SBCA Research Report

2018 North Carolina Residential Code Prescriptive Tables for Selection of Support Elements for Beams, Girders, and Headers: Example Problems

SRR No. 1801-01

Structural Building Components Association (SBCA)

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This research report is based on practical scientific research (literature review, testing, analysis, etc.). This research report complies with the following sections of the building code:

- *IBC* Section 104.11.1 and Section 1703.4.2 – "**Research reports.** Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved sources*."
- *IBC* Section 202 – "**APPROVED SOURCE.** An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses."

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Introduction:

The 2018 North Carolina Residential Code (2015 International Residential Code with North Carolina amendments) provides prescriptive requirements for residential structures of conventional construction. Those requirements include minimum footing widths for exterior walls supporting uniform floor and roof loads for a variety of building heights and load-bearing values of soil. The prescriptive requirements also address girders and headers in exterior walls, as well as the required number of studs to support each end of the girder or header.

The prescriptive requirements, however, do not directly address concentrated loads on exterior walls - such as the concentrated load from a girder truss bearing on an exterior wall. To address this issue, SBCA has published a series of documents with tables, figures, and footnotes titled “2018 North Carolina Residential Code Prescriptive Tables for Selection of Support Elements for Beams, Girders, and Headers.” These tables, separated into documents for 20, 30, 50, and 70 psf snow load, take the prescriptive requirements that are already in the code and extrapolate them to specific requirements for footings and wall studs at concentrated loads in exterior walls.

The tables are intended as a practical tool to assist contractors in the selection of footing widths and the determination of the quantity of wood studs required for supporting the end reactions of beams, girders, and/or headers. The following examples in this report demonstrate how the tables can be used.

Key Definitions:

BUILDING DESIGNER: (*ANSI/TPI 1* Section 2.2)
Owner of the building or the person that contracts with the owner for the design of the building structural system and/or who is responsible for the preparation of the construction documents. When mandated by the legal requirements, the building designer shall be a registered design professional.

CONSTRUCTION DOCUMENTS: (*IRC* Section R202)
Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction drawings shall be drawn to an appropriate scale.

CONTRACTOR: (*ANSI/TPI 1* Section 2.2)
Owner of a building, or the person who contracts with the owner, who constructs the building in accordance with the construction documents and the truss submittal package. The term "contractor" shall include those subcontractors who have a direct contract with the contractor to construct all or a portion of the construction.

REGISTERED DESIGN PROFESSIONAL: (*IRC* Section R202)
An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

OWNER: (*IRC* Section R202)
Any person, agent, firm or corporation having a legal or equitable interest in the property.

Background:

The values presented in the tables were derived from the minimum design criteria, maximum span conditions, and allowable loads published in the proposed 2018 North Carolina Residential Code. The section(s) of the proposed 2018 North Carolina Residential Code used in the development of the tabulated values is noted on each table. The tables and figures are grouped into three main categories: footing tables, jack stud tables, and beam tables.

This research report will offer example problems using tables from each section of the prescriptive tables document to help the user understand how the tables interact and how to use them. Tables and figures in this research report are labeled with the same titles and numbers as in the prescriptive tables document.

Note that structural elements that exceed the prescriptive limitations of the 2018 North Carolina Residential Code and/or these tables, must be designed in accordance with accepted engineering practice by a registered design professional.

Example 1:

Problem*:* A 4.5-inch thick header (3-2x plies) with an end reaction of 6400 pounds is located in the first story floor of a 28-foot wide two-story house with center bearing floors and exterior brick veneer. The load bearing value of the soil is 2000 psf and the roof snow load is 30 psf. Determine the quantity of jack studs and the minimum footing width required to support the reaction at each end of the header.

Solution: Table 2.1 indicates that 4 jack studs are required at each end of the header (Maximum End Reaction = 7040 pounds with a 4.5-inch thick header). Table 1.1 indicates that a 28-inch wide by 8-inch thick continuous footing is required to support the header reactions (Maximum Column Load = 8003 pounds; refer to Figure 4, *Roof, Ceiling and Two Center-Bearing Floors*). Note that Table 1.1 is based on a 36-foot wide house (See General Notes in NRC Prescriptive Tables document).

