

PROFESSIONAL ENGINEERING SERVICES

111 Gold Meadow Dr, Cary, NC 27513
North Carolina License 021195

CONSULTING.DESIGN

Revised Report:

Wednesday, October 12, 2022

See page 2 for revision,

Monday, October 3, 2022

Ref: Structural Evaluation and Design:
Beam design for garage vaulted ceiling

Address: 1462 Wheeler Dr,
Angier, NC 27501

To: Christopher Kerns/Whom it may concern

Homeowner is planning to make structural alteration in the garage by taking out the low ceiling and replace it with vaulted ceiling.

Property is single family home, one story, gable roofing, built 1990.

The subject ceiling in the garage currently consists of two beams in the middle of the ceiling and ceiling joists extends on both direction from beams to front and back of the garage, existing condition is showing on Fig 1.

To have a vaulted ceiling instead of the current 8 feet ceiling, the ridge board should be supported or replaced with ridge beam. To do that I recommend the following:

-Use (2)1.75"x16" LVL beam 2.0 E, under the current ridge board, the two ends of the ridge beam should be supported by (5)2x4 stud columns, the outer two studs to be used as a king studs, The stud column should be laid over (2)2x4 top plate over the existing concrete rings over the window width. The other end of the ridge beam can be supported from top to the existing floor slab, as in Fig 2. Make sure to add blocking on both sides of the end beam attached to end gable or/and an angled 2x4 between beam and top plate at the window side. Use 18" long strap to connect the existing ridge board with the ridge beam every 24" along the ridges length from both sides. Add connection between rafters and existing ridge board using either brackets or hurricane ties.

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Connect the 2 ply of the new ridge beam according to the schedule attached, Fig 4. Nail column studs together or strap them together at 24" off center with 2 nails, 16d box sinkers nails.

The current rafters for the roof are 2x6 at 16" O.C, I recommend adding additional rafters, use 2x8 rafter every third rafter to give additional support to the existing rafters.

Use strap to connect column with LVL beams on each side of the beam.

October 11, 2022, Revision:

Homeowner requested to look into another option of keeping the 8 feet ceiling and only replace the two dropdown beam with one flush beam.

In this case as in Fig 3:

Use (2)1.75"x16" LVL, E2.0, and use (4)2x4 studs columns on the dining room side, C1.

Use (2)1.75"x16" LVL, E2.0 above the window side and use (3)2x4 columns on both sides of the window under the LVL above the window, C2. Use Fig 4 for connection the 2ply LVL. Add strap between column and beams.

All works should be in compliance with the 2018 NCBC.

Should you have any questions or concerns regarding the information contained in this report, please contact me at: 919-749-5151.

Sincerely,

Kamal Essaid PE



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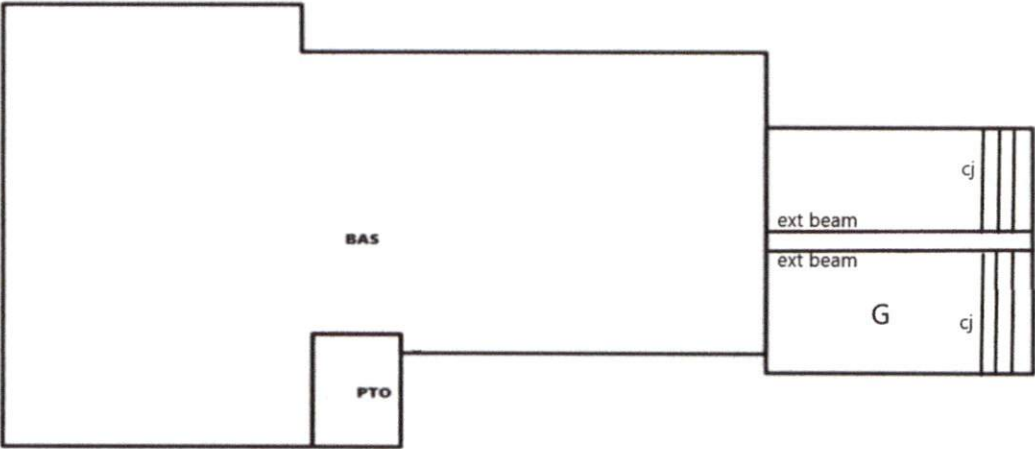


