

August 8 2017

Structured Creations
453 Brant Street
Burlington, Ontario
L7R 2G3

Attention: Darren Sanger-Smith

Dear Darren:

Re: 4210 Inglewood Drive
Our Project No. 17107

At your request the writer visited the above site July 27th 2017 where we met with you and the home owner. The purpose of our visit was to examine the existing roof structure.

Existing Exterior Conditions

- from the exterior, the roof ridge lines were observed to exhibit noticeable sag. See attached photo 853
- the front porch roof has deflected downwards away from the house, and the two supporting posts have splayed at the top, indicating movement of the roof downwards
- the roof deck has deflected around eyebrow dormers, indicating a lack of support. See attached photo 852

Existing Roof Framing

- refer to the attached existing roof framing plan S2.1
- the roof has been framed as a hip roof or cottage roof, with a gable dormer at each side
- roof rafters are 2x4@24 spanning approximately 9'-8" between supports
- rear roof hip beams are 2-2x6 spanning approximately 28'-4"
- front hip beams are 2-2x6 spanning 12'-2" from the main ridge to the dormer ridge
- only three 1x6 collar ties were observed

Structural Deficiencies

- roof rafters are spliced at approximately mid-span on all four sides of the roof. The support of the rafters at the splice point is structurally inadequate, consisting of either double 2x4 spreader beams, see attached photo 834, or a single 1x6 splice board, see attached photo 831. The spreader beams are supported on random diagonal 2x4 struts, see attached photo 828 which do not bear on load bearing ground floor walls. Effectively 50% of the roof load is being transferred by a few randomly placed diagonal struts which do not have adequate bearing.
- the rafter ends at the front (west) wall are supported on a single angled 2x6 plate, which bears 2x4 stub posts. See attached photo 846. The support is structurally inadequate and does not offer lateral resistance to spreading of the rafters.

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- the rafter ends at side (north and south) walls are supported on a single 2x4 stub posts. See attached photo 836. The support is structurally inadequate and does not offer lateral resistance to spreading of the rafters.
- the roof eyebrow dormers are not original and openings for the dormers have been cut through the roof framing without support or reinforcement
- the rough opening for the single roof vent we observed has not been reinforced. See attached photo 840

Summary

- it is our opinion the roof framing is structurally inadequate
- roof rafters are undersized, and should be full span with splices requiring intermediate support
- the intermediate rafter support is inadequate for strength and insufficiently braced
- the intermediate rafter support bracing is undersized, over spaced and has inadequate bearing
- in our opinion the roof framing does not comply with the all or part of the following clauses of Division B – Part 9 of the Ontario Building Code attached:
 - 9.23.13.1.
 - 9.23.13.3.
 - 9.23.13.4.
 - 9.23.13.6.
 - 9.23.13.7.
 - 9.23.13.8.

Conclusion

The roof framing is of such a poor standard that in our opinion it should be replaced entirely. To support the rafter splices, in accordance with Clause 9.23.13.2., continuous vertical supports bearing on the ceiling joists would be required. This would require the ceiling joists to be in conformance with Clause 9.23.13.10 meaning a minimum of 2x6 ceiling joist. The existing ceiling joists are 2x4. On two sides of the hip roof, ceiling joists will be parallel to the rafter and unable to support a vertical line of support.

Roof rafters are undersized in accordance with Table A-4 in Division B – Part 9 of the Ontario Building Code. Reinforcing cannot be done due to the existing splices and header support.

It is our opinion an attempt to reinforce the roof framing would be very difficult and dangerous due the inadequate existing structure.

We trust the above is satisfactory.