Relevant Tables and Figures:

TABLE 1.1: MAXIMUM COLUMN LOAD ON CONTINUOUS CAST-IN-PLACE CONCRETE FOOTING AT EXTERIOR WALL LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER / ROOF SNOW LOAD = 30 PSF

(Reference: 2018 North Carolina Residential Code Section 403.1.1)

LOAD BEARING VALUE OF SOIL (PSF)			*2000*								
FOOTING WIDTH, W (IN.)			*16*	*20*	*24*	*28*	*32*	*36*	*40*	*44*	*48*
FOUNDATION WALL SUPPORTING	*FOOTING THICKNESS, T (IN.)*	*WALL LOAD ON FOOTING (PLF)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*
ROOF AND CEILING OVER SLAB-ON-GRADE (FIGURE 1)	**8**	1550	5267	8580	11893	15205					
	10	1550	5384	8845	12307	15768	19229				
	12	1550	5479	9083	12688	16292	19896	23500			
	14	1550	5552	9293	13035	16777	20518	24260	28001		
	16	1550	5603	9476	13349	17223	21096	24969	28843	32716	
	18	1550	5631	9630	13630	17630	21629	25629	29628	33628	37628
	20	1550	5637	9757	13878	17998	22118	26238	30359	34479	38599
ROOF, CEILING AND ONE CENTER-BEARING FLOOR (FIGURE 2)	**8**	2000	2754	6067	9380	12693					
	10	2000	2722	6183	9644	13105	16567				
	12	2000	2667	6271	9875	13479	17083	20688			
	14	2000	2589	6331	10073	13814	17556	21297	25039		
	16	2000	2490	6363	10237	14110	17983	21857	25730	29603	
	18	2000	2368	6368	10368	14367	18367	22366	26366	30365	34365
	20	2000	2224	6345	10465	14585	18706	22826	26946	31066	35187
ROOF, CEILING AND ONE CLEAR-SPAN FLOOR (FIGURE 3)	**8**	2450	242	3555	6868	10180					
	10	2450	59	3520	6982	10443	13904				
	12	2450	-	3458	7063	10667	14271	17875			
	14	2450	-	3368	7110	10852	14593	18335	22076		
	16	2450	-	3251	7124	10998	14871	18744	22618	26491	
	18	2450	-	3105	7105	11105	15104	19104	23103	27103	31103
	20	2450	-	2932	7053	11173	15293	19413	23534	27654	31774
ROOF, CEILING AND TWO CENTER-BEARING FLOORS (FIGURE 4)	**8**	2840	-	1377	4690	8003					
	10	2840	-	1213	4674	8135	11597				
	12	2840	-	1021	4625	8229	11833	15438			
	14	2840	-	801	4543	8284	12026	15767	19509		
	16	2840	-	553	4427	8300	12173	16047	19920	23793	
	18	2840	-	278	4278	8277	12277	16276	20276	24275	28275
	20	2840	-	-	4095	8215	12336	16456	20576	24696	28817
ROOF, CEILING	**8**	3650	-	-	168	3480					
	10	3650	-	-	-	3343	6804				
	12	3650	-	-	-	3167	6771	10375			

AND TWO CLEAR-SPAN FLOORS (FIGURE 5)	**14**	3650	-	-	-	2952	6693	10435	14176		
	16	3650	-	-	-	2698	6571	10444	14318	18191	
	18	3650	-	-	-	2405	6404	10404	14403	18403	22403
	20	3650	-	-	-	2073	6193	10313	14434	18554	22674
ROOF, CEILING AND THREE CENTER-BEARING FLOORS (FIGURE 6)	**8**	3680	-	-	0	3313					
	10	3680	-	-	-	3165	6627				
	12	3680	-	-	-	2979	6583	10188			
	14	3680	-	-	-	2754	6496	10237	13979		
	16	3680	-	-	-	2490	6363	10237	14110	17983	
	18	3680	-	-	-	2187	6187	10186	14186	18185	22185
	20	3680	-	-	-	1845	5966	10086	14206	18326	22447
ROOF, CEILING AND THREE CLEAR-SPAN FLOORS (FIGURE 7)	**8**	4850	-	-	-	-					
	10	4850	-	-	-	-	-				
	12	4850	-	-	-	-	-	2875			
	14	4850	-	-	-	-	-	2535	6276		
	16	4850	-	-	-	-	-	2144	6018	9891	
	18	4850	-	-	-	-	-	1704	5703	9703	13703
	20	4850	-	-	-	-	-	1213	5334	9454	13574

