



CODE ADVISORY COMMITTEE
Notice of
Regular Meeting of the
Structural Subcommittee

DATE: September 10, 2013 (Tuesday)
TIME: 9:00 AM to 11:00 AM **PLEASE NOTE**
LOCATION: 1660 Mission St., Room **6034** **CHANGE IN LOCATION!!!**

This Subcommittee generally meets regularly on the second Tuesday of each month at 1660 Mission St., Room 2031. (DBI Office).

Note: Public comment is welcome and will be heard during each agenda item. Reference documents relating to agenda are available for review at Technical Services Division. For information or if you wish to be placed on a mailing list for agendas, please email to Yan Yan Chew as follows: Yanyan.chew@sfgov.org

AGENDA

- 1.0 Call to Order and Roll Call
Members: Stephen Harris, S.E.; Chair; Rene' Vignos, S.E.; Marc Cunningham; Tony Lau; Ned Fennie, A.I.A.
- 2.0 Approval of the minutes of the Structural Subcommittee special meeting of July 9, 2013.
- 3.0 Discussion and possible action on following Administrative Bulletins:
AB-106: Seismic Strengthening of Soft Story Wood Frame Buildings: Procedures
AB-107: Application of Engineering Criteria in SFBC 3406B
- 4.0 Discussion and possible action on training for DBI staff on soft story.
- 5.0 Discussion and possible action on draft AB on Guidelines for the Structural Review of Special Moment Frame Beam Lateral Bracing used in Light Frame Wood Construction for Seismic Applications.
- 6.0 Discussion and possible action regarding Private School Earthquake Safety.
- 7.0 Discussion and possible action on SFBC Section 3404.7.2.
- 8.0 Discussion and possible action on AB-102 Substantial Change expanding applicability to R2 occupancy.
- 9.0 Subcommittee Member's and Staff's identification of new agenda items, as well as current agenda items to be continued to another subcommittee regular meeting or special meeting. Subcommittee discussion and possible action regarding administrative issues related to building codes.
- 10.0 Public Comment: Public comment will be heard on items not on this agenda but within the jurisdiction of the Code Advisory Committee. Comment time is limited to 3 minutes per person or at the call of the Chair.

11.0 Adjournment

Note to Committee Members: Please review the appropriate material and be prepared to discuss at the meeting. **If you are unable to attend, please call Chairperson Stephen Harris, S.E. at (415) 495-3700.** The meeting will begin promptly. See attached materials for information about meeting accessibility.

KNOW YOUR RIGHTS UNDER THE SUNSHINE ORDINANCE (Chapter 67 of the San Francisco Administrative Code)

Government's duty is to serve the public, reaching its decisions in full view of the public. Commissions, boards, councils and other agencies of the City and County exist to conduct the people's business. This ordinance assures that deliberations are conducted before the people and that City operations are open to the people's review.

The ringing of and use of cell phones, pagers and similar sound-producing electronic devices are prohibited at this meeting. Please be advised that the chair may order the removal from the meeting room of any person(s) responsible for the ringing or use of a cell phone, pager, or other similar soundproducing electronic devices.

FOR MORE INFORMATION ON YOUR RIGHTS UNDER THE SUNSHINE ORDINANCE, TO OBTAIN A COPY OF THE SUNSHINE ORDINANCE, OR TO REPORT A VIOLATION OF THE ORDINANCE, CONTACT CHRIS RUSTOM BY MAIL TO ADMINISTRATOR, SUNSHINE TASK FORCE CITY HALL, ROOM 244, 1 DR. CARLTON B. GOODLETT PLACE, SAN FRANCISCO, CA 94102-4689. OFFICE (415) 554-7724, FAX (415) 554-7854, E-MAIL: sotf@sfgov.org

Citizens interested in obtaining a free copy of the Sunshine Ordinance can request a copy from Mr. Rustom or by printing Chapter 67 of the San Francisco Administrative Code on the Internet, <http://www.sfgov.org/sunshine/> and at the San Francisco Public Library.

POLICY STATEMENT OF PUBLIC HEARING OR MEETING

Pursuant to Section 67.7-1(c) of the San Francisco Administrative Code, members of the public who are unable to attend the public meeting or hearing may submit written comments regarding a calendared item to Technical Services Division, at 1660 Mission Street, San Francisco, CA 94103 or at the place of the scheduled meeting. These written comments shall be made a part of the official public record.

SAN FRANCISCO LOBBYIST ORDINANCE

Individuals and entities that influence or attempt to influence local legislative or administrative action may be required by the San Francisco Lobbyist Ordinance (SF Administrative Code Sec. 16.520-16.534) to register and report lobbying activity. For more information about the Lobbyist Ordinance, please contact the Ethics Commission at 1390 Market Street #701, SF, CA 94102 or (415) 554-9510 voice, or (415) 703-0121 fax, or visit their website at <http://www.sfgov/ethics/>.

