the hairpins in each corner (ACI 318-14 R25.9.4.46).

**DEAD ENDS**

- Common cause of breakage: Tendons must be fully secured at the dead ends to prevent slip during stressing.
- Verify 12" staggering of dead end anchorage devices.
- No hairpins are required unless otherwise stated on plans.
- Provide minimum of (2) #4 backup bars.

**CLOSURE STRIP**

- Must be a minimum of 3'.
- Reinforcement from the two sides of the closure strip shall not cross the closure.
- Verify closure strip is provided with shear keys unless not indicated on plans.

**PENETRATIONS**

- Verify the trim bars around penetrations (plumbing, electrical) per engineered details.
- Verify minimum separation from cables to plumbing and electrical penetrations.
- Verify added steel reinforcement at penetrations, inside corners, and at building perimeter per engineered details/drawings.