TABLE 2.1: MAXIMUM HEADER / GIRDER END REACTION FOR SPECIFIED NUMBER OF JACK STUDS AND HEADER THICKNESS

(Reference: 2018 North Carolina Residential Code Section R502.5 and Table R602.7(1))

HEADER THICKNESS	*3" (2-2x)*	*4.5" (3-2X)*	*6" (4-2x)*
NUMBER OF JACK STUDS	*MAXIMUM END REACTION (LB.)*	*MAXIMUM END REACTION (LB.)*	*MAXIMUM END REACTION (LB.)*
1	**1660**	**1760**	**2760**
2	**3320**	**3520**	**5520**
3	**4980**	**5280**	**8280**
4	**6640**	**7040**	**11040**

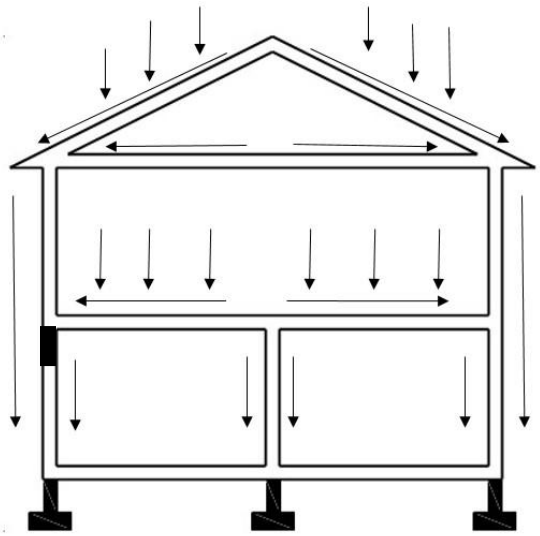

FIGURE 4: ROOF, CEILING AND TWO CENTER-BEARING FLOORS

Example 2:

Problem: A header with a span of 8 feet is located in the first story of a 34-foot wide three-story house with center bearing floors and wood exterior cladding. The load bearing value of the soil is 2000 psf and the roof snow load is 30 psf. Determine the quantity of jack studs and the minimum footing width required to support the reaction at each end of the header.

Solution: Table 2.3 indicates that the header has an end reaction of 6896 pounds (refer to Figure 13, *Roof, Ceiling, and Two Center-Bearing Floors*) and that 4 jack studs are required for a 4.5-inch thick header and 3 jack studs are required for a 6-inch thick header. Table 1.4 indicates that a 28-inch wide by 10-inch thick continuous footing is required to support the header reactions (Maximum Column Load = 9674 pounds; refer to Figure 6, *Roof, Ceiling, and Three Center-Bearing Floors).* Note that both Table 2.3 and Table 1.4 are based on a 36-foot wide house.

Relevant Tables and Figures:

TABLE 1.4: MAXIMUM COLUMN LOAD ON CONTINUOUS CAST-IN-PLACE CONCRETE FOOTING AT EXTERIOR WALL LIGHT-FRAME CONSTRUCTION / ROOF SNOW LOAD = 30 PSF

(Reference: 2018 North Carolina Residential Code Section 403.1.1)