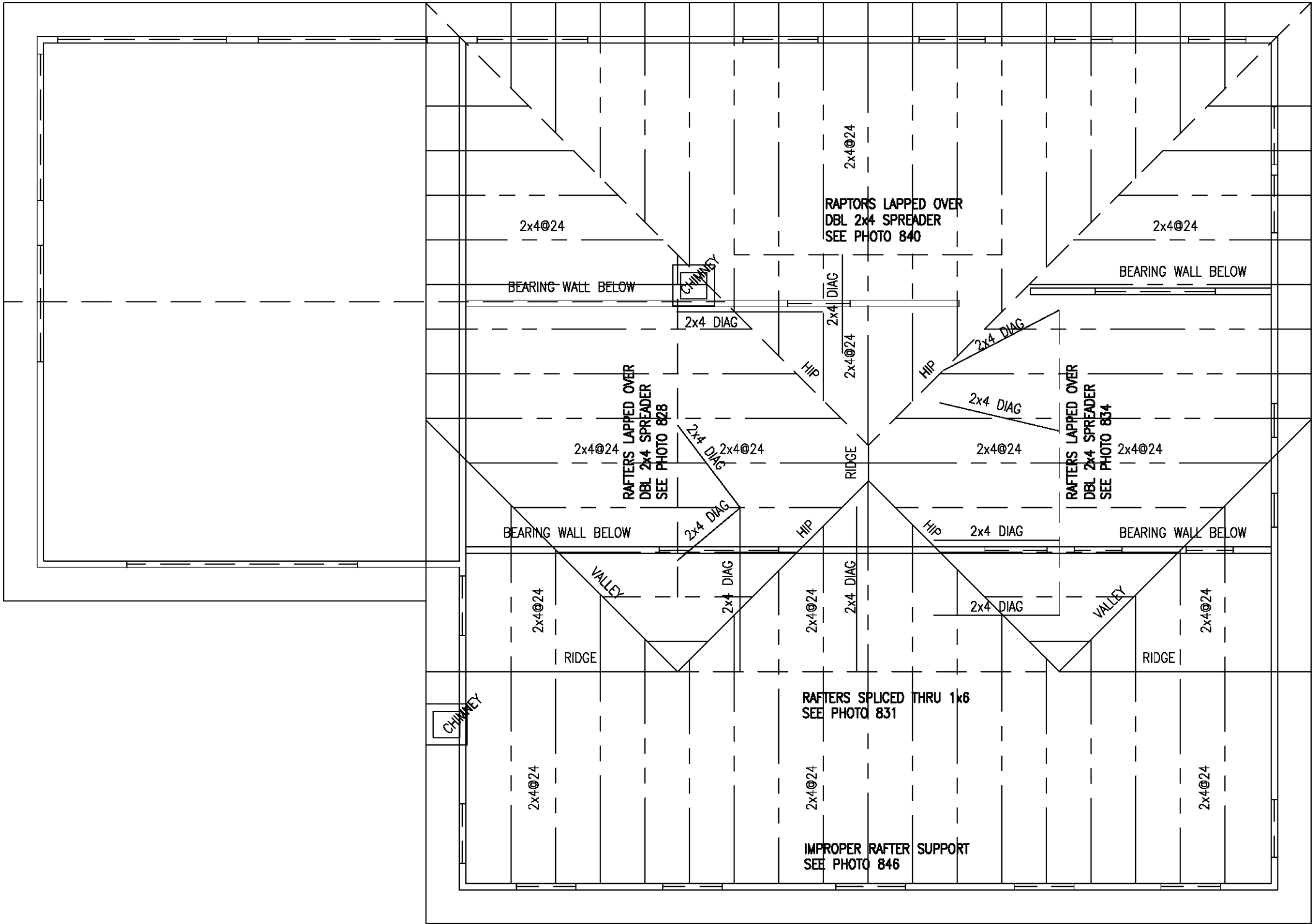
Yours truly,

**HAMANN ENGINEERING
STRUCTURAL CONSULTANTS LTD.**



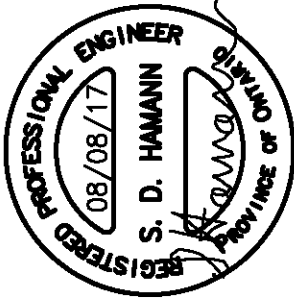
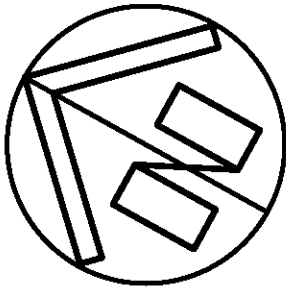
S.D. Hamann, P.Eng.
Attach.





