Memorandum
City of Lawrence
Planning & Development Services

TO: **Building Code Board of Appeals**

FROM: **Lee Queen, Ex-Officio, Building Inspector Development Services**
Janet Smalter, Ex-Officio, Plans Examiner Development Services

C: **Barry Walthall, Building Codes Manager,**
Kurt Schroeder, Asst. Director of Planning & Development, Development Services

Date: **March 16, 2017**

RE: **Building Code Board of Appeals Recommendation of Amendment Request**

The Lawrence Home Builders Association has requested to amend Table R602.7.5 of the 2015 International Residential Code to reduce the minimum full-height stud (king stud) requirements for wall openings.

The 2015 IRC was changed from the previous code edition to require additional structural support for headers in exterior walls in accordance with R602.7.5 and Table R602.7.5, the result of which adds additional king studs on each end of the header to resist lateral loads.

> **R602.7.5 Supports for headers.**
> Headers shall be supported on each end with one or more jack studs or with approved framing anchors in accordance with Table R602.7(1) or R602.7(2). The full-height stud adjacent to each end of the header shall be end nailed to each end of the header with four-16d nails (3.5 inches × 0.135 inches). The minimum number of full-height studs at each end of a header shall be in accordance with Table R602.7.5.

TABLE R602.7.5
MINIMUM NUMBER OF FULL HEIGHT STUDS
AT EACH END OF HEADERS IN EXTERIOR WALLS

HEADER SPAN (feet)	MAXIMUM STUD SPACING (inches) [per Table R602.3(5)]	
	16	24
≤ 3′	1	1
4′	2	1
8′	3	2
12′	5	3
16′	6	4

This code section lists minimum full-height stud (king stud) requirements for wall openings. The intent of the minimum full-height stud requirement is to ensure structural integrity in resisting loads by compensating for removal of full-height layout studs over the span of the wall opening. Full-height studs are used to stabilize a header by nailing the first stud into the end of the header, preventing header rotation. The number of full-height studs required is based on out-of-plane wind and gravity loads. An out-of-plane wind load is the load a wall resists due to wind pressing directly on it. Gravity loads passing down from the roof or wall above are transferred by both king studs and headers. Gravity loads passing through the header are then transferred by trimmers or jack studs to the foundation or story below.

The previous requirement for one full height stud at each end of longer headers is appropriate for shorter header spans but inadequate for longer header spans. The maximum stud spacing in accordance with Table R602.3(5) is specifically listed in the column heading to make clear that the maximum stud spacing, not actual stud spacing, is the determining factor for the number of required full-height studs at each end of the header. In construction, actual stud spacing is often 16 inches on center; however, the maximum stud spacing often permitted in the code is 24 inches on center. If the actual stud spacing is used and is less than the maximum stud spacing in accordance with Table R602.3(5), the required number of full-height studs at each end of the header would be over-estimated.

The table and amendment are a recorded document (Document RB229-16) submitted to the ICC COMMITTEE ACTION HEARINGS APRIL 2016 to review the proposed changes to the 2018 International Residential Code. The amendment was approved by the ICC membership and will be incorporated in the 2018 International Residential Code.

This change simplifies the full height stud (e.g. king stud) table while also removing conservatism and limited applicability of the 16" maximum stud spacing case. The number of full-height studs is based on out-of-plane wind resistance provided by the stud to plate nailing. The connection resistance has been increased from prior code editions based on RB272-13, approved last cycle. Wind loads are based on an assumption that full-height studs on either side of the opening carry 100% of the out-of-plane wind loads. Reference conditions for the calculations assume a 9' wall height and wall Zone 4 pressures for header spans greater than 6 feet and wall Zone 5 pressures for header spans less than 6 feet. The number of full height studs required by calculation is limited to the maximum number displaced by the opening. Footnote "a" clarifies that the number of full-height studs for intermediate header spans is based on the next larger header span. Footnote "b" provides a basic assumption of the number of tabulated requirements – that headers are supported at each end by jack studs. When jack stud support is not provided, such as when an approved anchor is used in lieu of a jack stud, the full height stud on either side of the opening is carrying both out-of-plane wind loads and gravity loads. For that case, footnote "b" indicates that the < 140 mph Exposure B column associated with the number of studs displaced by the opening is acceptable. This reduces number of full-height studs associated with 115 mph. Exposure B applies only in those lower wind pressure areas where jack stud support is provided to the header at each end.

TABLE R602.7.5
MINIMUM NUMBER OF FULL HEIGHT STUDS
AT EACH END OF HEADERS IN EXTERIOR WALLS

Maximum Header Span (feet)	ULTIMATE DESIGN WIND SPEED AND EXPOSURE CATAGORY	
	< 140 mph, Exposure B Or < 130 mph, Exposure C	≤ 115 mph, Exposure B[b]
4	1	1
6	2	1
8	2	1
10	3	2
12	3	2
14	3	2
16	4	2
18	4	2

a. For header spans between those given above, use the minimum number of full-height studs associated with the larger header span.
b. The tabulated minimum number of full-height studs is applicable where jack studs are provided to support the header at each end in accordance with Table R602.7.1(1). Where a framing anchor is used to support the header in lieu of a jack stud in accordance with footnote "d" of Table R602.7(1), the minimum number of full-heights studs at each end of a header shall be in accordance with requirements for wind speed < 140 mph, Exposure B.

STAFF RECOMMENDATION
Staff recommends that 2015 International Residential Code Table R602.7.5 be amended to reduce the minimum full-height stud (king stud) requirements for wall openings to conform to the upcoming requirements for header support in the 2018 International Residential Code.