LOAD BEARING VALUE OF SOIL (PSF)			*2000*								
FOOTING WIDTH, W (IN.)			*16*	*20*	*24*	*28*	*32*	*36*	*40*	*44*	*48*
FOUNDATION WALL SUPPORTING	*FOOTING THICKNESS, T (IN.)*	*WALL LOAD ON FOOTING (PLF)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*	*MAXIMUM COLUMN LOAD (LB.)*
ROOF AND CEILING OVER SLAB-ON- GRADE (FIGURE 1)	**8**	1130	7389	10701	14014						
	10	1130	7633	11094	14555	18016					
	12	1130	7854	11458	15063	18667	22271				
	14	1130	8054	11795	15537	19278	23020	26761			
	16	1130	8231	12104	15978	19851	23724	27598	31471		
	18	1130	8386	12385	16385	20385	24384	28384	32383	36383	
	20	1130	8519	12639	16759	20879	25000	29120	33240	37361	41481
ROOF, CEILING AND ONE CENTER-BEARING FLOOR (FIGURE 2)	**8**	1580	4876	8189	11502						
	10	1580	4970	8431	11893	15354					
	12	1580	5042	8646	12250	15854	19458				
	14	1580	5091	8833	12574	16316	20057	23799			
	16	1580	5118	8992	12865	16738	20612	24485	28358		
	18	1580	5123	9123	13123	17122	21122	25121	29121	33120	
	20	1580	5106	9226	13347	17467	21587	25708	29828	33948	38068
ROOF, CEILING AND ONE CLEAR-SPAN FLOOR (FIGURE 3)	**8**	2030	2364	5676	8989						
	10	2030	2308	5769	9230	12691					
	12	2030	2229	5833	9438	13042	16646				
	14	2030	2129	5870	9612	13353	17095	20836			
	16	2030	2006	5879	9753	13626	17499	21373	25246		
	18	2030	1861	5860	9860	13860	17859	21859	25858	29858	
	20	2030	1694	5814	9934	14054	18175	22295	26415	30536	34656
ROOF, CEILING AND TWO CENTER-BEARING FLOORS (FIGURE 4)	**8**	2060	2196	5509	8822						
	10	2060	2130	5591	9053	12514					
	12	2060	2042	5646	9250	12854	16458				
	14	2060	1931	5673	9414	13156	16897	20639			
	16	2060	1798	5672	9545	13418	17292	21165	25038		
	18	2060	1643	5643	9643	13642	17642	21641	25641	29640	
	20	2060	1466	5586	9707	13827	17947	22068	26188	30308	34428
ROOF, CEILING AND TWO CLEAR-SPAN FLOORS (FIGURE 5)	**8**	2870	-	986	4299						
	10	2870	-	799	4260	7721					
	12	2870	-	583	4188	7792	11396				
	14	2870	-	340	4082	7823	11565	15306			
	16	2870	-	69	3943	7816	11689	15563	19436		
	18	2870	-	-	3770	7770	11769	15769	19768	23768	
	20	2870	-	-	3564	7684	11805	15925	20045	24166	28286
ROOF, CEILING AND	**8**	2540	-	2829	6142						
	10	2540	-	2751	6213	9674					
	12	2540	-	2646	6250	9854	13458				

THREE CENTER-BEARING FLOORS (FIGURE 6)	14	2540	-	2513	6254	9996	13737	17479			
	16	2540	-	2352	6225	10098	13972	17845	21718		
	18	2540	-	2163	6163	10162	14162	18161	22161	26160	
	20	2540	-	1946	6067	10187	14307	18428	22548	26668	30788
ROOF, CEILING AND THREE CLEAR-SPAN FLOORS (FIGURE 7)	8	3710	-	-	-						
	10	3710	-	-	-	2751					
	12	3710	-	-	-	2542	6146				
	14	3710	-	-	-	2293	6035	9776			
	16	3710	-	-	-	2006	5879	9753	13626		
	18	3710	-	-	-	1680	5679	9679	13678	17678	
	20	3710	-	-	-	1314	5435	9555	13675	17796	21916

TABLE 2.3: LOAD CHART FOR END REACTIONS OF GIRDERS AND HEADERS IN EXTERIOR BEARING WALLS

GROUND SNOW LOAD = 30 PSF, ROOF SNOW LOAD = 30 PSF

(Reference: 2018 North Carolina Residential Code Section R502.5 and Table R602.7(1))

BUILDING WIDTH = 36 FT.

