



Comparison of the Structural Provisions in the International Existing Building Code 2012 versus the Rhode Island State Rehabilitation Code

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By: Structural Engineers Association of Rhode Island, Building Code Committee

Introduction

At the request of the Building Code Standards Committee of the RI State Building Code Commission, the Structural Engineers Association of Rhode Island (SEARI) Building Code Subcommittee created this document. It compares and contrasts the basic structural provisions of the current Rhode Island State Rehabilitation Code 2002 ("RI SRC-1") with the 2012 Edition of the International Existing Building Code ("IEBC 2012").

The purpose of this document is to provide an overview of the two codes and major changes to building structural design provisions that would occur if Rhode Island chooses to adopt the IEBC 2012 to replace the Rehab Code. This narrative does NOT provide a detailed comparison of the individual provisions – it is recommended that such an exhaustive study be performed, including analysis of typical project case studies, prior to full adoption of the IEBC. There are some uses and type of buildings that are not covered by the rehab codes (see Table 1).

Overall Philosophy

The IEBC 2012 and RI SRC-1 share similar philosophies – to encourage the repairs, renovations, alterations, reconstructions, additions, and/or changes of occupancy of existing buildings without requiring full compliance with the Code for new buildings (IBC 2012 in Rhode Island).

Like the RI SRC-1, the IEBC 2012 is intended to replace Chapter 34 of the International Building Code (IBC), which provides prescriptive provisions for existing buildings. Unlike the RI SRC-1, there are no specific provisions for fire code issues in the IEBC 2012. Instead, the IEBC 2012 refers to the International Fire Code.



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Table 1. Building Types and Uses Not Covered

IEBC 2012 : Types/Uses Not Covered		RI SRC-1: Types/Uses Not Covered	
-	<p>Uses Not Covered</p> <p>There are no restricted uses in the IEBC 2012.</p>	101.1.1	<p>Uses Not Covered</p> <p>Health care facilities, nursing homes, child day care centers, community residences, educational occupancies, detention and correctional occupancies, high hazard occupancies, and one, two, and three family homes shall not be covered or enforced by this code and shall comply with the Building Code (SBC-1 and IBC 2012 Ch 34).</p>
-	<p>Building Age Limitation</p> <p>No minimum age requirements exist in the IEBC 2012.</p>	101.1	<p>Building Age Limitation</p> <p>Buildings must be in existence for at least ten (10) years prior to the application for a permit for the RI SRC-1 to apply. (It is not clear if IBC Chapter 34 is disallowed for buildings under 10 years in age)</p>
1401.3.3	<p>Flood Zones</p> <p>In flood hazard areas, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the International Building Code if the work covered by this section constitutes <i>substantial improvement</i>.</p> <p>Substantial Improvement is any repair, alteration, addition, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure, before the improvement or repair is started.</p>	102.10	<p>Flood Zones</p> <p>Buildings and structures located wholly or partially within the flood hazard area established by the Building Code shall comply with that code.</p>



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Methods of Compliance

The RI SRC-1 was written as an alternative Code for some classes of existing buildings in Rhode Island, and can be used in lieu of Chapter 34 of the IBC for such buildings. However, Chapter 34 of the IBC can be used for all buildings (i.e., the Rehab Code is not required).

The IEBC 2012 was written as an independent Code that can be adopted on its own, however it maintains compatibility with the family of I-Codes (including the IBC). Ultimately, the IEBC2012 is intended to supplant Chapter 34 of the IBC (although there is a great deal of debate and controversy over this idea), and therefore it incorporates several “methods of compliance”. The “methods of compliance” are discussed below and compared to the RI SRC-1.