ACCESSIBLE MEETING INFORMATION POLICY

In order to assist the City's efforts to accommodate persons with severe allergies, environmental illness, multiple chemical sensitivity or related disabilities, attendees at public meetings are reminded that other attendees may be sensitive to various chemical based products. Please help the City to accommodate these individuals.

The meeting will be held at the Department of Building Inspection, 1660 Mission Street. The closest accessible BART stations are the Civic Center Station at 8th (at the United Nations Plaza) and Market Street and 16th at Mission Street.

Accessible MUNI/Metro lines servicing this location are the, 42 - Downtown, 14 & 14 Limited - Mission, and F - Market bus lines. For information about MUNI accessible services call (415) 923-6142.

The meeting room is wheelchair accessible. Accessible curb side parking spaces have been designated on Mission and Otis Streets. There is accessible parking available within the Department of Building Inspection parking lot. The entrance to this lot is on Otis Street.

Accessible seating for persons with disabilities (including those using wheelchairs) will be available. Assistive Listening devices will be available at the meeting. A sign language interpreter will be available upon request. Agendas and Minutes of the meeting are available in large print/tape form and/or readers upon request. Please contact Technical Services Division at (415) 558-6205, providing 72 hours notice will help to ensure availability.

To request a sign language interpreter, reader, materials in alternative formats, or other accommodations for a disability, please contact Technical Services Division at (415) 558-6205. Providing 72 hours notice will help to ensure availability.

Materials are available in alternate formats on request.



CODE ADVISORY COMMITTEE

Regular Meeting of the Structural Subcommittee (Revised 8/13/13)

DATE: July 9, 2013 (Tuesday)
TIME: 9:00 AM to 11:00 AM
LOCATION: 1660 Mission St., Room 2013

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Draft MINUTES

Present

Stephen Harris, S.E.
Ned Fennie, A.I.A.
Marc Cunningham
Rene' Vignos, S.E.

Absent

Tony Lau

Other Present

Laurence Kornfield, ESIP
David Bonowitz, S.E.
Behruz Vahdani, Matrix Seismic Group
Homer Yim, Simpson Strong-Tie
Louay Shamroukh, Simpson Strong-Tie
Sandra Hawkins
Matt Mrizek
Sdenne Demarle
Julia Pavivic
Brendon Gee
Jenny Taing
Robert Chun, DBI
Susie Song, DBI
Eric Gee, DBI
David Leung, DBI

Structural Subcommittee

1.0 Call to Order and Roll Call.

Members: Stephen Harris, S.E.; Chair; Rene' Vignos, S.E.; Marc Cunningham; Tony Lau; Ned Fennie, A.I.A.

Meeting was called to order at 9:00 a.m. Quorum established with 4 members present.

2.0 Approval of the minutes of the Structural Subcommittee regular meeting of June 11, 2013.

A motion to approve the minutes. Seconded and approved.

3.0 Discussion and possible action on proposed amendments to Chapter 34B of the 2013 San Francisco Building Code for implementation of Ordinance No. 66-13 on Mandatory Earthquake Retrofit of Wood-Frame Buildings

A motion to approve the proposed amendments on Chapter 34B and forward to full CAC. Seconded and approved.

4.0 Discussion and possible action on Administrative Bulletin detailing the procedural and implementation requirements for proposed Chapter 34B: Mandatory Earthquake Retrofit of Wood –Frame Buildings

Drafts of AB-106, AB-107, Screening and Optional Evaluation Forms are presented. Reference should be made to SFBC Chapter 34B instead of Ordinance 66-13. There is an urgency to finalize these documents by mid-August. Criteria on using various codes for the soft story retrofit, disabled access compliance when triggered and permission to use California Historical Building Code for qualified historic buildings are discussed.

5.0 Discussion and possible action on training for DBI staff by SEAONC on soft story

Training for DBI staff by David Bonowitz on soft story is scheduled on July 10, 2013.

6.0 Discussion and possible action on Special Inspection for Earthquake Improvements for One- and Two-Family Homes.

No discussion.

7.0 Discussion and possible action regarding Private School Earthquake Safety.

No discussion.

8.0 Discussion and possible action on SFBC Section 3404.7.2.

No discussion.

9.0 Discussion and possible action on AB-102 Substantial Change expanding applicability to R2

Structural Subcommittee

occupancy.

No discussion. This will be further discussed with possible input from SEAONC.

10.0 Items 4 thru 9 will be included to the agenda in next meeting.

11.0 Public Comment:

Homer Yim of Simpson Strong-Tie mentioned that they are developing some guidelines on the use of moment frames.

12.0 Adjournment.

The meeting was adjourned at 10:30 a.m.

AB-106

has any portion extending above grade, contains five or more dwelling units, and was permitted or constructed prior to January 1, 1978. It is the intent of this code to limit work, insofar as possible, to the first story and any weak story below the first story. In a few unusual cases where extremely weak stories are found to exist above the first story, it may be necessary to provide seismic retrofit above the first story.

