

Summary of Structural considerations for Mutliplex Housing proposal

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The following summarizes the structural investigations into the use of the Residential Code for the multiplex housing appendix proposal. Significant questions asked were;

1. Does the IRC accommodate vertical support for the gravity framing for three story structures?
2. Does the IRC accommodate lateral support for the seismic wind loads anticipated for three story structures?
3. Specifically, is the prescriptive seismic design an acceptable option for the design of structures in the Multiplex Housing Appendix proposal?

Input was requested from structural engineers who routinely use the IRC, these included engineers within DCI Engineers as well as structural engineers from the IBC TAG. There were also discussions with some building officials and code development experts. These interactions also lead to obtaining a **Basis of Lateral Force Calculations for IRC:** document from a professor at WSU who was involved in the development of the lateral design tables in the IRC.

From these interactions I have summarized the data I found into the following answers to the questions above.

1. There was unanimous agreement that the use of the IRC for three stories for the gravity design. In fact, the IRC already accommodate three story buildings, see R301.2.2.7 and Table R602.3(5) for instance.
2. Again, the answer is yes, the IRC anticipates three story structures for seismic and wind design, see R602.10. Also, the Basis of Lateral Force document appropriately anticipates various seismic and wind conditions with the state of Washington.
3. The biggest conversation was around the prescriptive lateral design, and should it be allowed for multiplex housing. My recommendation is that yes it should be allowed, based on the following information.
 - a. In the development of the prescriptive lateral design a three story structure was anticipated and the design of these structures is allowed. That is clear both from the inclusion of such structure in the code and the basis of design provided in the Basis of Lateral Force document.
 - b. In talking with both design engineers and building officials who design or review three story designs within the IRC, it is rare that a three-story building utilizes prescriptive lateral design. The prescriptive lateral design has come under more scrutiny from reviewers so that the engineering effort for this design is often as much or more than doing a specific engineered lateral design out of the IBC. In addition, a prescriptive lateral design will typically be more conservative and cost more than a specific engineered lateral design out of the IBC.

It is my recommendation that the Multiplex Housing Appendix should allow either the prescriptive lateral design or an engineered lateral design out of the IBC.

Given the information included above, the Multiplex Housing Appendix does not need to have anything specific about structural implications. All structural considerations are already anticipated within the IRC.