

Mandatory Retrofit Program for Non-Ductile Concrete Buildings

STRUCTURAL DESIGN GUIDELINES

The purpose of this information bulletin is to provide structural design guidelines per the minimum standards of Division 95, Los Angeles Municipal Code (Ordinance 183983 and 184081) to mitigate the hazards from the deficiencies in non-ductile concrete buildings. Non-ductile reinforced concrete buildings are brittle and have a limited capacity to absorb the energy of strong ground shaking beyond their limited elastic range, causing the likelihood of collapse and serious injury or mortality of inhabitants. Adherence to these minimum standards will improve the performance of these buildings during earthquakes and reduce, but not necessarily prevent, the loss of life, injury or earthquake-related damage.

1. SCOPE

The provisions of the non-ductile concrete retrofit program apply to existing concrete buildings designed and built using codes prior to the 1976 Los Angeles City Building Code provisions.

Exception: The program does not apply to detached single-family dwellings or detached duplexes.

The evaluation and retrofit of any exit path components, such as stairs, landing, and corridors, shall be included within the scope of the mandatory retrofit.

2. DEFINITIONS

CONCRETE BUILDING is a building having concrete floors and/or roofs, either with or without beams, supported by concrete walls and/or concrete columns, and/or concrete frames with or without masonry infills, or any combination thereof.

QUALIFIED HISTORICAL BUILDING is any building designated or currently in the process of being designated as a “qualified historical building” as defined in Part 8, Title 24 of the California Code of Regulations.

MASONRY INFILL is the unreinforced or reinforced masonry wall construction within a reinforced concrete frame.

RETROFIT is an improvement of the lateral force-resisting system by alteration of existing structural elements or addition of new structural elements.

3. ENGINEERING ANALYSIS

Non-Ductile Concrete Retrofit Ordinance (183,893) and the Los Angeles Building Code LABC Section 9508.2 (1) require the strength of the lateral-force resisting system to meet or exceed 75% of the base shear specified in the current LABC seismic provisions. Elements not designed to be part of the lateral-force resisting system shall be adequate for gravity load effects and seismic displacement due to the full (100%) of the design story drift specific in the current LABC seismic provisions.

As an alternative, use of ASCE 41-17 is permitted, using a Tier 3 procedure and the two-level performance objective in Table 303.3.2 of Los Angeles Existing Building Code (LAEBC) for the applicable risk category with amendments as noted below. The BSE-1E and BSE-2E earthquake hazard shall be determined in accordance with procedures defined by ASCE 41-17.

[BS] TABLE 303.3.2
 PERFORMANCE OBJECTIVES FOR USE IN ASCE 41 FOR COMPLIANCE WITH REDUCED SEISMIC FORCES

RISK CATEGORY (Based on CBC Table 1604.5)	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-1E EARTHQUAKE HAZARD LEVEL	STRUCTURAL PERFORMANCE LEVEL FOR USE WITH BSE-2E EARTHQUAKE HAZARD LEVEL
I	Life Safety (S-3) See Note a	Collapse Prevention (S-5)
II	Life Safety (S-3) See Note a	Collapse Prevention (S-5)
III	Damage Control (S-2) See Note a	Limited Safety (S-4) See Note b
IV	Immediate Occupancy (S-1)	Life Safety (S-3) See Note c

For the purpose of complying with the Non-Ductile Concrete Retrofit ordinance, a retrofitted building does not need to comply with the structural separation requirements of section 12.12.3 of ASCE 7-16, unless the building is altered, added to, or increases the risk category.

4. ADDITIONS, ALTERNATIONS, AND/OR CHANGE IN OCCUPANCY IN CONJUNCTION WITH THE RETROFIT WORK

A Project that involves mandatory retrofit work only, per Ordinance No. 183,893, shall not be considered an alteration, and may be analyzed per Section 3 above.

If a project proposes an addition to a building or structure, the evaluation and design/upgrade of both existing and addition shall be based on the Full Seismic Forces. Any existing lateral load-carrying structural elements whose demand-capacity ratio with the addition considered is not more than 10% greater than its demand-capacity ratio with the addition ignored shall be permitted to remain unaltered, as per LAEBC, Section 502.5, exception 1. Alternatively, if ASCE 41-17 is used, the analysis shall use a Tier 3 procedure and the two-level performance objective in LAEBC Table 303.3.1 for the applicable risk category.