The requirements of Chapter 34B and the related design criteria represent a minimum standard to reduce earthquake risk. Property owners may upgrade buildings to higher performance levels and undertake seismic retrofit improvements that exceed the requirements of this code.

IMPLEMENTATION

Screening Form

On September 15, 2013, the Department will mail a Notice and Screening Form to all owners of buildings that meet the criteria of buildings under this code. The Screening Form provides a simplified mechanism to determine if buildings must comply with the seismic upgrade requirements of Chapter 34B, and to identify the time frame for building retrofit within a four-tier system. All Screening Forms must be returned to the Department no later than September 15, 2014. Information provided on the Screening Form will be spot-checked by DBI staff; if errors are found or if additional information is required, the Department will contact the property owner or the owner's designated representative.

Copies of the Screening Form and detailed instructions for completion and submittal of this form are available from the Department's website at www.sfdbi.org/softstory or at the Department offices at 1660 Mission Street, San Francisco. There is no fee for submittal of the Screening Form.

Optional Evaluation Form

A building that has been previously seismically upgraded or which the owner believes may already meet the requirements of Chapter 34B may be exempt from this program if an evaluation confirms that the criteria detailed in Chapter 34B are met. This confirmation may be done using the Optional Evaluation Form process. These forms and detailed instructions for completion and submittal of the form are available on the Department's website at www.sfdbi.org/softstory or at the Department offices at 1660 Mission Street, San Francisco. A fee for a minimum of two hours of plan review time is due upon submittal of the Optional Evaluation Form. Additional fees may apply if more than two hours is required for plan review.

Submittal Documents

Please see Attachment A: Checklist

Please see Administrative Bulletin AB-107 for submittal information on structural calculations.

Plan review by Department of Building Inspection

Building permit applications that are submitted to comply with this program will be reviewed for compliance with acceptable methodologies and appropriate design criteria. Insofar as possible, such review will be done over-the-counter. If over-the-counter review is not an available option, permit applications must be submitted. Such applications will be routed and tracked in accordance with standard Department procedures.

Plan review by other agencies

Review by agencies other than the Department of Building Inspection shall be in accordance with the guidelines set forth in the attachments to this Administrative Bulletin. Where such guidelines do not cover specific issues or concerns, such other agencies will apply their standard plan review guidelines.

Fees for plan review and permit issuance by all agencies shall be as detailed in codes and regulations, in addition to any modifications noted in the attachments to this Administrative Bulletin.

Specific conditions of approval may be part of permit approval by any City agency. Project sponsors should carefully review all comments and notes on plans and permits regarding such conditions of approval.

Please visit the following websites for further information for permits from other departments.

<http://www.sf-planning.org/>

<http://www.sfdpw.org/>

<http://www.sf-fire.org/>

Triggered code requirements

In accordance with the specific requirements of the San Francisco Building Code, smoke detectors and carbon monoxide detectors may be required to be installed in a building at the time of this seismic upgrade work. Other work, such as water heater bracing, may also be triggered. Please review the codes and plan review comments for more information about such triggered such work.

AB-106

When required under San Francisco Building Code Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Publically Funded Housing, disability access improvements will be required when seismic upgrade work involves alterations and/or structural repairs. Chapter 11A, Housing Accessibility, may apply in certain unusual cases when a building has undergone a change of use, addition, or provides certain public or common use areas. A design professional or consultant will be able to provide guidance as to the scope of any such required disability access work.

Modifications, Equivalencies, or Alternates

Any proposal for seismic retrofit work that does not meet the specific technical requirements or the performance criteria detailed in Chapter 34B, in Administrative Bulletin AB-097, or in this administrative bulletin may be considered for administrative approval by the Department of Building Inspection on a case-by-case basis if the requirements of San Francisco Building Code, Section 104A.2, *Local Equivalencies and Alternate Materials, Design, and Methods*, are met. Such equivalencies or alternatives must be shown to be at least equal to the code requirements and criteria for structural integrity, suitability, strength, effectiveness, durability and safety. Applications for modifications, equivalencies, or alternates should be submitted in accordance with the requirements of Administrative Bulletin AB-005, Procedures for Approval of Local Equivalencies.

Inspection and Special Inspection

Work undertaken to comply with Chapter 34B must meet all requirements of the San Francisco Building Code including inspections and, when necessary, Special Inspections. Please review approved permits and permit documents regarding any such special inspection requirements.

Completion of Work

Completion of this required seismic upgrade work will result in the issuance of a Certificate of Final Completion (CFC). This CFC will be issued only following final inspection, submittal and approval of any Special Inspection documents, and compliance with all conditions of approval. The CFC document will become part of the permanent record of the building.

Extensions of time to complete work may be granted in accordance with Section 106A4.4, but such extensions may not extend the time beyond the deadline designated in Table 34B-A for completion of required work.

