

Selecting the Correct Design Capacity for Adjustable Steel Columns



Residential construction in the United States typically relies on either wood or cold-formed steel framing. For a typical home, the required size and spacing of these structural elements are given in the *International Residential Code*® (IRC®), and an engineer does not need to assess the loads on the structure and determine the size of individual elements. However, many residential structures are more complicated than those addressed by the IRC, and the engineer must then select the building components, in accordance with the *International Building Code*® (IBC®). Adjustable steel columns manufactured by [AFCO Manufacturing](#) (AFCO) and others are one such type of building component. These structural steel products can be selected by an engineer for use in nonresidential buildings as well. Therefore, the ICC-ES evaluation reports on these products must give sufficient information to allow the engineer to select the proper column for the project.

For design of structural steel elements of a building structure, the IBC references the AISC Specification for Structural Steel Buildings (AISC 360). AISC 360 allows for two different design approaches: Allowable Strength Design (ASD) and Load and Resistance

Factor Design (LRFD). This is also true of other referenced standards for structural elements, such as the AISI North American Specification for the Design of Cold-Formed Steel Structural Members (AISI S100) and AF&PA National Design Specification for Wood (NDS). To be consistent with these referenced standards and to facilitate use of adjustable steel columns in engineered structures, ICC-ES® evaluation reports on these products, such as [ESR-2452](#) for AFCO, provide both the allowable strength and the design strength for each recognized product. While some manufacturers may feel that providing allowable strength only is sufficient, providing both allowable and design strengths ensures that competing products are compared on the same basis. Including both allowable and design strengths in the evaluation report is a requirement of the ICC-ES Acceptance Criteria for Adjustable Steel Columns ([AC335](#)).

Elyse Levy, a Senior Structural Engineer with ICC-ES, stated, “While the LRFD design approach has been around for roughly 20 years, it has not yet become as well-known and understood as the older ASD design approach. This is particularly true in the



residential construction arena, where structures are often designed prescriptively rather than through engineered design. For this reason, it is important to support our evaluation reports with educational information like this article, given our interest in providing good technical information to code officials.”

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 (249)634-4415 SIZE: 3 X 11 LENGTH: 7'3" - 7'7" Design Thickness 0.120 inch ZIP® ADJUSTABLE COLUMN ICC-ES Evaluation Report ESR-2452		
Model 3K Length	Allowable Load ASD	Design Strength LRFD
8'0"	12,180	16,455
8'3"	11,825	16,080
8'6"	11,465	15,705
8'9"	11,110	15,330
7'0"	11,195	17,810
7'3"	10,845	17,510
7'6"	10,490	17,105
7'9"	10,140	16,700
8'0"	10,180	16,290
8'3"	9,825	15,875
8'6"	9,465	15,465
8'9"	9,105	15,050
9'0"	9,150	14,635
9'3"	8,790	14,220
9'6"	8,430	13,810
9'9"	8,075	13,400
10'0"	8,120	12,990

Column to be installed either end up & installed vertically with the bottom supported by a footing capable of supporting the imposed loads. After adjustment to desired length, screw threads to be either encased in concrete or one screw thread damaged to 1 1/2 inches to immobilize. Top plate shall be attached to the beam as required by specifications. Inspection Agency (BMH). LRFD design strength must be compared to factored loads.

When using ASD, the capacity of an element is called *allowable strength*. When using LRFD, the capacity of an element is called *design strength*. Because of the different design approaches, the allowable strength of a structural steel element is always less than the design strength. Despite the fact that allowable strengths and design strengths are available to the code official through the ESR,

many manufacturers choose to also include these loads on the product labeling.

Sometimes, construction drawings include a design load for an adjustable steel column in lieu of specifying a particular product. There should be an indication of whether this load is an ASD load or an LRFD load. However, in AFCO’s experience, this is often not the case. AFCO has fielded several calls from interested parties wondering which column capacity to use when the design approach is not included in the design information. D. F. Holbrook, President of AFCO Mfg., has been asked by customers, “Why are there multiple loads listed on your product labels and ICC -ES Evaluation Report, and which load am I to use?” To help educate the design and construction community about this issue, AFCO asked ICC-ES to provide clarification.

When in doubt, the design load on the construction drawings should be assumed to be an ASD load and

should be compared to the allowable strengths in the ESR. Because ASD predates LRFD, it is likely that a design load that does not include the design method has been determined using ASD. Design professionals who are familiar with LRFD will understand the importance of clarifying the design method used. Furthermore, because allowable strengths are always less than design strengths, it will always be safe to assume the ASD approach.

ICC-ES appreciates AFCO’s information regarding frequent questions received about ESR-2452 and interest in educating the public. If you are aware of other frequently asked questions regarding an ICC-ES ESR, please let us know.

All ICC-ES Evaluation Reports can be accessed and downloaded free of charge at www.icc-es.org/evaluation-reports/index.shtml, and are readily searchable based on attributes such as product type, manufacturer or report number. For more information, please visit www.icc-es.org.



* This article is intended to provide information about Allowable Strength Design (ASD) and Load and Resistance Factor Design (LRFD). It should not be construed as an endorsement or recommendation by ICC-ES®.

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