Figure 1

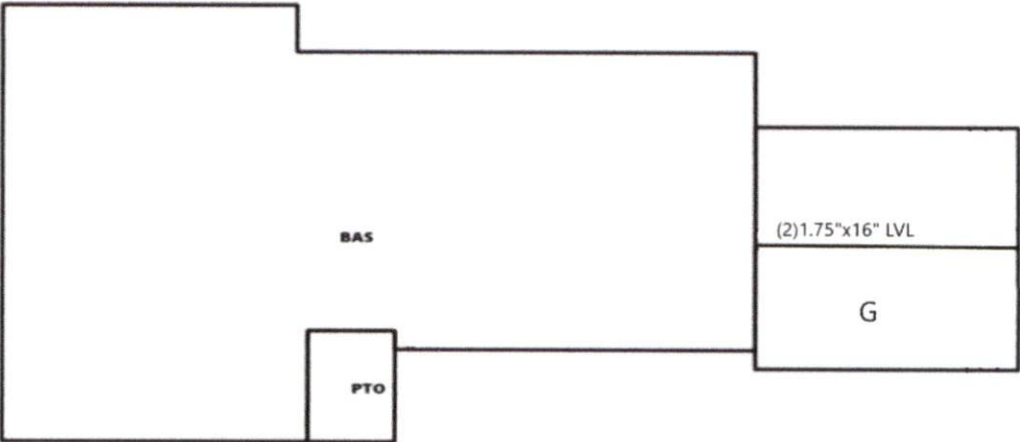


Figure 2

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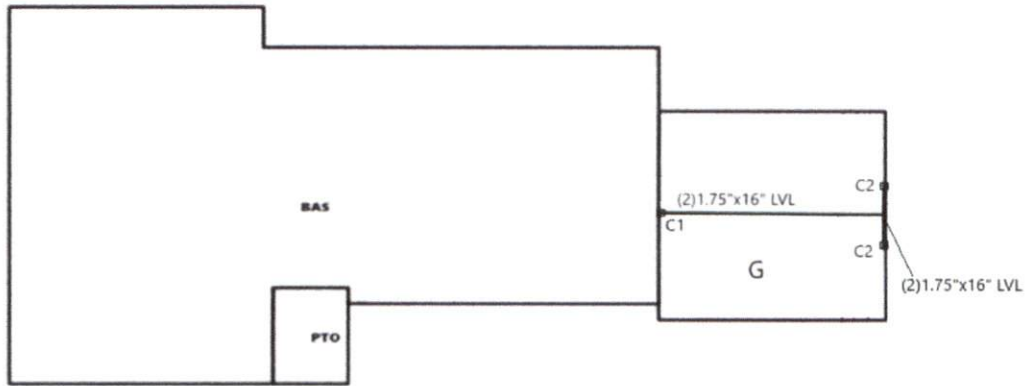


Figure 3

Top Loaded Applications

For top-loaded beams and beams with side loads with less than those shown:

Plies	Depth	Nailing ⁽²⁾	Maximum Uniform Load From One Side
(2) 1 1/4" plies	Depths 11 1/8" & less	2 rows 16d box/sinker nails @ 12" o.c.	400 plf
	Depths 14" - 18" X	3 rows 16d box/sinker nails @ 12" o.c. X	600 plf
	Depth = 24"	4 rows 16d box/sinker nails @ 12" o.c.	800 plf
(3) 1 1/4" plies ⁽¹⁾	Depths 11 1/8" & less	2 rows 16d box/sinker nails @ 12" o.c.	300 plf
	Depths 14" - 18"	3 rows 16d box/sinker nails @ 12" o.c.	450 plf
	Depth = 24"	4 rows 16d box/sinker nails @ 12" o.c.	600 plf
(4) 1 1/4" plies	Depths 18" & less	2 rows 1/2" bolts @ 24" o.c., staggered	335 plf
	Depth = 24"	3 rows 1/2" bolts @ 24" o.c., staggered every 8"	505 plf
(2) 3/2" plies	Depths 18" & less	2 rows 1/2" bolts @ 24" o.c., staggered	855 plf
	Depth 20" - 24"	3 rows 1/2" bolts @ 24" o.c., staggered every 8"	1285 plf

Figure 4