Historic Buildings

AB-106

Buildings that qualify to use the California Historical Building Code may apply the provisions and analysis techniques referenced in the California Historical Building Code, Chapter 8-7, Structural Regulations, and Chapter 8-8, Archaic Materials and Methods of Construction, and other provisions of that code upon approval of the Department.

To determine if a building can be qualified to use the California Historical Building Code, please contact the Technical Services Division of the Department of Building Inspection at 558-6205.

Optional Earthquake Recording Instrumentation

Building owners are encouraged to provide earthquake recording instrumentation in their buildings. This instrumentation will typically require installation of sensors at the ground level, on the second floor, and at the highest story of a building. Costs of providing instrumentation are modest. The Department may assist in installation and maintenance of earthquake recording instruments in accordance with *San Francisco Building Code*, Section 1604.12.4.

Earthquake recording instrumentation provides information about actual building movement. Instrumentation may be valuable to a building owner in providing a clearer understanding of actual building performance in an earthquake, possibly reducing the need for more detailed post-earthquake inspection and evaluation. The information from instrumented buildings will also provide scientists and engineers with a better understanding of the earthquake behavior of buildings. For information about participation in the optional earthquake recording instrumentation program, please contact the Technical Services Division at 558-6205.

ENFORCEMENT AND ABATEMENT

Enforcement and abatement action will be promptly taken by the Department if a property owner fails to comply with any of the requirements of this program, including failure to submit a properly completed Screening Form or other document within the allowable one-year time, submittal of Screening Form or other documents that are found to contain errors or misrepresentations, failure to obtain a building permit or failure to complete all work and obtain a final inspection within the time limits indicated in Table 34B-A, or for any other violation of this code. Such enforcement and abatement action will be in accordance with the requirements of San Francisco Building Code, Section 102A, Unsafe Buildings, Structures or Property.

In every case, when any required action has not been properly completed within the time limits of Chapter 34B, the Department will post the building with a notice stating:

**Earthquake Warning:
This building is in violation
of the requirements of the
San Francisco Building
Code regarding
earthquake safety.**

This notice may not be removed until the building is in compliance with the requirements of Chapter 34B. The notice shall also be recorded against the title of the property, with a release of this notice filed upon compliance with the requirements of Chapter 34B.

Violation of any code requirement related to the upgrade of these buildings may subject the property owner to penalties detailed in *San Francisco Building Code*, Section 103A, Violations, including fines of up to \$500 per day per violation and other penalties.

APPEALS

Board of Examiners

In cases where proposed *modifications, equivalencies, or alternates* substantially differ from those prescribed in this bulletin, such proposals may be referred by the Department to the Board of Examiners. Determinations made by the Department regarding technical provisions may be appealed by the permit applicant to the Board of Examiners in accordance with San Francisco Building Code, Section 105A.

Building Inspection Commission

Any person may appeal a determination of the Director related to these requirements to the Building Inspection Commission, pursuant to Chapter 77 of the San Francisco Administrative Code.

RECORDING AND REPORTING

A list of buildings by street address and by block and lot number to which notice has been given regarding this required seismic upgrade program will be maintained and made public on the Department's website.

The Department will track the status of all buildings noticed under this program and will provide an annual update to the Mayor and the Board of Supervisors regarding the status of compliance.

Tom C. Hui, S.E., C.B.O., _____ Date
Acting Director
Department of Building Inspection

Approved by Building Inspection Commission on

AB-106

Attachment A Checklist

Attachment B Wood-Frame Seismic Retrofit Program: Screening Form

Attachment C Wood-Frame Seismic Retrofit Program: Screening Form Instructions

Attachment D Wood-Frame Seismic Retrofit Program: Optional Evaluation Form

Attachment A: Submittal Checklist

I. Submittal Requirements for evaluations and retrofit design– Review all items on the following checklist. If you check no, revise documents or have appropriate documentation to clarify.

- | Yes | No | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Is the scope of work to comply with Ordinance 66-13 Mandatory Soft Story Retrofit? |
| <input type="checkbox"/> | <input type="checkbox"/> | Is there no other work to be completed on this permit? (Work triggered by the retrofit is accepted.) |
| <input type="checkbox"/> | <input type="checkbox"/> | Are there two sets of dimensioned plans with each page wet signed and stamped by the design professional of record? Are all exterior walls, interior walls, and permanent partitions shown? (Minimum size of 11"x17". All character height to be a minimum of 1/8".) |
| <input type="checkbox"/> | <input type="checkbox"/> | Are there photographs of building exterior? Front, back and sides as possible. |
| <input type="checkbox"/> | <input type="checkbox"/> | Are there two sets of structural calculations with the cover pages wet signed and stamped by a licensed design professional? Do these calculations detail how the seismic retrofit will meet the standards of the ordinance? |
| <input type="checkbox"/> | <input type="checkbox"/> | Does each portion of the building have occupancy classification? |
| <input type="checkbox"/> | <input type="checkbox"/> | Are archaic materials used as part of the lateral force resisting system? Please provide detailed values for these materials. |
| <input type="checkbox"/> | <input type="checkbox"/> | Is the ground floor a commercial space? (Provide a completed disability access checklist and associated documentation.) |
| <input type="checkbox"/> | <input type="checkbox"/> | Does the retrofit work trigger any disability access code provisions? (Provide a completed disability access checklist and associated documentation.) |
| <input type="checkbox"/> | <input type="checkbox"/> | Are all other materials typically required as part of a permit application submittal package included? |