Table 2. Compliance Methods

IEBC 2012: Compliance Methods		RI SRC-1: Compliance Methods	
301.1.1	<p>Prescriptive Compliance Method: This method allows the use of provisions similar to Chapter 34 of the IBC 2012. <i>(Note: RI can choose to not adopt this method)</i></p> <p>NOTE: In IEBC 2012 and all future editions, it is the intent that the IEBC Prescriptive Compliance Method is identical to Chapter 34 in the IBC.</p>	-	<p>Prescriptive Compliance Method: The Prescriptive Compliance Method is similar to Chapter 34 of the IBC, which can be used instead of the RI SRC-1 for any building.</p>
301.1.2	<p>Work Area Method: This method represents the majority of the body of the IEBC 2006 Code, and establishes provisions based on the level of work (repairs, alterations, additions, changes in occupancy, and relocated buildings).</p>	202	<p>Work Area Method: The work area method is similar to the main body of the RI SRC-1 (repairs, renovations, alterations, reconstruction, additions, and changes in occupancy). <i>Commentary in this narrative is limited to the “Work Area Method” of compliance, which presumably is used by the majority of projects for which the IEBC 2012 would be applicable.</i></p>
301.1.3	<p>Performance Compliance Method:</p>	-	<p>Performance Compliance Method:</p>



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	Similar to IBC building performance evaluation (requires a structural evaluation to demonstrate compliance to IBC provisions).		Since IBC Chapter 34 is permitted by the RI SRC-1, this would not be a change to current requirements.
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Structural Provisions: Comparison for Levels of Work

The following tables are some definitions of work levels and underlying structural provisions in the IEBC 2012 and the RI SRC-1. We attempted to compare chapters based on levels of work, but they do not exactly correspond, so it is difficult to do this comparison when definitions have changed. Note that work area methods of compliance in the IEBC 2012 and in the RI SRC-1 are both cumulative (i.e., higher levels of work must conform to all of the lower levels as well).

Table 3. Levels of Work

IEBC 2012: Levels of Work		RI SRC-1: Levels of Work		Comparison Table
Ch 6	Repairs	Ch 3	Repairs	Table 5
Ch 7	Alteration Level 1	Ch 4	Renovations (Not Quite the Same as Alt Level 1)	Table 6
Ch 8	Alteration Level 2	Ch 5	Alterations	Table 7
Ch 9	Alteration Level 3	Ch 6	Reconstruction	Table 8
Ch 10	Change of Occupancy	Ch 7	Change of Use and Occupancy	Table 9
Ch 11	Additions	Ch 8	Additions	Table 11
Ch 12	Historical	Ch 9	Historical	Table 12
Ch 13	Relocated or Moved	Ch 11	Relocated or Moved	Table 13

Table 4. Levels of Work (Proportional Nature of Code)



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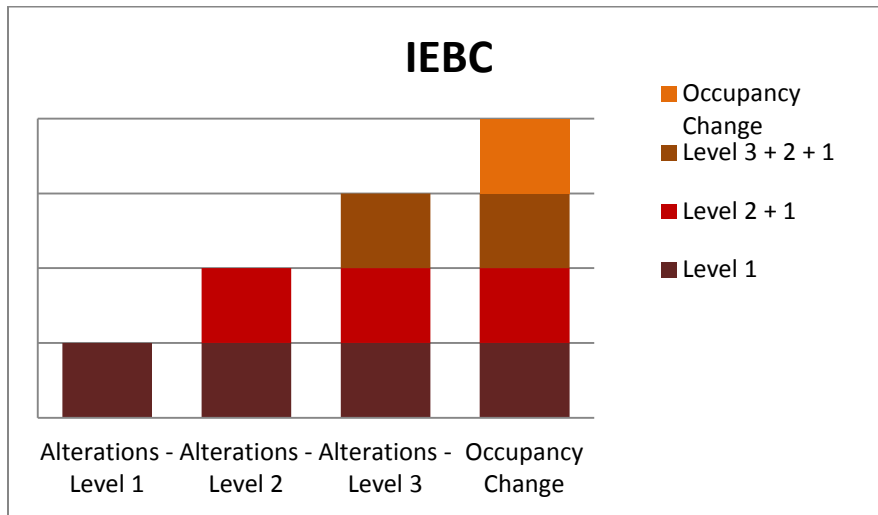


