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Narrative Discussion of the Structural Provisions in the Rhode Island Rehabilitation Code and International Existing Building Code (2006 Edition)

By: David J. Odeh, P.E.

Structural Engineers Association of Rhode Island, Code Advisory Committee

This narrative compares and contrasts the basic structural provisions of the current Rhode Island Rehabilitation Code (the “Rehab Code”) with the 2006 Edition of the International Existing Building Code (“IEBC 2006”).

The purpose of this document is to provide a high level overview of the two codes and major changes to building structural design provisions that would occur if Rhode Island chooses to adopt the IEBC 2006 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.

Overall Philosophy

The IEBC 2006 and RI Rehab Code share similar philosophies – to encourage the renovation and reuse of existing buildings without requiring full compliance with the Code for new buildings (IBC 2006 in Rhode Island). Like the RI Rehab Code, the IEBC 2006 is intended to replace Chapter 34 of the International Building Code (IBC), which provides prescriptive provisions for existing buildings.

Unlike the RI Rehab Code, there are no specific provisions for fire code issues in the IEBC 2006. Instead, the IEBC 2006 refers to the International Fire Code.

Methods of Compliance

The RI Rehab Code 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 2006 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 IEBC2006 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 Rehab Code.

IEBC 2006 Compliance Method	RI Rehab Code Comparison
<p>Prescriptive Compliance Method: This method allows the use of provisions similar to Chapter 34 of the IBC 2006, and refers to the International Fire Code for fire code issues.</p>	<p>The Prescriptive Compliance Method is similar to Chapter 34 of the IBC, which can be used instead of the RI Rehab Code for any building. NOTE: IBC Chapter 34 MUST be used in RI for “Uses Not Covered” in section 101.1.1.; there are no restricted uses in the IEBC 2006.</p> <p>Also, buildings must be a minimum of 10 years in age for the RI Rehab Code to apply (no such age requirements exist in the IEBC) – it is not clear if IBC Chapter 34 is disallowed for buildings under 10 years in age?</p>
<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 (including repairs, alterations, additions, changes in occupancy, and relocated buildings).</p>	<p>The work area method is similar to the main body of the RI Rehab Code (repairs, renovations, alterations, reconstruction, additions, and changes in occupancy).</p>
<p>Performance Compliance Method: Similar to IBC building performance evaluation (requires a structural evaluation to demonstrate compliance to IBC provisions).</p>	<p>Since IBC Chapter 34 is permitted by the RI Rehab Code, this would not be a change to current requirements.</p>

Commentary in this narrative is limited to the “Work Area Method” of compliance, which presumably be used by the majority of projects for which the IEBC 2006 would be applicable.

Substantial Damage and Substantial Structural Damage

These terms are defined similarly and have similar structural ramifications in both the IEBC 2006 and the RI Rehab code. Important differences exist in the seismic requirements for building repair related to these types of damage.

NOTE: The IEBC defines the term “Dangerous” in section 202 to include members overstressed by more than 1.33 times the allowable strength of the IBC. The RI Rehab Code defines “dangerous structurally” as a condition in which overload exceeds 1.5 times the allowable strength of the IBC.

Structural Provisions Comparison for Levels of Work

The following is a brief, high-level summary of the comparative definitions of work levels and underlying structural provisions in the IEBC 2006 and the RI Rehab Code. Note that work area methods of compliance in the IEBC 2006 and in the RI Rehab Code are both cumulative (i.e., higher levels of work

must conform to all of the lower levels as well). **Some important differences in the structural provisions are highlighted.**