GIRDERS AND HEADERS SUPPORTING	1st FLOOR SPAN (FT.)	2nd FLOOR SPAN (FT.)	3rd FLOOR SPAN (FT.)	ROOF SPAN (FT.)	HEADER / GIRDER SPAN (FT.)	1st FLOOR LIVE (PSF)	1st FLOOR DEAD (PSF)	2nd FLOOR LIVE (PSF)	2nd FLOOR DEAD (PSF)	3rd FLOOR LIVE (PSF)	3rd FLOOR DEAD (PSF)	ROOF LIVE / SNOW (PSF)	ROOF DEAD (PSF)	WALL LOAD (PLF)	HEADER / GIRDER LOAD (PLF)	HEADER END REACTION (LB.)	NJ HEADER THICKNESS 3" (2-2x)	NJ HEADER THICKNESS 4.5" (3-2x)	NJ HEADER THICKNESS 6" (4-2x)
ROOF AND CEILING (FIGURE 10)	0	0	0	36	2	40	10	30	10	30	10	30	10	0	**800**	**800**	1	1	1
	0	0	0	36	4	40	10	30	10	30	10	30	10	0	**800**	**1600**	1	1	1
	0	0	0	36	6	40	10	30	10	30	10	30	10	0	**800**	**2400**	2	2	1
	0	0	0	36	8	40	10	30	10	30	10	30	10	0	**800**	**3200**	2	2	2
	0	0	0	36	10	40	10	30	10	30	10	30	10	0	**800**	**4000**	3	3	2
	0	0	0	36	12	40	10	30	10	30	10	30	10	0	**800**	**4800**	3	3	2
	0	0	0	36	14	40	10	30	10	30	10	30	10	0	**800**	**5600**	4	4	3
	0	0	0	36	16	40	10	30	10	30	10	30	10	0	**800**	**6400**	4	4	3
ROOF, CEILING AND ONE CENTER-BEARING FLOOR (FIGURE 11)	0	18	0	36	2	40	10	30	10	30	10	30	10	108	**1268**	**1268**	1	1	1
	0	18	0	36	4	40	10	30	10	30	10	30	10	108	**1268**	**2536**	2	2	1
	0	18	0	36	6	40	10	30	10	30	10	30	10	108	**1268**	**3804**	3	3	2
	0	18	0	36	8	40	10	30	10	30	10	30	10	108	**1268**	**5072**	4	3	2
	0	18	0	36	10	40	10	30	10	30	10	30	10	108	**1268**	**6340**	4	4	3
	0	18	0	36	12	40	10	30	10	30	10	30	10	108	**1268**	**7608**			3
	0	18	0	36	14	40	10	30	10	30	10	30	10	108	**1268**	**8876**			4
	0	18	0	36	16	40	10	30	10	30	10	30	10	108	**1268**	**10144**			4
ROOF, CEILING AND ONE CLEAR-SPAN FLOOR (FIGURE 12)	0	36	0	36	2	40	10	30	10	30	10	30	10	108	**1628**	**1628**	1	1	1
	0	36	0	36	4	40	10	30	10	30	10	30	10	108	**1628**	**3256**	2	2	2
	0	36	0	36	6	40	10	30	10	30	10	30	10	108	**1628**	**4884**	3	3	2
	0	36	0	36	8	40	10	30	10	30	10	30	10	108	**1628**	**6512**	4	4	3
	0	36	0	36	10	40	10	30	10	30	10	30	10	108	**1628**	**8140**			3
	0	36	0	36	12	40	10	30	10	30	10	30	10	108	**1628**	**9768**			4
	0	36	0	36	14	40	10	30	10	30	10	30	10	108	**1628**	**11396**			
	0	36	0	36	16	40	10	30	10	30	10	30	10	108	**1628**	**13024**			
ROOF, CEILING AND TWO CENTER-BEARING FLOORS (FIGURE 13)	0	18	18	36	2	40	10	30	10	30	10	30	10	204	**1724**	**1724**	2	1	1
	0	18	18	36	4	40	10	30	10	30	10	30	10	204	**1724**	**3448**	3	2	2
	0	18	18	36	6	40	10	30	10	30	10	30	10	204	**1724**	**5172**	4	3	2
	0	18	18	36	8	40	10	30	10	30	10	30	10	204	**1724**	**6896**		4	3
	0	18	18	36	10	40	10	30	10	30	10	30	10	204	**1724**	**8620**			4
	0	18	18	36	12	40	10	30	10	30	10	30	10	204	**1724**	**10344**			4
	0	18	18	36	14	40	10	30	10	30	10	30	10	204	**1724**	**12068**			
	0	18	18	36	16	40	10	30	10	30	10	30	10	204	**1724**	**13792**			
ROOF, CEILING AND TWO CLEAR-SPAN FLOORS (FIGURE 14)	0	36	36	36	2	40	10	30	10	30	10	30	10	204	**2444**	**2444**	2	2	1
	0	36	36	36	4	40	10	30	10	30	10	30	10	204	**2444**	**4888**	3	3	2
	0	36	36	36	6	40	10	30	10	30	10	30	10	204	**2444**	**7332**			3
	0	36	36	36	8	40	10	30	10	30	10	30	10	204	**2444**	**9776**			4
	0	36	36	36	10	40	10	30	10	30	10	30	10	204	**2444**	**12220**			
	0	36	36	36	12	40	10	30	10	30	10	30	10	204	**2444**	**14664**			
	0	36	36	36	14	40	10	30	10	30	10	30	10	204	**2444**	**17108**			
	0	36	36	36	16	40	10	30	10	30	10	30	10	204	**2444**	**19552**			