Table 5. Repairs

IEBC 2012: Repairs		RI SRC-1: Repairs	
502.1	Definition Patching or restoration or replacement of damaged materials, elements, equipment, or fixtures for the purpose of maintaining such components in good or sound conditions with respect to existing loads or performance requirements.	301.1	Definition The patching, restoration, painting and/or minor replacement of materials, elements, components, equipment and/or fixtures for the purposes of maintaining such materials, elements, components, equipment and/or fixtures in good or sound condition.
606.1 – 606.2	Amount of Damage For members in structures with “Less than substantial damage”, repairs are allowed that restore the structure to its pre-damage state (although all new members must conform to the detailing provisions of the IBC). “Dangerous Conditions” must be “eliminated” regardless of the extent of structural damage.	403.1	Amount of Damage An “engineering evaluation or analysis” is required for buildings with substantial structural damage, but no seismic analysis is required. Under Renovations, Structural elements found to be “unsound or structurally dangerous” during the course of renovations must be rehabilitated to comply with the load requirements of IBC.
606.2.2	Wind Wind evaluation is required for buildings	302.3.1	Wind Wind design must conform to the IBC as



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	with "substantial structural damage". Wind design must conform to the IBC or IRC as applicable.		applicable.
606.2.2	<p>Seismic</p> <p>Seismic evaluation is required for buildings with "substantial structural damage" to the lateral system by a seismic event in SDC A,B,C or any event in E,F and may be performed using reduced seismic forces from the IBC.</p>	-	<p>Seismic</p> <p>No specific seismic evaluation procedures are described in the RI Rehab Code (other than reference to the IBC).</p>



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Table 6. Alterations Level 1 / Renovations

IEBC 2012: Alterations - Level 1		RI SRC-1: Renovations	
503.1	<p>Definition Removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serves the same purpose. (Similar to Repairs as well.)</p>	401.1	<p>Definition The change, strengthening or addition of load bearing elements, the refinishing, replacement, bracing, strengthening, upgrading or extensive repair of existing materials, elements, components, equipment and/or fixtures. Renovation involves no reconfiguration of spaces.</p>
-	<p>Unsound Members There are no provisions for damaged members in this chapter of the IEBC 2006, however such members are covered under "Repairs" (see above).</p>	403.1	<p>Unsound Members Structural elements uncovered that are found to be unsound or structurally dangerous must be rehabilitated to meet IBC.</p>
706.2	<p>Addition or replacement of roofing or replacement of equipment Requires compliance with IBC requirements for gravity loads (<5% additional force is allowed as an exception; 3psf additional roofing dead load is allowed)</p>	403.2.1	<p>Addition or replacement of roofing or replacement of equipment Requires compliance with IBC requirements for gravity loads (<5% additional stress is allowed as an exception).</p>
706.3.2	<p>Roof Diaphragm Requirements Requires evaluation and upgrade of roof diaphragms when re-roof permit is issued for more than 50% of the roof of any building.</p>	403.3	<p>Roof Diaphragm Requirements Requires evaluation and upgrade of roof diaphragms when re-roof permit is issued for more than 50% of the roof of any building.</p>
706.3.1	<p>Seismic Requirements when Reroofing Whenever a reroofing permit is issued for more than 25% of the roof of buildings in Seismic Design Category D, E, and F buildings (D can existing in Rhode Island), installation of parapet bracing and wall anchors at the roof line</p>	-	<p>Seismic Requirements when Reroofing No specific seismic requirements.</p>



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	<p>may be required (per reduced IBC seismic design requirements). (Note: MA is considering adopting this provision in Cat C buildings – Should we?)</p>		
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Table 7. Alterations Level 2 / Alterations