II. Submittal Requirements for retrofit design only –

Construction documents. Construction documents shall show all information necessary for compliance review and shall accurately reflect the results of the engineering investigation and design. The documents shall include:

1. A statement that the retrofit was designed in compliance with SFBC Chapter 34B.
2. A statement of the engineering criteria used for the design, including the performance objective used with FEMA P-807, ASCE 41-06, or ASCE 41-13.
3. Documentation of existing conditions, including plans of the floor diaphragm and framing above any retrofit element, first story walls and frames and their foundations, and any basement or underfloor conditions.
Note: For designs based on FEMA P-807, the plans must show all walls and partitions contributing to the lateral strength at each story.
4. Demolition plans as needed.
5. A foundation plan, including proposed new elements and connections to existing elements.
6. A first floor retrofit plan, showing the types and locations of retrofit elements and existing elements to remain, including identification of those existing, altered, or new elements designated to participate in the retrofitted seismic force-resisting system.
7. Where applicable, plans and details for strengthening the second floor diaphragm.
8. A retrofit schedule, notes, and details showing the materials and construction of all altered or new elements acting as retrofit elements.
 - 8.1. For foundation elements, at minimum: dimensions; depth of excavation; concrete reinforcing.
 - 8.2. For wood-frame elements, at minimum: sheathing type and thickness; fastener type and spacing, including edge distance; hold-downs and anchor bolts; alteration or supplement of studs, sill plates, and other framing; and quality control measures such as flush nailing at the wood surface and limits on notching or penetrations.
 - 8.3. For steel elements, at minimum: member sizes and dimensions; fasteners, including bolts, shop and field welds; base plates and anchor bolts; and erection procedures and sequences.
9. Load path, collector, and other details as needed for construction of the intended seismic force-resisting system.
10. Scope of required field verification, structural observation, testing, and inspection.
11. Other work as required for compliance with applicable provisions for work on existing

AB-106

buildings.

12. Other information as required by the Department.

Construction quality assurance [for designs based on FEMA P-807 only]:

Construction documents. Construction documents based on FEMA P-807 shall include, at minimum:

1. Floor plans for each floor level, including those where no retrofit elements are added, indicating which wall lines are presumed to contribute to the story strength.

Note: This is necessary to provide a reference for future alterations. Normally, non-conforming walls are not considered structural elements and may therefore be altered without triggering structural review. Because FEMA P-807 considers all wall assemblies, a provision will be added to SFBC Section 3404 to flag alterations to any walls or partitions used to calculate story strength for compliance with Chapter 34B; the record plans will be needed to facilitate these checks.

III. Routing to other Departments

If Yes is checked, routing to the appropriate departments will be required. *Refer to each department's website for the most up to date procedures.*

Yes No

Planning

 Is any exterior work proposed?

Department of Public Works

 Is street space or work in the public is required?

Fire Department

 Are there any changes to the means of egress?

 Are fire and/or carbon monoxide detectors being added/altered?

Planning Department

<http://www.sf-planning.org/>

Department of Public Works

<http://www.sfdpw.org/>

Fire Department

<http://www.sf-fire.org/>



ADMINISTRATIVE BULLETIN

NO. AB-107 Draft #6

DATE: September 4, 2013

SUBJECT: Ordinance No. 66-13: Mandatory Seismic Retrofit Program – Wood-Frame Buildings

TITLE: Application of Engineering Criteria in SFBC 3406B

PURPOSE: The purpose of this Bulletin is to establish acceptable design criteria, standards and technical provisions for complying with Chapter 34B of the 2013 San Francisco Building Code, as amended by Ordinance No. 66-13.

REFERENCE:

- Chapter 34B, 2013 San Francisco Building Code
- 2012 International Existing Building Code, Appendix Chapter A4
- ASCE 31-03, Seismic Evaluation of Existing Buildings
- ASCE 41-06, Seismic Rehabilitation of Existing Buildings
- ASCE 41-13, Seismic Evaluation and Retrofit of Existing Buildings
- FEMA P-807, Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories

BACKGROUND:

SFBC Chapter 34B, created with Ordinance 66-13, mandates the seismic retrofit of certain wood-frame residential buildings. Section 3406B.4 calls for the development and publication of this Administrative Bulletin to “detail the technical requirements to be used for the evaluation and retrofitting of buildings required to meet the criteria established in Section 3406B.2.”