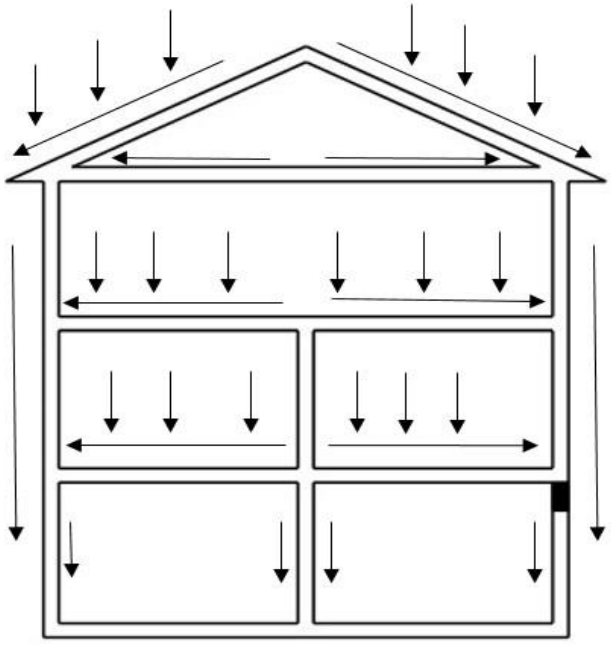

FIGURE 13: ROOF, CEILING AND TWO CENTER-BEARING FLOORS

Example 3:

Problem: An interior beam is required to support a uniform load of 600 plf over a span of 8 feet. Select an appropriate wood beam for the load and span specified and determine the quantity of jack studs required to support each end of the beam.

Solution: Table 3.1 indicates that a 3-ply 2x10 spruce-pine-fir beam is required to support a load of 600 plf over a span of 8 feet (Allowable Load = 643 plf). Table 3.1 also indicates, for a 3-ply 2x10 with a uniform load of 643 plf and a span of 8 feet, an end reaction of 2572 pounds. Using this reaction, Table 2.1 indicates that 2 jack studs are required to support each end of the beam (Maximum End Reaction = 3520 pounds with a 4.5-inch thick header).

Relevant Tables and Figures:

TABLE 2.1: MAXIMUM HEADER / GIRDER END REACTION FOR SPECIFIED NUMBER OF JACK STUDS AND HEADER THICKNESS

(Reference: 2018 North Carolina Residential Code Section R502.5 and Table R602.7(1))

HEADER THICKNESS	*3" (2-2x)*	*4.5" (3-2X)*	*6" (4-2x)*
NUMBER OF JACK STUDS	*MAXIMUM END REACTION (LB.)*	*MAXIMUM END REACTION (LB.)*	*MAXIMUM END REACTION (LB.)*
1	1660	1760	2760

2	3320	3520	5520
3	4980	5280	8280
4	6640	7040	11040

TABLE 3.1: WOOD BEAMS AND GIRDERS ALLOWABLE LOADS AND CORRESPONDING REACTIONS
(Reference: 2018 North Carolina Residential Code Table W-1)

2x8 (1-1/2" x 7-1/4")

BEAM / GIRDER SPAN, L (FT.)	SPRUCE-PINE-FIR						SOUTHERN PINE					
	2-PLY		3-PLY		4-PLY		2-PLY		3-PLY		4-PLY	
	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)
3	1305	1958	1956	2934	2610	3915	1692	2538	2538	3807	3383	5075
4	979	1958	1468	2936	1958	3916	1013	2026	1519	3038	2026	4052
5	736	1840	1104	2760	1472	3680	648	1620	972	2430	1296	3240
6	511	1533	767	2301	1022	3066	450	1350	675	2025	900	2700
7	375	1313	563	1971	751	2629	331	1159	496	1736	661	2314
8	287	1148	431	1724	575	2300	253	1012	380	1520	506	2024
9	227	1022	341	1535	454	2043	200	900	300	1350	400	1800
10	184	920	276	1380	368	1840	162	810	243	1215	324	1620
12	114	684	172	1032	228	1368	113	678	169	1014	225	1350
14	72	504	108	756	144	1008	72	504	108	756	144	1008