IEBC 2012: Alterations - Level 2		RI SRC-1: Alterations	
504.1	<p>Definition The reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.</p>	501.1	<p>Definition The reconfiguration of any space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.</p>
807.4	<p>Reduction in strength Reduction in strength of existing members is not allowed below IBC required levels unless demonstrated member meets IBC (and added stress > 5%).</p>	502.2	<p>Reduction in strength Reduction in strength of existing members is not allowed below IBC required levels unless demonstrated member meets IBC.</p>
807.2	<p>New structural members New structural members must conform to the IBC requirements.</p>	502.3	<p>New structural members New structural members must conform to the IBC requirements unless the authority having jurisdiction allows replacement with "like materials"</p>
807.4	<p>Existing structural members Existing structural members supporting additional loads or equipment must comply to the IBC provisions for gravity loads. (Exception: Stress is not increased by more than 5%)</p>	502.4.1	<p>Existing structural members Existing structural members supporting additional loads or equipment must comply to the IBC provisions for gravity loads. (Exception: Stress is not increased by more than 5%)</p>
807.5	<p>Seismic Buildings in which members have a</p>	-	<p>Seismic No specific seismic requirements.</p>



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	demand/capacity ratio increased by more than 10% by wind or seismic or creates a structural irregularity must meet IBC Reduced Seismic and Wind. (There is no exception for Seismic Cat A,B,C – RI should consider excluding these categories)		
807.4	<p>Additional Snow Drift Loads Additional snow drift loads from new equipment must be evaluated and comply with the IBC requirements. (Exception: Stress is not increased by more than 5%)</p>	502.4.2	<p>Additional Snow Drift Loads Additional snow drift loads from new equipment must be evaluated and comply with the IBC requirements. (Exception: Stress is not increased by more than 5%)</p>

Table 8. Alterations Level 3 / Reconstruction

IEBC 2012: Alterations - Level 3		RI SRC-1: Reconstruction	
505.1	<p>Definition Level 3 alterations apply where the work area exceeds 50 percent of the aggregate area of the building.</p>	601.1	<p>Definition The reconfiguration of a space which affects an exit, or a corridor shared by more than a single tenant; and/or reconfiguration of space such that the rehabilitation work area is not permitted to be occupied because existing means of egress and fire protection systems, or their equivalent, are not in place or continuously maintained; and/or extensive alterations (including where the work area exceeds 50% of the area of a building – 501.2.2)</p>
807.4	<p>Existing structural members Existing structural members supporting additional loads or equipment must comply to the IBC provisions for gravity loads. (Exception: Stress is not</p>	602.9.6	<p>Existing structural members Existing structural members supporting additional loads must comply to the IBC provisions for gravity loads. (Exception: Stress is not increased by more than 5%)</p>



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	increased by more than 5%)		
907.4.2	<p>Wind</p> <p>Where 30% or more of the total floor and roof areas are involved in the structural alteration, an engineering evaluation must be performed to demonstrate that the lateral force resisting system can comply with IBC.</p>	602.9.5	<p>Wind</p> <p>Where 30% or more of the total floor and roof areas are involved in the structural alteration, an engineering evaluation and analysis must be performed to demonstrate that the lateral force resisting system (once altered) can comply with IBC.</p>
907.4.2	<p>Seismic</p> <p>Where 30% or more of the total floor and roof areas are involved, an engineering evaluation must be performed to demonstrate that the lateral force resisting system can comply with reduced seismic forces prescribed (see “Repairs”).</p>	-	<p>Seismic</p> <p>No specific seismic requirements.</p>
807.6	<p>Voluntary lateral force resisting system alterations</p> <p>are allowed to increase the lateral force resisting strength or stiffness, provided such alterations do not reduce the capacity of existing elements or increase loads to existing elements by more than 10% (or their capacity). Such alterations must be detailed according to the IBC requirements and not create a “dangerous condition”.</p>	602.9.7	<p>Voluntary lateral force resisting system alterations</p> <p>are allowed to increase the lateral force resisting strength or stiffness, provided such alterations do not reduce the capacity of existing elements or increase loads to existing elements by more than 10% (or their capacity). Such alterations must be detailed according to the IBC requirements and not create an “imminent danger”.</p>
907.4.4-5	<p>Seismic D, E, F</p> <p>Bracing of unreinforced parapets and wall anchors for concrete and masonry building may be required (Note: MA is considering adopting this provision in Cat C buildings – Should we?) NOTE: Mass Code 8th Edition extends bracing of parapets to Category B, and also</p>	-	none