If a project proposes alteration to a building or structure, the evaluation and design/upgrade shall be based on the Reduced Seismic Forces provided the reduced seismic load is not less than the original building permitted seismic loads. Any existing

lateral load-carrying structural elements whose demand-capacity ratio with the alteration considered is not more than 10% greater than its demand-capacity ratio with the alteration ignored shall be permitted to remain unaltered, as per LAEBC, Section 503.4, exception 1. Alternatively, if ASCE 41-17 is used, the analysis shall use a Tier 3 procedure and the two-level performance objective in LAEBC Table 303.3.2 for the applicable risk category with modifications as noted in this document.

Where the work area exceeds 50% of the building area and where work involves a substantial structural alteration or the existing building is assigned Seismic Design Category F, the lateral load-resisting system of the altered building shall satisfy the requirements of Sections 1609 and 1613 of the LABC, unless the work satisfies exceptions 1 or 2 of section 503.11 of LAEBC. Reduced seismic forces may be used.

5. QUALIFIED HISTORICAL BUILDINGS

Qualified historical buildings shall comply with the Los Angeles Historical Building Code (LAHBC). The strength-level seismic forces used to evaluate the structure for resisting seismic loads shall be 75 percent of the seismic forces prescribed by Sections 1609 and 1613 of the LABC. However, the seismic forces need not exceed 0.30W for Risk Categories I & II and 0.40W for Risk Categories III & IV. Alternatively, the qualified historical building shall be analyzed using ASCE 41-17, with a Tier 3 procedure and the two-level performance objective in Table 303.3.2 of the 2020 LAEBC for the applicable risk category with modifications as noted in this document.

6. DATA COLLECTION, MATERIAL TESTING, AND CONDITION ASSESSMENT

As-built conditions and material properties of the building elements are required in order to properly characterize building performance in seismic analysis. In order to make sound engineering assumptions and judgments, the design professional shall either obtain the existing building construction documents and test records and/or perform appropriate condition assessment and material testing to establish the properties of building structural components. A preliminary review of drawings and/or available test records should identify primary gravity- and lateral-force-resisting elements and systems, and their critical components and connections. When complete as-built drawings and/or prior testing records are not available, the design professional shall perform an appropriate investigation of the building gravity and lateral-load-resisting systems. Data collection, material testing, and condition assessment shall be done per Information Bulletin P/BC 2020-153 and shall be submitted to the department along with the plans and calculations.

7. PREVIOUSLY RETROFITTED NON-DUCTILE CONCRETE BUILDINGS

In accordance with the Ordinance 183,893 and Section 9504.2 subparagraph 2(a) of the Los Angeles Building Code (LABC), an option to show compliance with the ordinance is to submit proof to the Los Angeles Department of Building and Safety (LADBS) that the building was previously retrofitted in conformity with the provisions in either Chapter 85 or former Chapter 95 of the LABC.

Previous Chapter 95 of LABC “Voluntary Earthquake Hazard Reduction in Existing Reinforced Concrete Buildings and Concrete Frame Buildings with Masonry Infills” was effective August 30, 1996, per Ordinance 171,260. Chapter 85 of LABC included structural requirements for the conversion of existing buildings from commercial or industrial uses to Joint Living and Work Quarters and became effective July 6, 2005 per Ordinance 176,673.

The following building permits for previous seismic retrofits, which also received a final inspection for the proposed work, are deemed to meet Section 9504.2 subparagraph 2(a) of the Los Angeles Building Code:

1. Previous building permits for seismic retrofit of buildings which state “**Full Compliance with Chapter 95**” in either the work description or the “Checklist Items” of the building permit.
2. Previous building permits for plans that were submitted for plan check on or after July 6, 2005 which state “**Full Compliance with Chapter 85**” in the work description of the building permit **and** the approved building plans include seismic strengthening work.
3. Previous building permits which state “**Full Compliance with FEMA 356**” in the work description and where a Modification of Building Ordinance Request was approved by the Los Angeles Department of Building and Safety (LADBS) to be an equivalent alternative to the former Chapter 95 of the LABC.
4. Qualified historic buildings that have been previously retrofitted to earlier editions of the LAHBC are deemed to comply with the requirements of the ordinance. These retrofit permits shall clearly state “**Full Seismic Retrofit Compliance with LAHBC**” in the work description of the building permit and approved building plans.

For all other previous building permits for seismic retrofits of buildings not meeting the four categories above, and which received final inspections, the approved retrofit plans and structural calculations are required to be submitted to LADBS in order to determine compliance with Ordinance 183,893 and LABC Section 91.9504.2