SCOPE AND OUTLINE:

This bulletin covers only SFBC Sections 3406B.2 through 3406B.4. It does not cover administrative or procedural requirements of Chapter 34B or of Ordinance 66-13. It is separate from, but intended to be in coordination with, other sections of Chapter 34B, other Administrative Bulletins, and other forms and instructions.

This bulletin has two parts: Part A, which applies to all projects seeking to comply with Chapter 34B, and Part B, whose sections apply to the specific compliance alternatives allowed in Section 3406B.2.

Part A. Requirements for all projects

Part A of this Bulletin applies to all evaluation and retrofit projects intended to comply with SFBC Chapter 34B. Unless noted otherwise, requirements in Part B are additional to, not in place of, requirements in Part A.

A1. Compliance

A1.1. Other SFBC requirements and Administrative Bulletins. Alterations and repairs required to meet the provisions of Chapter 34B shall comply with all other applicable structural requirements of the SFBC unless specifically waived by those requirements, by this Bulletin, or by related Administrative Bulletins.

CA1.1. See Administrative Bulletin 106 regarding procedural compliance with SFBC Chapter 34B, specifically Section 3406B.6.

A1.2. Qualified historic buildings. In addition to or in place of the criteria allowed by SFBC Section 3406B.2, qualified historical buildings shall be permitted to use structural engineering criteria provided in the latest edition of the California Historical Building Code (California Code of Regulations Title 24 Part 8), subject to the eligibility requirements of that code.

CA1.2. SFBC Section 3404B.5 also mentions the CHBC, but that provision is about historic preservation in accord with San Francisco Planning Department guidelines and has no direct bearing on the structural engineering criteria.

A2. Seismicity, Soil, and Geotechnical issues

A2.1. Site Class E. Buildings located in areas labeled “NEHRP E” on the latest USGS map of “Soil Type and Shaking Hazard in the San Francisco Bay Area” will be assigned to Site Class E unless site-specific investigation in accordance with ASCE 7-10 Chapter 20 indicates otherwise.

CA2.1. The map is available online at <http://earthquake.usgs.gov/regional/nca/soiltype/map/>

A2.2. Site Class F. The requirement in ASCE 7-05 Section 11.4.7 for site response analysis of Site Class F sites is waived.

CA2.2. SFBC Chapter 34B does not require mitigation of existing geologic site hazards such as liquefiable soil. Also, many buildings subject to Chapter 34B would be exempt from site response analysis by the exception to ASCE 7-05 Section 20.3.1.

A2.3. Seismic ground motion values. Where seismic ground motion values are calculated per ASCE 7-05 Section 11.4 or by similar provisions, the value of F_a shall be taken as 1.3 for Site Class E.

CA2.3. This requirement applies to any code-based procedure for calculating seismicity parameters, such as that used by IEBC Appendix Chapter A4 (see Bulletin part B.5) and application of “regular code” provisions through the California Historical Building Code. It also applies where criteria such as ASCE 31, ASCE 41, and FEMA P-807 apply equations similar to those in ASCE 7 Section 11.4.

A3. Assessment of Existing Building Conditions

A3.1. Building investigation and report. In support of an engineering evaluation or retrofit design, the owner shall conduct or cause to be conducted an investigation of the existing building. The engineer of record shall prepare a written report documenting procedures, findings, and conclusions of the investigation. The report may reference other materials submitted to demonstrate compliance or to support findings and conclusions.

A3.1.1. Scope of investigation. At minimum, the investigation shall comply with any investigation and assessment provisions in the engineering criteria selected from SFBC Section 3406B.2, as modified by Part B of this Bulletin. Otherwise, the investigation scope and methods may generally be set at the discretion of the engineer of record, but all findings shall be reported. The Department is authorized to require additional investigation as needed to fulfill the purpose of the report and the intent of SFBC Chapter 34B. With the approval of the Department, field verification of assumed conditions may be performed during the construction phase.

As needed or required, the investigation shall include identification, verification, and assessment of existing conditions relevant to the engineering assumptions applied in the evaluation or retrofit design. The investigation shall be based on a combination of non-destructive testing or inspection, destructive testing or inspection, and reference to record documents. Where record documents are used to reduce the scope of testing or other on-site work, appropriate field verification is required.

CA3.1.1. With respect to evaluation, the primary purpose of the investigation is to identify or confirm the nature of the existing construction as needed to justify load drift curves, tributary floor weights, load path assumptions, etc. A secondary purpose is to provide condition assessment sufficient to rule out deterioration or construction defects significant enough to affect earthquake performance of the structure as a whole. The investigation should therefore seek evidence of damage, deterioration, or defective construction sufficient to affect significantly the performance of the seismic force-resisting system. With respect to retrofit design, the primary purpose of the investigation is to confirm design assumptions regarding the adequacy of existing seismic load path components within the context of the retrofitted structure. In addition, though it need not be stated in the provision, the Department is always authorized to require repair of damage, correction of defects, and elimination of dangerous conditions; hence the requirement that “all findings shall be reported.”