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	<p>requires use of Appendix A1 for all unreinforced masonry buildings by amendment...this requirement is very controversial and has been already been slated for removal in the next edition of the Mass code.</p>		
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Table 9. Change of Use

IEBC 2012: Change of Occupancy		RI SRC-1: Change of Use and Occupancy	
202	<p>Definition</p> <p>The activity within a building is classified as a change of occupancy (whether or not the occupancy category has changed).</p>	701.1	<p>Definition</p> <p>The occupancy classification (defined in Section 302 of IBC as modified by Section 202.0 of SRC) may be changed, provided the building or structure meets all the requirements of Chapter 6 (Reconstruction) and the requirements of Chapter 7. (There are exceptions)</p>
1007.1	<p>Gravity Loads</p> <p>Where change of occupancy results in higher gravity loads per IBC Table 1607.1, structure must meet IBC requirements for the higher loads. (Exception: Stress is not increased by more than 5%)</p>	703.2	<p>Gravity Loads</p> <p>Any existing structure in which the proposed new occupancy requires floor live loads equal to or less than required for the existing occupancy is permitted to be continued in use for the originally approved live loads, provided that the structure is not dangerous and is adequate for the proposed occupancy. If the approved floor live load is less than required by Section 1607 of the Building Code, the areas designed for the reduced live load shall be posted with the approved load or shall be structurally strengthened to support the new load. Placards shall be of an approved design.</p>
1007.2	<p>Snow and Wind Loads</p>	703.4	<p>Snow and Wind Loads</p>



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	<p>Increase in wind or snow risk category requires strengthening to meet compliance with wind and/or snow loads of IBC for the new category. (Exception: Where new occupancy is less than 10% of floor area)</p>		<p>Increase in wind or snow due to occupancy category requires strengthening to meet compliance with wind and/or snow loads of IBC for the new category.</p>
1007.3	<p>Seismic Loads</p> <p>Where change of use results in an a higher seismic risk category based on Table 1604.5 of the IBC, or where the structure is reclassified to have a higher hazard category per Table 1012.4 of the IEBC, the building must be upgraded to conform to the seismic requirements of the IBC for the new use group. (See code for exceptions)</p> <p><i>NOTE: Table 1012.4 is would require seismic upgrade of numerous categories of buildings for adaptive reuse structures where a commercial occupancy is changed to residential. NCSEA has submitted a proposed amendment to this provision to relax these requirements in the 2015 version of code. In the meantime, RI should consider adding an exception to this requirement for “all buildings with change of occupancy to residential uses”.</i></p>	-	<p>Seismic Loads</p> <p>No seismic requirements.</p>

