



Oregon

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Jim Varco
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In response to concerns expressed by Mr. Jim Varco about the construction of his residence, the State of Oregon Building Codes Division performed a visual inspection of the residence on May 7, 2004. The purpose of this inspection was to assess the safety and the performance of the residence in its as-built condition to the requirements of the one and two family dwelling code. This letter contains observations and recommendations of the State of Oregon Building Codes Division. During the site visit, Mr. Varco and his representatives were in attendance, as was Mr. Tony West, representing Lane County.

Mr. Varco's residence is a wood framed structure supported on continuous concrete footing for the exterior walls. The first floor framing consists of manufactured joists supported on stud pony walls, which in turn are supported on continuous strip footings. The second floor framing consists of manufactured joists supported on beams and stud walls. The roof structure is constructed with manufactured trusses.

In our review of Mr. Varco's house, we find most of his concerns are minor in nature and are easy to resolve to a satisfactory level of safety. However, we are unable to confirm whether the fireplace contains adequate bracing at the floor and roof levels. Further analysis and inspection of the fireplace is necessary. Mr. Varco and Lane County should take appropriate steps to address our concerns in regards to the fireplace.

The following represents the State's observations for each issue brought to our attention during the visit and our recommended solutions.

1. Fireplace

The second story is composed of two sections connected by a bridge. The great room and the foyer, located at each side of the bridge, are open from the first floor deck to the bottom of the second story roof trusses. On the side of the great room, there is a freestanding fireplace attached to the first floor, the bridge and the roof.

The approved drawing for the fireplace framing showed the following in Plan No. 8:

- a. The fire place structure is supported on 5'-0" x 9'-8" x 12" concrete foundation.
- b. The walls of the chase are supported on continuous masonry walls.
- c. The masonry walls are reinforced by # 4 @ 24" o.c with standard hook in the concrete foundation.
- d. The walls of the chase consist of (2) 2x 6-stud walls sheathed with ½ plywood on both sides.
- e. 4" stone veneer is attached to the framing with galvanized ties spaced at 16" o.c vertical and horizontal. Above the exposed stone veneer and in the attic space, the brick veneer support 4" masonry walls. The portion of the chimney above the roof is covered by 4" stone veneer supported on 4" masonry walls.
- f. The approved drawings do not specify the connections of the chase walls to the foundation walls, second floor and the roof framing.

Based on BCD's observations, the masonry walls are not used to support the structure of the fireplace. Furthermore, the 4" masonry walls above the stone veneer in the attic space are not used. The contractor used stud pony walls to transfer the load from the chase walls to the foundation. The review of construction photos indicates the sheathing of the chase walls appear to be placed on one side only. The connection of the chase walls to the floor and roof diaphragms and the connection of the stone veneer to the chase walls cannot be verified. The method of construction used to frame the fireplace appears to provide adequate support for gravity load. The adequacy of the lateral supports of the chimney cannot be evaluated by visual observations because the connection between the chase walls to floor and roof diaphragms could not be visually verified at the time of our visit. The chimney structure needs to be analyzed in detail to determine its adequacy to resist lateral loads. The analysis should include the following:

1. Evaluate the applied loads: gravity and lateral loads.
2. Evaluate the reactions at floor and roof level.
3. Provide corrective solutions for the deficiencies, if needed.

In conclusion, the fireplace does not appear to be built according to the approved plan.

2. Exterior Wall Anchoring

A concern brought to our attention by Mr. Varco was the attachment of the sill plates to the concrete stem walls. Mr. Varco was concerned that the spacing of the anchor bolts is not uniform. In some areas, the spacing is greater than allowed by code (6'-0" maximum spacing). In other areas, the spacing meets code. Furthermore, in a few areas, the anchor bolts are not placed within 12" of each end of each of the wall or each end of the piece of the sill plate. Simpson foundation anchors can replace the missing anchor bolts. These anchors consist of galvanized steel plates of several shapes. These plates can be nailed to the sill plates and anchored in the stem walls using expansion or epoxy anchors (see attachments Nos. 4 through 6). Simpson foundation anchors

provide equivalent shear strength of the anchor bolts embedded in the concrete and are an acceptable solution.