IEBC 2006	RI Rehab Code
<p>Repairs 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.</p> <p>Wind design must conform to the IBC or IRC as applicable.</p> <p>Seismic evaluation may be performed using reduced seismic forces from the IBC, or the procedures of ASCE 31/FEMA 356 (performance based evaluation procedures)</p> <p>Seismic and wind evaluation are required for buildings with substantial structural damage.</p> <p>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.</p>	<p>Repairs 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.</p> <p>Wind design must conform to the IBC or IRC as applicable.</p> <p>No specific seismic evaluation procedures are described in the RI Rehab Code (other than reference to the IBC).</p> <p>An “engineering evaluation or analysis” is required for buildings with substantial structural damage, but no seismic analysis is required.</p> <p>Under Renovations, Structural elements found to be “unsound or structurally dangerous” (403.1) during the course of renovations must be rehabilitated to comply with the load requirements of the IBC</p>
<p>Alterations – Level 1 Removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.</p> <p>There are no provisions for damaged members in this chapter of the IEBC 2006, however such members are covered under “Repairs” (see above).</p>	<p>Renovations 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>Structural elements uncovered during the course of renovation that are found to be unsound or structurally dangerous must be rehabilitated to meet load requirements of IBC.</p>

IEBC 2006	RI Rehab Code
<p>Addition or replacement of roofing or replacement of equipment (606.2.1) requires compliance with IBC requirements for gravity loads (<5% additional dead load and dead load stress is allowed as an exception; 3psf additional roofing dead load is allowed)</p> <p>AND</p> <p>Seismic Design Category D, E, and F buildings (D can existing in Rhode Island) would require installation of parapet bracing and wall anchors at the roof line whenever a reroofing permit is issued. Bracing and anchors must be designed per reduced IBC seismic design requirements.</p> <p>Roof Diaphragm (606.2.2) Requires evaluation and upgrade of roof diaphragms when re-roof permit is issued for more than 50% of the roof of any building,</p>	<p>Addition or replacement of roofing or replacement of equipment (403.2.1) requires compliance with IBC requirements for gravity loads, <5% additional stress is allowed as an exception.</p> <p>Roof Diaphragm (403.3) Requires evaluation and upgrade of roof diaphragms when re-roof permit is issued for more than 50% of the roof of any building,</p>
<p>Alterations – Level 2 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> <p>Reduction in strength (707.2) of existing members is not allowed below IBC required levels.</p> <p>New structural members must conform to the IBC requirements.</p> <p>Existing structural members supporting additional loads or equipment must comply to the IBC provisions for gravity loads. (<5% load increase permitted)</p> <p>Buildings in which seismic base shear is increased by more than 10%, or decrease seismic capacity by more than 10% must meet seismic requirements for Alterations – Level 3 (see below).</p> <p>Additional snow drift loads from new equipment must be evaluated and comply with the IBC requirements.</p>	<p>Alterations 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> <p>Reduction in strength is not allowed below IBC levels</p> <p>New structural members must conform to the IBC requirements, unless the authority having jurisdiction allows replacement with “like materials”</p> <p>Existing structural members supporting additional loads or equipment must comply to the IBC provisions for gravity loads. (<5% load increase permitted)</p> <p>No lateral force resisting system requirements.</p> <p>Additional snow drift loads from new equipment must be evaluated and comply with the IBC requirements.</p>

IEBC 2006	RI Rehab Code
<p>Alterations – Level 3 Level 3 alterations apply where the work area exceeds 50 percent of the aggregate area of the building.</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:</p> <ul style="list-style-type: none"> • Wind load provisions of IBC. • Reduced seismic forces prescribed in 506.1.1.3 (see “Repairs”). <p>Voluntary lateral force resisting system alterations 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>	<p>Reconstruction 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> <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 wind load provisions of IBC.</p> <p>Voluntary lateral force resisting system alterations 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>
<p>Change of Use Structural provisions are based on the snow, wind, and seismic occupancy categories of the IBC (Table 1604.5).</p> <p>Gravity Loads. Where change of use results in higher gravity loads per IBC, structure must meet IBC requirements for the higher loads. (907.1)</p>	<p>Change of Use Structural provisions are based on the snow and wind occupancy categories in IBC Table 1604.5 (no seismic requirements).</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</p>