Table 10. Additions

IEBC 2012: Additions	RI SRC-1: Additions
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1103.1	<p>Definition</p> <p>Additions must comply with IBC provisions for new structures. Use Group R (with less than 5 dwellings or sleeping units) .</p>	801.1	<p>Definition</p> <p>Additions must comply with IBC provisions for new structures. Use Group R (with less than 5 dwellings or sleeping units) .</p>
1103.2	<p>Additional Gravity Loads</p> <p>Additional gravity loads on existing structural elements must meet requirements of IBC (<5% stress increase is allowed).</p>	804.2	<p>Additional Gravity Loads</p> <p>Additional gravity loads on existing structural elements must meet requirements of IBC (<5% stress increase is allowed).</p>
1103.4	<p>Snow Drift</p> <p>Loads created by new additions on existing roofs must comply with IBC requirements. (<5% stress increase is allowed, use group R exempted)</p>	804.4	<p>Snow Drift</p> <p>Loads created by new additions on existing roofs must comply with IBC requirements. (<5% stress increase is allowed, use group R exempted)</p>
1103.3	<p>Lateral Forces</p> <p>Vertical additions on existing structures – must comply with lateral load provisions of IEBC 301.1.4.1. Structural connected horizontal additions – all lateral force resisting elements of the existing structure affected by the addition must conform to the lateral load provisions of the IEBC 01.1.4.1.</p>	804.3	<p>Lateral Forces</p> <p>Vertical additions on existing structures – must comply with lateral load provisions of IBC. Structural connected horizontal additions – all lateral force resisting elements of the existing structure affected by the addition must conform to the lateral load provisions of the IBC.</p>
1103.3	<p>Lateral Force Exemptions</p> <p>Use Group R (with less than 5 dwellings or sleeping units) and buildings with < 10% increase in story shear cumulative are exempted from lateral force provisions.</p>	804.3	<p>Lateral Force Exemptions</p> <p>Use Group R (with less than 5 dwellings or sleeping units) and buildings with < 5% increase in story shear cumulative are exempted from lateral force provisions.</p>
1103.5	<p>Flood Areas</p> <p>Work in Flood hazard areas requires compliance with IBC 1612 based on amount of work.</p>		<p>Flood Areas</p> <p>Work in Flood hazard areas requires compliance with IBC 1612 based on amount of work.</p>



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Table 11. Historic Buildings

IEBC 2012: Historic Buildings		RI SRC-1: Historic Buildings	
1206.1	<p>Definition Building must conform to applicable provisions for work as classified.</p>	501.2.2	<p>Definition Building must conform to applicable provisions for work as classified above. Replacement and repair of features using original or like materials is permitted. <i>(Many more provisions – see actual code)</i></p>
1206.2	<p>Dangerous Conditions No work shall be required beyond what is required to remedy dangerous conditions (1103.9)</p>	904.8.2	<p>Stairs / Rails Nonconforming stairway railings and “winders” are permitted provided they are not “structurally dangerous” (904.8.2) <i>NOTE: This should probably be added as an amendment since it is unique to RI.</i></p>

Table 12. Relocated Buildings

IEBC 2012: Relocated Buildings		RI SRC-1: Relocated Buildings	
1302.2	<p>Foundations Foundations and connection of existing building to foundations must comply with IBC .</p>	501.2.2	<p>Foundations Foundations and connection of existing building to foundations must comply with IBC.</p>
1302.5	<p>Snow Snow loads must comply with IBC snow loads where snow loads are higher at new location. (Exempt <5% added stress)</p>	1102.4	<p>Snow Snow loads must comply with IBC snow loads where snow loads are higher at new location. (Exempt <5% added stress)</p>
1302.6	<p>Flood Structures relocated in or moved into flood hazard areas must comply with IBC 1612.</p>	1102.5	<p>Flood Structures relocated in or moved into flood hazard areas must comply with IBC 1612.</p>
1302.3	<p>Wind</p>	1102.3	<p>Wind</p>



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	Wind loads must comply with IBC for new buildings. (Exempt <10% added stress)		Wind loads must comply with IBC for new buildings. (Exempt <5% added stress)
1302.4	Seismic Buildings must comply with Seismic loads at new location (Seismic Design Categories A and B and 1- 2 family dwellings and <5% added stress are exempted.	-	Seismic No seismic provisions.

By: Erik Nelson, P.E., Ethan Tirrell, E.I.T. and the Building Code Committee of SEARI (updated from 2006 Comparison by David J. Odeh, P.E. and with blue comments)

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