2x10 (1-1/2" x 9-1/4")

BEAM / GIRDER SPAN, L (FT.)	SPRUCE-PINE-FIR						SOUTHERN PINE					
	2-PLY		3-PLY		4-PLY		2-PLY		3-PLY		4-PLY	
	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)
3	1665	2498	2498	3747	3330	4995	2158	3237	3238	4857	4317	6476
4	1249	2498	1873	3746	2498	4996	1426	2852	2139	4278	2852	5704
5	999	2498	1499	3748	1998	4995	913	2283	1369	3423	1825	4563
6	763	2289	1144	3432	1525	4575	634	1902	951	2853	1268	3804
7	560	1960	840	2940	1120	3920	466	1631	698	2443	931	3259
8	429	1716	643	2572	858	3432	357	1428	535	2140	713	2852
9	339	1526	508	2286	678	3051	282	1269	423	1904	563	2534
10	275	1375	412	2060	549	2745	228	1140	342	1710	456	2280
12	191	1146	286	1716	381	2286	158	948	238	1428	317	1902
14	140	980	210	1470	280	1960	116	812	175	1225	233	1631

2x12 (1-1/2" x 11-1/4")

BEAM / GIRDER SPAN, L (FT.)	SPRUCE-PINE-FIR						SOUTHERN PINE					
	2-PLY		3-PLY		4-PLY		2-PLY		3-PLY		4-PLY	
	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)	LOAD (PLF)	END REACTION (LB.)
3	2025	3038	3038	4557	4050	6075	2625	3938	3938	5907	5250	7875
4	1519	3038	2278	4556	3038	6076	1969	3938	2953	5906	3938	7876
5	1215	3038	1823	4558	2430	6075	1266	3165	1898	4745	2531	6328
6	1013	3039	1519	4557	2025	6075	879	2637	1318	3954	1756	5268
7	753	2636	1130	3955	1507	5275	646	2261	969	3392	1291	4519
8	577	2308	856	3424	1154	4616	494	1976	742	2968	989	3956
9	456	2052	684	3078	911	4100	391	1760	586	2637	781	3515
10	369	1845	554	2770	738	3690	316	1580	475	2375	633	3165
12	256	1536	385	2310	513	3078	220	1320	330	1980	439	2634
14	188	1316	283	1981	377	2639	161	1127	242	1694	323	2261

Building Designer Responsibility:

Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Owner, Registered Design Professional, etc.) for the Building and shall be in accordance with *IRC* Section R106 and *IBC* Section 107. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *IRC* Section 301 and *IBC* Section 1603. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

Responsibilities:

- The information contained herein is a product, engineering or building code compliance research report prepared in accordance with the referenced building codes, testing and/or analysis using accepted engineering procedures, experience, and good technical judgment.
- Product design and code compliance quality control are the responsibility of the referenced company. Consult the referenced company for the proper detailing and application for the intended purpose. Consult your local jurisdiction or design professional to assure compliance with the local building code.
- SBCA Research Reports provide an assessment of only those attributes specifically addressed within a given report.
- The engineering evaluation was performed on the dates provided in this report, within SBCA's scope of work.

This research report is subject to periodic review and revision. For the most recent version of this report, visit sbcindustry.com. For information on the current status of this report, contact SBCA.

References:

ANSI/TPI 1 – National Design Standard for Metal Plate Connected Wood Truss Construction; Truss Plate Institute; 2007

International Building Code; International Code Council; 2015.

International Residential Code; International Code Council; 2015.

North Carolina Residential Code; North Carolina Building Code Council; 2018.

Prescriptive Tables for Selection of Support Elements for Beams, Girders, and Headers; Structural Building Components Association*;* 2018

Appendix A

Referenced Sections of the Proposed 2018 North Carolina Residential Code

R403.1.1 Minimum size.
Minimum sizes for concrete and masonry footings shall be as set forth in Table R403.1(1) and Figure R403.1(1). The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Spread footings shall be at least 6 inches (152 mm) in thickness, T. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection for fireplaces shall be in accordance with Section R1001.2. The size of footings supporting piers and columns shall be based on the tributary load in accordance with Table R403.1(2) and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3).

R502.5 Allowable Girder and Header Spans
The allowable spans of girders and headers fabricated of dimension lumber shall not exceed the values set forth in Tables R602.7(1), R602.7(2) and R602.7(3).