EXISTING ROOF FRAMING PLAN
3/16"=1'-0"

1. SLOPED ROOF; LL = 22 psf SPECIFIED SNOW LOAD for BURLINGTON.
DL = 21 psf



PROJECT 4210 INGLEWOOD DRIVE	PROJECT No. 17107		DWG. No. S2.1	
	DRAWING TITLE PLANS		DRAWN SH	DATE JUL 17
	FOR STRUCTURED CREATIONS		SCALE AS NOTED	

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PHOTO 828



PHOTO 831



PHOTO 834



PHOTO 836



PHOTO 840



PHOTO 846

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PHOTO 852



PHOTO 853

- (3) Lintels referred to in Sentence (2),
 - (a) shall be not less than 50 mm greater in depth than those shown in Tables A-12 to A-16 for the maximum spans shown, and
 - (b) shall not exceed 2.24 m in length.

9.23.13. Roof and Ceiling Framing

9.23.13.1. Continuity of Rafters and Joists

- (1) Roof rafters and joists and ceiling joists shall be continuous or shall be spliced over vertical supports that extend to suitable bearing.

9.23.13.2. Framing Around Openings

- (1) Roof and ceiling framing members shall be doubled on each side of openings greater than two rafter or joist spacings wide.

9.23.13.3. End Bearing Length

- (1) The length of end bearing of joists and rafters shall be not less than 38 mm.

9.23.13.4. Location and Attachment of Rafters

- (1) Rafters shall be located directly opposite each other and tied together at the peak, or may be offset by their own thickness if nailed to a ridge board not less than 17.5 mm thick.
- (2) Except as permitted in Sentence (3), framing members shall be connected by gusset plates or nailing at the peak in conformance with Table 9.23.3.4.
- (3) Where the roof framing on opposite sides of the peak is assembled separately, such as in the case of factory-built houses, the roof framing on opposite sides is permitted to be fastened together with galvanized-steel strips not less than 200 mm by 75 mm by 0.41 mm thick spaced not more than 1.2 m apart and nailed at each end to the framing by at least two 63 mm nails.

9.23.13.5. Shaping of Rafters

- (1) Rafters shall be shaped at supports to provide even bearing surfaces and supported directly above the exterior walls.

9.23.13.6. Hip and Valley Rafters

- (1) Hip and valley rafters shall be not less than 50 mm greater in depth than the common rafters and not less than 38 mm thick, actual dimension.

9.23.13.7. Intermediate Support for Rafters and Joists

- (1) Ceiling joists and collar ties of not less than 38 mm by 89 mm lumber are permitted to be assumed to provide intermediate support to reduce the span for rafters and joists where the roof slope is 1 in 3 or greater.
- (2) Collar ties referred to in Sentence (1) more than 2.4 m long shall be laterally supported near their centres by not less than 19 mm by 89 mm continuous members at right angles to the collar ties.
- (3) Dwarf walls and struts may be used to provide intermediate support to reduce the span for rafters and joists.

- (4) When struts are used to provide intermediate support, they shall be not less than 38 mm by 89 mm material extending from each rafter to a *loadbearing* wall at an angle of not less than 45° to the horizontal.
- (5) When dwarf walls are used for rafter support, they shall be framed in the same manner as *loadbearing* walls and securely fastened top and bottom to the roof and ceiling framing to prevent overall movement.
- (6) Solid blocking shall be installed between floor joists beneath dwarf walls referred to in Sentence (5) that enclose finished rooms.

