Regular Meeting
of the
Building Inspection Commission

October 15, 2025

Agenda Item 7

City and County of San Francisco
Department of Building Inspection

Daniel Lurie, Mayor
Patrick O'Riordan, C.B.O., Director

October 14, 2025

Building Inspection Commission
49 South Van Ness Avenue
San Francisco, CA 94103

Re: AB-099 Post-Earthquake Repair and Retrofit Requirements for Concrete Buildings

Honorable Members of the Commission:

On October 8, 2025, the full Code Advisory Committee (CAC) met to consider adoption of revised Administrative Bulletin (AB)-099 Post-Earthquake Repair and Retrofit Requirements for Concrete Buildings. Bill Tremayne, Structural Engineer, Holmes U S on behalf of Applied Technology Council (ATC – 151), provided a presentation describing the proposed changes to AB-099 and the reasoning behind them.

The CAC went on to vote unanimously, with one abstention, to recommend the Building Inspection Commission approve the revised language in AB-099.

Respectfully submitted,

Thomas Fessler
DBI Technical Services
Secretary to the Code Advisory Committee

cc. Patrick O'Riordan, C.B.O. Director
David Kane, Deputy Director
Mary Wilkinson-Church, Permit Services Manager
Christine Gasparac, Assistant Director
Tate Hanna, Legislative Affairs Manager
J. Edgar Fennie, Chair, Code Advisory Committee

Attach. AB - 099

ADMINISTRATIVE BULLETIN

NO. AB-099

DATE : Effective Month, Day, 2026

SUBJECT : Permit Review and Operations

TITLE : **Post-Earthquake Inspection, Evaluation, Repair and Retrofit Requirements for Concrete Buildings**

PURPOSE : The purpose of this bulletin is to establish policies for interpreting the San Francisco Existing Building Code requirements for post-earthquake damage evaluation and retrofit triggers for reinforced concrete buildings and to detail the scope and criteria for such triggered retrofits and other repairs.

REFERENCE : San Francisco Existing Building Code, Current edition

- Section 202, Definition of disproportionate earthquake damage
- Section 202, Definition of substantial structural damage
- Section 304.4 Minimum Lateral Force for Existing Buildings
- Chapter 4 Repairs
- Section 502 Additions
- Section 503 Alterations

California Historical Building Code, CCR Title Part 8, Current edition

ASCE/SEI 41, Seismic Evaluation and Retrofit of Existing Buildings, Current edition

California Health and Safety Code, Section 17920.3

FEMA 306, Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Basic Procedures Manual, 1998

FEMA 308, Repair of Earthquake Damaged Concrete and Masonry Wall Buildings, 1998

FEMA P-2335, Guidelines for Post-Earthquake Repair and Retrofit of Buildings Based on Assessment of Performance-Critical Damage, 2025

DISCUSSION:

San Francisco Existing Building Code (SFEBC), Sections 405.2.3 and 405.2.4 triggers seismic evaluation, and possibly retrofit, of buildings when earthquake-related damage reaches the level of substantial structural damage to gravity load-carrying components or substantial structural damage to vertical elements of the lateral-force-resisting system. For the latter, substantial structural damage is

defined in SFEBC Section 202 as a loss of lateral load-carrying capacity of more than 33 percent of any story in any horizontal direction from its predamage condition.

In addition to substantial structural damage, SFEBC Section 405.2.2 triggers seismic evaluation, and possibly retrofit, when earthquake-related damage reaches the level of disproportionate earthquake damage. It is defined in SFEBC Section 202 as a loss of lateral load-carrying capacity of more than 10 percent of any story in any horizontal direction from its predamage condition in an earthquake of low intensity. The low earthquake intensity is when the 0.3-second spectral acceleration ($S_{a0.3}$) at the building site for the earthquake in question, as estimated by the United States Geological Survey's (USGS) algorithm for the data point closest to the site, or as determined from peer-reviewed seismograph records from the site or from locations closer to the site than the nearest USGS data points, is less than 30 percent of the mapped acceleration parameter S_S.

The code gives no specific rules for identifying this capacity loss or guidance as to how to calculate capacity loss, so implementation of these code provisions relies on interpretation by the Department of Building Inspection (DBI). This bulletin presents the DBI's interpretation of how to calculate lateral load-carrying capacity loss for reinforced concrete buildings.

For concrete shear wall and concrete moment resisting frame buildings, the procedures provided in this bulletin, including FEMA P-2335, shall be used to calculate lateral load-carrying capacity loss and to determine whether a building has sustained substantial structural damage or disproportionate earthquake damage.