A3.1.2. Timing of investigation. Unless otherwise required by the engineering criteria selected from SFBC Section 3406B.2, as modified by Part B of this Bulletin, with the approval of the Department, investigation may be deferred to a confirmation or construction phase.

CA3.1.2. This allowance is offered for the benefit of owners for cases in which destructive investigation will be unusually disruptive or expensive. However, the owner will bear the risk of change orders, design revisions, and supplemental design review if actual conditions differ from those assumed by the evaluation or design. Approval of the

Department is required to allow the Department to identify cases where deferred investigation will complicate its review and approval process. The Department may allow some parts of the investigation to be delayed while requiring other parts of the investigation to be completed prior to review of calculations.

A3.2. Existing materials and components. Where the applicable engineering criteria specify material or structural properties of existing elements, those criteria shall be used. Otherwise, the general rules of this section apply.

A3.2.1. Damage and defects. The capacity of any element damaged by deterioration, wear, or other causes or constructed or altered so as differ from its intended condition shall be reduced based on the judgment of the engineer of record, subject to review of condition assessment findings and the approval of the Department. This provision shall apply where the applicable engineering criteria do not make an explicit provision for capacity reduction.

CA3.2.1. This provision is consistent with ASCE 31-03 Section 4.2.4.4.

A3.2.2. Relation of nominal and expected strength to allowable stress. Where element capacities are based on allowable stresses from codes and standards, nominal strengths shall be taken no greater than the allowable stresses multiplied by the following factors: 1.7 for steel; 2.5 for masonry; 2.0 for wood. Where the element is ductile or deformation-controlled, the expected strength shall be taken as 1.25 times the nominal strength.

CA3.2.2. This provision is consistent with ASCE 31-03 Section 4.2.4.4.

A3.2.3. Concrete footings and stem walls. Evaluation and design of existing concrete footings shall be permitted to assume default concrete strength based on ASCE 41-13.

A3.2.4. Unreinforced brick footings. The capacity of an existing brick footing to resist shear or pullout of an existing or new anchor shall be established by testing or by reference to approved tests of similar conditions. Where the capacity of an anchor is limited by failure of the footing or grout, the anchored wall or frame element shall be considered non-ductile or force-controlled.

CA3.2.4. Because FEMA P-807 presumes ductile retrofit elements, the last sentence of this provision means that retrofit elements designed with FEMA P-807 may only be used with brick footings when testing has demonstrated that the anchor will develop the strength of the wall or frame element or will yield itself in a ductile fashion.

A3.2.5. Concrete or masonry retaining walls.

Reserved.

A3.2.6. Sheathed wood-frame walls and partitions. Wood-frame walls and partitions shall be permitted to use peak strength values from Bulletin Section B1.2.5.1.1. Where these values are used, they shall be taken as expected strengths and reduced to nominal strength per Bulletin Section A3.2.2 where used on non-ductile or force-controlled elements. This provision is subject to the following limitations:

1. A wall assembly may be considered deformation-controlled if all sheathing materials that are individually force-controlled are ignored in the strength calculation.

2. Retrofit designs based on R values from the building code shall use only code-approved sheathing materials and combinations appropriate to the assumed R value.

A3.2.6. Steel anchor bolts at wood sill plates.

Reserved

A4. Structural Calculations and Project Documentation

A4.1. Submittals. Structural calculations and supporting documents shall be prepared and submitted as required by Bulletin Section A4.2. Other documents shall be prepared and submitted as required by Administrative Bulletin 106.

A4.2. Structural calculations and supporting documents. Structural calculations shall be submitted as required to confirm compliance with the selected engineering criteria. Calculations shall be specific to the engineering criteria used (see Part B for criteria-specific requirements) and shall include, at minimum:

1. A statement that the evaluation or retrofit design was prepared to demonstrate compliance with SFBC Chapter 34B.
2. Identification of the engineering criteria used for the evaluation or retrofit design, including the performance objective used with FEMA P-807, ASCE 41-06, or ASCE 41-13.
3. All building investigation, soils, geotechnical, or other supporting reports, as well as a summary of such reports indicating how the findings or conclusions are reflected in the structural calculations.
4. Identification of structural properties and capacities assumed for all existing materials and elements, including any capacity reductions for damage, deterioration, or defect.
5. Identification of structural properties and capacities assumed for all new materials and elements, including product literature for proprietary devices.
6. If requested by the Department, verification calculations for any engineering software used.
7. Other information as required by the Department.

A5. Construction Quality Assurance

A5.1 Testing and inspection. All work shall comply with inspection and testing requirements of the building code as they apply to existing buildings and structures. Additional field verification,

AB-107

structural observation, testing, and inspection may be required in accordance with the selected engineering criteria or as directed by the Department.