9.23.13.8. Ridge Support

- (1) Except as provided in Sentence (4), roof rafters and joists shall be supported at the ridge of the roof by,
 - (a) a *loadbearing* wall extending from the ridge to suitable bearing, or
 - (b) a ridge beam supported by not less than 89 mm length of bearing.
- (2) Except as provided in Sentence (3), the ridge beam referred to in Sentence (1) shall conform to the sizes and spans shown in Table A-12, provided,
 - (a) the supported rafter or joist length does not exceed 4.9 m, and
 - (b) the roof does not support any concentrated loads.
- (3) The ridge beam referred to in Sentence (1) need not comply with Sentence (2) where,
 - (a) the beam is of not less than 38 mm by 140 mm material, and
 - (b) the beam is supported at intervals not exceeding 1.2 m by not less than 38 mm by 89 mm members extending vertically from the ridge to suitable bearing.
- (4) When the roof slope is 1 in 3 or more, ridge support need not be provided when the lower ends of the rafters are adequately tied to prevent outward movement.
- (5) Ties required in Sentence (4) are permitted to consist of tie rods or ceiling joists forming a continuous tie for opposing rafters and nailed in accordance with Table 9.23.13.8.
- (6) Ceiling joists referred to in Sentence (5) shall be fastened together with at least one more nail per joist splice than required for the rafter to joist connection shown in Table 9.23.13.8.
- (7) Members referred to in Sentence (6) are permitted to be fastened together either directly or through a gusset plate.

Table 9.23.13.8.
Rafter-to-Joist Nailing (Unsupported Ridge)
 Forming Part of Sentences 9.23.13.8.(5) and (6)

Roof Slope	Rafter Spacing, mm	Minimum Number of Nails not less than 75 mm Long											
		Rafter Tied to every Joist						Rafter Tied to Joist every 1.2 m					
		Building Width up to 8.0 m			Building Width up to 9.8 m			Building Width up to 8.0 m			Building Width up to 9.8 m		
		Roof Snow Load, kPa			Roof Snow Load, kPa			Roof Snow Load, kPa			Roof Snow Load, kPa		
		1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more
1 in 3	406	4	5	6	5	7	8	11	—	—	—	—	—
	610	6	8	9	8	—	—	11	—	—	—	—	—
1 in 2.4	406	4	4	5	5	6	7	7	10	—	9	—	—
	610	5	7	8	7	9	11	7	10	—	—	—	—
1 in 2	406	4	4	4	4	4	5	6	8	9	8	—	—
	610	4	5	6	5	7	8	6	8	9	8	—	—
1 in 1.71	406	4	4	4	4	4	4	5	7	8	7	9	11
	610	4	4	5	5	6	7	5	7	8	7	9	11
1 in 1.33	406	4	4	4	4	4	4	4	5	6	5	6	7
	610	4	4	4	4	4	5	4	5	6	5	6	7
1 in 1	406	4	4	4	4	4	4	4	4	4	4	4	5
	610	4	4	4	4	4	4	4	4	4	4	4	5
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14

9.23.13.9. Restraint of Joist Bottoms

(1) Roof joists supporting a finished ceiling, other than plywood, OSB or waferboard, shall be restrained from twisting along the bottom edges by means of furring, blocking, cross bridging or strapping conforming to Article 9.23.9.3.

9.23.13.10. Ceiling Joists Supporting Roof Load

(1) Except as provided in Sentence (2), ceiling joists supporting part of the roof load from the rafters shall be not less than 25 mm greater in depth than required for ceiling joists not supporting part of the roof load.

(2) When the roof slope is 1 in 4 or less, the ceiling joist sizes referred to in Sentence (1) shall be determined from the span tables for roof joists.

9.23.13.11. Wood Roof Trusses

- (1) Roof trusses that are not designed in accordance with Part 4 shall,
- be capable of supporting a total ceiling load (*dead load plus live load*) of 0.35 kPa plus two and two-thirds times the specified live roof load for 24 h, and
 - not exceed the deflections shown in Table 9.23.13.11. when loaded with the ceiling load plus one and one-third times the specified roof snow load for 1 h.