For concrete infill frame buildings, the procedures provided in this bulletin, including the evaluation procedures developed in FEMA 306 and the simplified version of the methodology in FEMA 308 shall be used to determine whether a building has sustained substantial structural damage or disproportionate earthquake damage.

The process for determining whether repair or retrofit is triggered for a damaged concrete building begins with a determination of whether the building, including its foundation, if repaired to its pre-earthquake state, would comply with Section 304.4 of the SFEBC. If this is satisfied, then the building need not be retrofitted regardless of the level of damage, and restoration (repair) of the building to its pre-earthquake condition shall be undertaken in accordance with Section 405.2 of the SFEBC.

Any damage to structural components shall, at minimum, be repaired in accordance with Section 405.2 of the SFEBC and the Repair section of this bulletin. Retrofit may also be triggered, as discussed in the Repair section.

Residential buildings that incur substantial structural damage or disproportionate earthquake damage as detailed in this bulletin are considered to be substandard per California Health and Safety Code Section 17920.3(b) Structural hazards and (o) Inadequate structural resistance to horizontal forces.

APPLICABILITY:

The interpretations and provisions of this bulletin shall apply to a building if any of the following criteria are met:

A. The building has cast-in-place concrete walls, or
B. The building has cast-in-place concrete frames with or without infill, or
C. The building has one or more cast-in-place concrete diaphragm.

Buildings of other construction types may apply the provisions of this bulletin on a case-by-case basis when approved by the director of the Department of Building Inspection. Other methods of determining capacity loss based on analysis, testing, or other objective data may also be allowed at the discretion of the director.

Qualified buildings may be permitted to be evaluated or retrofitted using the provisions in the California Historical Building Code, provided that such standards do not result in seismic performance less than the evaluation and retrofit engineering criteria detailed in this bulletin.

EXCLUDED SYSTEMS:

The following concrete systems are excluded from the scope of this bulletin:

A. Structural walls made of precast elements or tilt-up construction[1]
B. Frame and wall components of composite construction such as concrete encased steel sections[1]
C. Slab-column frames made of precast slab panels and lift-slab construction[1]

Notes:

1. Components and systems are not included in the scope of FEMA P-2335.

DEFINITIONS:

For the purpose of this bulletin, the following definitions shall apply:

- **CONCRETE SHEAR WALL**: A reinforced concrete wall which resists lateral forces applied parallel to the plane of the wall.
- **CONCRETE MOMENT FRAME**: A reinforced concrete frame system which resists lateral forces by shear and flexure in members (beams and columns) and joints of the frame, including slab-column moment frames.
- **CONCRETE INFILL FRAME**: A concrete moment frame having panel(s) of masonry that participate in resisting lateral forces that are placed within the frame members.
- **NONSTRUCTURAL REPAIR**: Repairs that restore the nonstructural properties of a damaged component, such as visual appearance, weathering, durability or fire protection. Any immediate structural benefit is negligible. This is defined as “repair to restore appearance or durability” in FEMA P-2335.

INSPECTION, EVALUATION PROCEDURE AND RETROFIT SCOPE:

<u>Concrete Shear Wall and Concrete Moment Frame Buildings</u>

Concrete shear wall and concrete moment frame buildings shall be inspected, evaluated and repaired in accordance with FEMA P-2335.

A. Inspection
   Inspections shall be in accordance with Chapter 3 and Chapter 5 of FEMA P-2335.
B. Evaluation
   The determination of substantial structural damage or disproportionate earthquake damage shall be in accordance with Chapter 4 and Section 5.8 of FEMA P-2335.
C. Repair
   Structural components assigned to damage classification DC2, per Section 4.3 of FEMA P-

2335, shall be repaired per Section 4.5.1 of FEMA P-2335. Structural components assigned to damage classification DC0 or DC1, per Section 4.3 of FEMA P-2335, need not be repaired unless required to restore appearance or durability, including weather or fire protection (nonstructural repair), per Section 4.5.2 of FEMA P-2335, or otherwise required by this bulletin. Repairs to achieve alternative performance objectives shall be permitted in accordance with Section 4.5.3 of FEMA P-2335, provided that the repairs are not less than otherwise required by this bulletin.

Repairs shall satisfy the requirements of SFEBC Sections 405.2, 502 (Additions) and 503 (Alterations). Repair of structural damage shall be in accordance with the guidance and methods provided in Chapter 5 of FEMA P-2335. Other repair methods may be permitted, subject to the approval of the director.

Where retrofit is triggered, due to substantial structural damage or disproportionate earthquake damage, the retrofit shall comply with the Retrofit requirements of this bulletin.