IEBC 2006	RI Rehab Code
<p>Snow and Wind Loads. Increase in wind or snow occupancy category requires strengthening to meet compliance with wind and/or snow loads of IBC for the new category.</p> <p>Seismic Loads. Where change of use results in an a higher seismic occupancy factor based on Table 1604.5 of the IBC, or where the structure is reclassified to have a higher “means of egress hazard category” per Table 912.4 of the IEBC, the building must be upgraded to conform to the seismic requirements of the IBC for the new use group.</p>	<p>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> <p>Snow and Wind Loads. Increase in wind or snow occupancy category requires strengthening to meet compliance with wind and/or snow loads of IBC for the new category.</p> <p>No seismic requirements.</p>
<p>Additions Additions must comply with IBC provisions for new structures.</p> <p>Additional gravity loads on existing structural elements must meet requirements of IBC (<5% load increase is allowed).</p> <p>Lateral Forces: Vertical additions on existing structures – must comply with lateral load provisions of IBC.</p> <p>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> <p>Voluntary addition of structural elements to the lateral force resisting system is allowed per requirements of “Alterations – Level 3”.</p>	<p>Additions Additions must comply with IBC provisions for new structures.</p> <p>Additional gravity loads on existing structural elements must meet requirements of IBC (<5% load increase is allowed).</p> <p>Lateral Forces: Vertical additions on existing structures – must comply with lateral load provisions of IBC.</p> <p>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> <p>Voluntary addition of structural elements to the lateral force resisting system is allowed per requirements of 606.9.6 (see “reconstruction”)</p>

IEBC 2006	RI Rehab Code
<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> <p>Snow Drift loads created by new additions on existing roofs must comply with IBC requirements. (<5% load increase is allowed, use group R exempted)</p> <p>Work in Flood hazard areas requires compliance with IBC 1612 based on amount of work.</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. (804.3)</p> <p>Snow Drift loads created by new additions on existing roofs must comply with IBC requirements. (<5% load increase is allowed, use group R exempted)</p> <p>Work in Flood hazard areas requires compliance with IBC 1612 based on amount of work.</p>
<p>Historic Buildings Building must conform to applicable provisions for work as classified above. (1106.1) Replacement and repair of features using original or like materials is permitted.</p> <p>Where “unsafe structural elements” are determined to exist, only those specific elements or portions of the building need be repaired, strengthened or replaced. (1106.2)</p> <p>Nonconforming stairway railings are permitted provided they are not “structurally dangerous” (1103.9)</p>	<p>Historic Buildings Building must conform to applicable provisions for work as classified above. Replacement and repair of features using original or like materials is permitted.</p> <p>Nonconforming stairway railings and “winders” are permitted provided they are not “structurally dangerous” (904.8.2)</p>
<p>Relocated Buildings Foundations and connection of existing building to foundations must comply with IBC</p> <p>Wind loads must comply with IBC for new buildings.</p> <p>Snow loads must comply with IBC snow loads where snow loads are higher at new location.</p> <p>Buildings must comply with Seismic loads at new location (Seismic Design Categories A and B and 1-2 family dwellings are exempted)</p>	<p>Relocated Buildings Foundations and connection of existing building to foundations must comply with IBC.</p> <p>Wind loads must comply with IBC for new buildings.</p> <p>Snow loads must comply with IBC snow loads where snow loads are higher at new location.</p> <p>No seismic provisions.</p>

IEBC 2006	RI Rehab Code
Structures relocated in or moved into flood hazard areas must comply with IBC 1612.	Structures relocated in or moved into flood hazard areas must comply with IBC 1612.

NOTE: in general, both IEBC 2006 and RI Rehab Code allow increase in stresses of structural elements by no more than 5% without upgrade or retrofitting.

Structural Engineers Association of Rhode Island, Code Advisory Committee Members

Stephen Olsen, P.E., Daniel Batt, P.E., Bruce Davey, P.E.