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January 25, 2010
3299

Fred and Jeanne Brohart
P.O. Box 9
25 McLary Road,
Webbwood, Ontario
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Dear Mr. & Mrs. Brohart:

Subject: Residence at 22 Salo Rd, Nairn Centre, Ontario, (Building Permit No. B08-1658)

As requested I reviewed the documentation provided including the house plans, truss drawings, correspondence and photos provided. My comments herein relate to the living room gable end wall noted on drawing A03 of the house plans. The living room adjacent to this wall is vaulted using scissor trusses spanning parallel to the wall. The last scissor truss is approximately 2ft from the wall. The gable end truss is a flat bottom truss.

House Plans (A00-A06 – no revision noted dated June 14, 2008 - Project No A33-2008)

1. Designer Marc G. Levasseur, BCIN No 19194
2. Drawing A03 clearly shows all the exterior walls of the same W1a (A01) construction consisting of a minimum of a 2x6@16"c/c maximum
3. Drawing A02-A05 notes clearly state that the
   "...any specified pre-engineered elements, on these drawings, including technical data and placement guide(s) are to be provided by Garden River Truss Co. and its suppliers....
   In addition it states,
   "...engineered sealed shop drawings are to be provided by Garden River Truss Co... therefore any substitutions...will not be allowed without written permission from the designer."
   These pre-engineered elements are noted on drawing A03 as "...lintels in walls having roof loads..." and as the roof trusses on the cross sections on drawing A05.
4. Drawing A06, refers in notes to Double Volume walls as consisting of walls up to 19'-0" in height and consisting of a minimum of 2-2x6 studs at 16"c/c maximum. No other reference to this wall description is used on the drawings.
5. Section B on drawing A05 also shows the location of the scissor trusses over the living room area. The extent of the trusses is not shown on this drawing but it is shown on a truss placement plan drawing.

Truss Drawings (Job No ML08218R – 11sheets including the delivery ticket)

1. Truss Placement Layout Plan (8.5x11 sheet) by designer Marc G. Levasseur shows a gable end wall truss GE1 at each end of the building. Directly adjacent to this truss are shown scissor trusses.
2. The detail of Truss GE1 shows a typical gable end wall truss with flat bottom chord. These are not true trusses but are used to assist in framing the roof. As indicated on the drawing the truss requires continuous vertical support to the bottom chord. Also, Note 3 on drawing A100 requires discrete or continuous lateral support at the bottom chord.

Discussion

Placing a flat bottom gable end wall truss adjacent to scissor trusses creates a weak point in the wall at the interconnection between the bottom chord of the truss and top of the load bearing wall. This is not good engineering practice for the following reasons:

1. Standard stud wall construction presumes that the top of the wall is braced laterally by a floor, roof or ceiling using this element as a diaphragm to transfer the loads.
2. In addition to the continuous vertical support required, the gable end wall truss provided is quite weak laterally and in fact the notations on the truss drawing clearly states that they have not been designed for wind, therefore, they would not be suitable as a lateral brace point either. As a minimum a lateral brace would be required at the bottom chord. Normally, this brace is provided by the ceiling.
3. Without this lateral brace the wall and truss could buckle laterally under the vertical load and/or collapse due to wind or seismic load.
4. Furthermore, concentration of forces occurs around door and window openings such as in your gable wall. The greater stress at these points requires good lateral bracing at the top of the wall to prevent it from buckling or being overstressed. For small buildings this is provided by the floor, ceiling or roof.

Since Mr. Levasseur was both the Building Code designer (BCIN) and the Truss Designer (as noted on the truss placement plan), he was aware of the situation. In fact his email to you of November 23, 2009 suggests that splicing the wall below the level of the ceiling is an acceptable solution. It is in fact not acceptable. Section 9.23.10.4 (1) of the OBC states the following:

> "Wall studs shall be continuous for the full *storey* height except at openings and shall not be spliced except with finger-jointing with a structural adhesive."

With the word, "*storey*"defined in Section 1.1.3.2 of Part 1 of the OBC as,

> "...that portion of a *building* which is situated between the top of any floor and top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it."

In addition, any solution that deviates from the structural requirements of Part 9 of the building code requires the intervention of a Professional Engineer licensed in the Province of Ontario (Refer to Section 9.4.1.1 (1). Solutions such as:

1. splicing the stud wall below the ceiling level as currently installed and,
2. reinforcing the wall using continuous 2x4's from the bottom plate to the ceiling at 4ft c/c let into the midplate,

do not conform to Part 9 and therefore are not acceptable solutions without the advise of a Professional Engineer. In fact a properly engineered design and sealed drawing must be provided for this wall unless it is rebuilt in conformance with Part 9.

The reference to "double volume walls" may imply that a wall over the standard floor height should be framed using 2-2x6, although this is not clear. However, the wall type noted on the drawings is W1a, and it is clearly stated on drawing A01 as being a minimum of a 2x6@16"c/c.

According to the drawings, the maximum height of the ceiling is 8ft at the eave and 13'-3" at the centre. The maximum height permitted by Table 9.23.10.1 of Part 9 of the OBC for an exterior load bearing stud wall is 11'-10" (2x6 @16"). There is no provision in Part 9 for walls over this height. Therefore, this wall is required to be designed by a Professional Engineer licensed in the Province of Ontario.

Section 9.23.10.3 (2), states that "Studs on the flat are permitted to be used in gable ends of roofs that contain only unfinished space...". In fact using a flat bottom chord truss contravenes this section by placing the flat portion of the truss below the ceiling level.

Mr. Levasseur as a registered BCIN should have been aware of the above issues, in that the stud wall, gable end truss configuration (flat bottom chord) and splice joint location do not comply with Part 9 of the building code. Part 9 is clear in stating that the stud wall should have been continuous from floor to ceiling, however, by providing a flat bottom chord gable end truss, it becomes impossible to satisfy this requirement.

In our opinion in order to comply with the OBC, what should have been provided was an engineered gable end wall scissor truss with an engineered gable end stud wall. This would have made the joint in the wall at the ceiling level. Also anchorage details would have been provided in the engineering drawing for the stud wall, which would have provided the necessary lateral support for the taller wall.

We trust this is sufficient for your needs if you have any further questions please do not hesitate to contact me.

Yours Truly,

Byron G. Moss
Vice President-Engineering
attached

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