D. Reporting
A report documenting the inspection and evaluation outcomes, including recommendations for repair or retrofit, shall be prepared in accordance with Chapter 2 of FEMA P-2335. The report shall be submitted to the Department of Building Inspection for review within 90 days of a triggering earthquake.

Concrete Infill Frame Buildings

For concrete frame buildings with any interacting infill walls, the evaluation procedure and retrofit scope given in this section shall be applied. The concrete frame itself shall be inspected, evaluated and repaired in accordance with the requirements of this bulletin for concrete moment frame buildings. Substantial structural damage to elements of the lateral force-resisting system shall be deemed to exist when the results of a FEMA 306 evaluation shows that capacity loss exceeds 33 percent at any story in any horizontal direction for a concrete infill frame building. Disproportionate earthquake damage shall be deemed to exist when a FEMA 306 evaluation shows a capacity loss exceeding 10 percent at any story in any horizontal direction in an earthquake of low intensity, as defined by the SFEBC.

A. Inspection
Inspections shall be in accordance with Chapter 3 and Chapter 8 of FEMA 306.

B. Evaluation
Determine whether the building has sufficient pre-earthquake capacity to satisfy SFEBC Section 304.4. SFEBC Table 304.4.1 references dates of design required to demonstrate compliance with the SFEBC Section 304.4. Alternatively, it is permitted for the building in its pre-damaged condition to be evaluated in accordance with Section 304.4.3 to determine compliance with reduced seismic forces. If the building does not satisfy SFEBC Section 304.4 requirements, then a full FEMA 306 evaluation is required.

C. Repair
If the building in its pre-damaged condition complies with the requirements of Section 304.4 of the SFEBC, then the building need not be retrofitted regardless of the level of damage, and repair (restoration) to pre-earthquake capacity is sufficient. Refer to FEMA 306 for repair techniques of infill components and the Repair section of this bulletin for concrete components. Alternatively, if a full FEMA 306 evaluation shows a capacity loss of less than 5 percent, nonstructural repair to the building instead of restoration to pre-earthquake capacity shall be permitted, except that any performance-critical damage to the concrete frame itself shall be

repaired in accordance with FEMA P-2335.
If the building does not satisfy SFEBC Section 304.4 requirements, nonstructural repair, repair (restoration) to pre-earthquake capacity, or retrofit requirements may be triggered depending on the severity of damage. In addition, the concrete frame itself shall be inspected, evaluated and repaired (including retrofit, if triggered) in accordance with the requirements of this bulletin for concrete moment frame buildings. Any concrete shear walls and cast-in-place concrete floor diaphragms shall also be inspected, evaluated and repaired (including retrofit, if triggered) in accordance with the requirements of this bulletin for concrete shear wall and concrete moment frame buildings.

D. Reporting
A report documenting the inspection and evaluation outcomes, including recommendations for repair or retrofit, for the infill frame building shall be submitted to the Department of Building Inspection for review within 90 days of a triggering earthquake.

FEMA 306 Evaluation Process

A FEMA 306 evaluation process for the pre-earthquake structure and the damaged structure shall be performed using the guidelines below:

1. The evaluation shall use the nonlinear static procedures defined in FEMA 306 to determine the capacity for pre-earthquake and damaged conditions. FEMA 306 was developed at the time FEMA 273 was also in development, prior to the publication of ASCE 41. Since then, additional research and development effort has been incorporated into ASCE 41. Therefore, the comparable, current equations in ASCE 41 shall be used in performing a FEMA 306 evaluation rather than the FEMA 273 equivalents.
2. The global displacement demand shall be determined in accordance with ASCE 41.
3. The performance objective shall meet the requirements of ASCE 41 for Life Safety Structural Performance Level (S-3) at the BSE-1E seismic hazard.

When a FEMA 306 analysis is used to determine loss of capacity outlined in this bulletin for concrete infill frame buildings, the concrete frame need not be included in development of the force-displacement pushover curve. If the concrete frame capacity is included in the development of the force-displacement pushover curve, the concrete frame shall be inspected and evaluated in accordance with the requirements of this bulletin for concrete moment frame buildings. Any damage to the concrete frame components shall be accounted for in the FEMA 306 damaged structure analysis in accordance with Chapter 5 of FEMA P-2335.

Alternative evaluation processes may be permitted, subject to the approval of the director.

Simplified FEMA 308 Evaluation Process

The following simplified version of the FEMA 308 approach, based on loss in performance, L, may be used for the purpose of determining threshold triggers for restoration to pre-earthquake capacity and retrofit. The FEMA 308 parameters shall be determined using the guidelines as follows.