Based on the discussion with Mr. Varco and the observation of two anchor bolts where the concrete was removed for inspection, it appears that the embedment of the anchor bolts are 5 inches instead of 7" as specified in One- and Two Family Dwelling Code. Table 19-D of Oregon Structural Specialty Code shows that ½ diameter anchor bolt embedded 4" in concrete has a shear capacity of 1650 pounds. Table 8.2A of National Design Specification for Wood Construction and UBC 1994 Table 23-I-F shows that ½ diameter bolt has 480 pounds shear capacity parallel to grain. From these tables, it can be concluded that the capacity of the anchor bolt is governed by the capacity of the wood, which is the weakest material compared to concrete and steel. Using 5" embedment instead of 7" does not undermine the shear capacity of the structure.

3. Foundation Pony Walls

Based on the visual observations, the "pony" walls appear to be attached to the foundation by expansion bolts. The spacing varies from 3' to 4' on center. The code requires that sill plates of interior load bearing wall on monolithic slab to be positively anchored with approved fasteners. The code does not address the anchorage of "pony" walls to the foundation unless the walls are shear walls or interior brace panels. Anchoring the "pony" walls to the strip foundation would exceed the minimum code requirements.

4. Framing

The connections of walls to framing and floor framing system to supporting elements such as walls, beams and "pony" walls cannot be verified. In accessible areas such as under floor and attic space, we recommend installing nails and screws to provide a positive connection between the horizontal framing elements and their vertical supports.

5. Duct Insulation

The contractor used batt insulation to insulate the duct system in the crawl space. This insulation is usually used in wall and floor cavities. The duct insulation should comply with Oregon One and Two Family Specialty Code section 1901.2.1. The existing insulation should be replaced with insulation material manufactured specifically for use as heating and cooling duct insulation.

6. Gutters and Drainage

The house does not have gutters. The code does not require gutters or any other means to collect the water from roofs. However, when the structure is located on expansive or collapsible soils, the code requires a control method of water disposal from the roofs away from the structure (minimum 5'-0"). In this case, the soil supporting the house does not appear to be an expansive or collapsible soil.

Oregon One and Two Family Specialty Code requires that the finish grade to be sloped away from foundation walls a minimum of 6" within the first 10'. BCD was not able to verify the slope. However, there was no evidence of any presence of water or moisture in the under floor. The ground in all areas under the house was dry.

7. Garage

During the inspection Mr. Varco pointed out two areas in the garage where the sill plate of the wall was notched at the anchor bolt location (Photo No. 6). The problem can be easily corrected by nailing Simpson strap as shown in the attachment No. 7. Mr. Varco has a concern regarding the attachment of the garage wall plates to the sill plate. He indicated that there are missing nails. This can easily corrected by adding 16d nails spaced 16" on center.

Mr. Varco raised the issue of the nailing of the wall sheathing on the garage wall (Photo no. 7). He was concerned about the overdriven staples in some areas of the wall. We believe that the overdriven fasteners do not undermine the integrity of the garage structure because the wall is fully sheathed. The code requires only 8'-0" shear panels (two 4-foot panels). The sheathed area is 27 feet long, which exceeds code requirements.

Mr. Varco also raised the issue of the nailing of the wall sheathing on the garage wall (Photo no. 7). He was concern about the overdriven staples in some areas of the wall. We believe that the overdriven fasteners do not undermine the integrity of the garage structure because the wall is fully sheathed. The code requires only 8'-0" shear panels (two 4-foot panels). The sheathed area is 27 feet long, which exceeds code requirements.

8. Foundation

Mr. Varco expressed concern regarding reinforcement in the foundation concrete. The review of photos provided by Mr. Varco reveal the following:

- a. Photo No. 1 (taken during the casting of concrete) shows that two continuous bars reinforced the foundation. The reinforcement has at least 3" cover.
- b. Photo No. 2 shows that the stem walls are reinforced by vertical bars spaced at approximately 4'-0" on center.
- c. Photo Nos. 3, 4 and 5 show foundation after the removal of the forms.

Based on the photos, the method of construction used to build the house foundation exceeds the minimum code requirements. Oregon One and Two Family Specialty Code does not specify any required reinforcement in the foundation. The presence of reinforcement in the foundation does not add significant benefit to the strength of the residence.

The conclusion reached by the Building Codes Division based on our visual observations is that the residence is not a dangerous building and most issues brought to our attention were minor in nature. With the exception of the fireplace, the deficiencies are easily resolved. The recommendations presented in attachments 1 through 7 can be used to make the corrections. However, the fireplace needs to be analyzed in detail and provided adequate bracing at floor and roof levels. If the chase walls are not extended to the roof sheathing, there will be a need for a sub-diaphragm at the bottom chord of the trusses or some other engineered method of lateral support to eliminate the hinge affect.

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