1. To use this method, first determine the following performance capacity and loss indices:
    a. Pre-earthquake (Undamaged) Performance Index:
    $P = d_c / d_d$, where d_c is the global displacement capacity for the selected performance objective and d_d is the maximum global displacement demand for the selected ground

motion. This performance index is calculated using component properties for the pre-earthquake conditions in accordance with the methodology outlined in FEMA 306.

b. Damaged Performance Index:
P' = d'_c / d'_d, where the prime symbol (') denotes that the global displacement capacity and demand, d'_c and d'_d, respectively, are determined for the components in their damaged state using FEMA 306.

c. Loss:
L = 1 – (P' / P), where L is the performance loss of a building due to earthquake damage, and is given by the ratio of the damaged performance index, P', to the undamaged performance index, P, for a specific performance objective. L ranges between 0 and 1.

2. To determine whether earthquake damage is acceptable and neither repair (restoration) to pre-earthquake capacity nor retrofit is triggered, the performance loss, L, is compared against the FEMA 308 Table 3-1 threshold parameters defined below:
   a. $L_{r(min)}$: The loss threshold below which neither restoration to pre-earthquake capacity nor retrofit is triggered, shall be defined as follows:
   $L_{r(min)} = 0.05$ for earthquake event with $S_{a0.3} \leq 0.3S_S$
   $L_{r(min)} = 0.05$ for earthquake event with $S_{a0.3} > 0.3S_S$
   b. $L_{r(max)}$: The loss threshold above which either restoration to pre-earthquake capacity or retrofit is triggered. For this simplified procedure, $L_{r(max)}$ may be taken to be the same as $L_{r(min)}$ since L_r does not vary:
   $L_{r(max)} = 0.05$ for earthquake event with $S_{a0.3} \leq 0.3S_S$
   $L_{r(max)} = 0.05$ for earthquake event with $S_{a0.3} > 0.3S_S$

   Alternatively, the Damaged Performance Index, P', may be used to determine whether earthquake damage is acceptable and neither repair (restoration) to pre-earthquake capacity nor retrofit is triggered by comparing P' against the FEMA 308 Table 3-1 limit parameters defined below:
   a. P'_{min}: The Damage Performance Index limit below which repair (restoration) to pre-earthquake capacity or retrofit is triggered, is not used since L_r does not vary for the simplified method.
   b. P'_{max}: The Damage Performance Index limit above which neither repair (restoration) to pre-earthquake capacity nor retrofit is triggered regardless of the value of loss, L, shall be defined as 1.0.
3. If a building is required to be repaired (restored) to its pre-earthquake capacity or retrofitted per step 2, the performance loss, L, is compared against the FEMA 308 Table 3-2 threshold parameters defined below to determine if retrofit is triggered:
   a. $L_{u(min)}$: The loss threshold below which earthquake damage does not trigger retrofit but requires repair (restoration) to pre-earthquake capacity, shall be defined as below:
   $L_{u(min)} = 0.10$ for earthquake event with $S_{a0.3} \leq 0.3S_S$
   $L_{u(min)} = 0.33$ for earthquake event with $S_{a0.3} > 0.3S_S$
   b. $L_{u(max)}$: The loss threshold above which earthquake damage triggers retrofit, shall be taken to be the same as $L_{u(min)}$ since L_u does not vary for the simplified method:
   $L_{u(max)} = 0.10$ for earthquake with $S_{a0.3} \leq 0.3S_S$
   $L_{u(max)} = 0.33$ for earthquake with $S_{a0.3} > 0.3S_S$

Alternatively, the Undamaged Performance Index, P may be used to determine whether repair (restoration) to pre-earthquake capacity or retrofit is triggered by comparing P against the FEMA 308 Table 3-2 limit parameters defined below:

a. P_{min}: The Pre-earthquake Performance Index limit below which existing earthquake damage triggers retrofit, is not used since L_u does not vary for the purpose of the simplified method.
b. P_{max}: The Pre-earthquake Performance Index limit above which existing earthquake damage does not trigger retrofit and repair (restoration) to pre-earthquake capacity is sufficient regardless of the value of loss, L, shall be taken as 1.0.

RETROFIT ENGINEERING CRITERIA

When retrofit is triggered by this bulletin or otherwise by the SFEBC, the retrofit shall comply with the minimum requirements of Section 304.4 of the SFEBC. Retrofit of buildings that have sustained disproportionate earthquake damage shall also comply with the requirements of Section 405.2.2 of the SFEBC.

_____ _____

Name Date

Director

Department of Building Inspection

Approved by the Building Inspection Commission on ___