Part B. Application of specific engineering criteria

Part A of this Bulletin applies to all evaluation and retrofit projects intended to comply with SFBC Chapter 34B. Unless noted otherwise, requirements in Part B are additional to, not in place of, requirements in Part A.

B1. Application of FEMA P-807 to evaluation and retrofit design

B1.1. Intent of 3406B.2 item 1 and 3406B.3

SFBC Section 3406B.2 item 1 allows the use of FEMA P-807 as follows:

1. FEMA P-807, Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings with Weak First Stories, as detailed in an Administrative Bulletin to be prepared pursuant to 3406B.3 [sic] of this ordinance, with the performance objective of 30 percent maximum probability of exceedance of Onset of Strength Loss drift limits with a spectral demand equal to $0.50 S_{MS}$.

SFBC Section 3406B.3 allows an alternative objective as follows:

A proposed seismic retrofit plan which fails to meet the criteria of 3406B.2(1) or 3406B.2(5) shall be deemed to comply with this Chapter if, with the approval of the Department, it satisfies the intent of FEMA P-807, Section 6.4.2 with a maximum acceptable Onset of Strength Loss drift limit probability of exceedance of 50 percent.

Exception: Alternative retrofit criteria shall not apply to buildings in which the critical stories, basements, or underfloor areas contain other than parking, storage, or utility uses or occupancies.

The code language provided in FEMA P-807 Appendix B includes these caveats, repeated here for reference:

Limitations. These evaluation and retrofit provisions are related to the onset of strength loss in wood-frame elements of the seismic force-resisting system, a condition that indicates a substantially increased potential for structural collapse. As such, they might not be adequate for predicting the likelihood of other damage states. The retrofit provisions are premised on the assumption that work will be constrained to the first story and the second floor diaphragm. As such, they do not necessarily provide a comprehensive retrofit to a stated performance objective. When followed, the retrofit provisions will improve performance, but they will not necessarily prevent damage or mitigate failure modes other than those related to weak-story conditions and associated torsion.

Coordination with other codes and standards. Compliance with these provisions does not necessarily satisfy the requirements of *International Building Code* Chapter 34 or the *International Existing Building Code* as they apply to certain additions, alterations, repairs, or changes of occupancy. Compliance with these provisions does not necessarily meet any

AB-107

performance level of ASCE/SEI 31-03, or any retrofit objective of ASCE/SEI 41-06, or ASCE/SEI 41-13.

B1.2. Code language provisions

FEMA P-807, unlike the other documents cited by Section 3406B.2, is not a code or standard and is written in a guideline or narrative style. Enforceable provisions in “code language” are therefore provided here, adapted from FEMA P-807 Appendix B. In general, use of FEMA P-807 for compliance with SFBC Chapter 34B shall mean compliance with these code language provisions; FEMA P-807 itself constitutes a commentary to these provisions.

B1.2.1. General

B1.2.1.1

Reserved.

B1.2.1.2. Performance Objective

B1.2.1.2.1. Hazard level. The spectral demand shall be $0.5S_{MS}$, calculated in accordance with ASCE 7-05 Section 11.4 except that for sites in Site Class E, the value of F_a shall be taken as 1.3.

CB1.2.1.2.1. The value of F_a is modified for Site Class E to adjust the demand for site effects not considered explicitly in the development of FEMA P-807 (see FEMA P-807 section 2.6.1).

B1.2.1.2.2. Performance level. Acceptable performance shall be based on drifts corresponding to the Onset of Strength Loss in the seismic force-resisting wood-frame elements.

CB1.2.1.2.2. This provision merely reflects the requirements of the ordinance, referencing the Onset of Strength Loss performance level defined in FEMA P-807. It does not require any additional work by the engineer, since the Onset of Strength Loss criteria are already embedded in the criteria given in this Bulletin.

B1.2.1.2.3. Maximum drift limit probability of exceedance. The maximum drift limit *POE* for evaluation or retrofit design shall be 30 percent.

Exception: Where the story or underfloor area subject to evaluation or retrofit contains only parking, storage, or utility uses or occupancies, the maximum drift limit *POE* for evaluation or for retrofit design shall be 50 percent, as long as the additional requirements of Bulletin Section 1.2.7.3 are met.

CB1.2.1.2.3. This Exception incorporates the alternative criteria given in SFBC Section 3406B.3. The alternative criteria apply to what FEMA P-807 calls “optimized retrofit,” as discussed in FEMA P-807 Sections 6.3.1 and 6.4.2.

B1.2.1.3. Required scope of work. Compliance with the provisions of SFBC Chapter 34B using FEMA P-807 requires:

1. Correction of all aspects of eligibility non-compliance per Bulletin Section B1.2.3, and
2. Correction of all building survey non-compliance per Bulletin Section B1.2.4, and either

AB-107

- 3a. Demonstration of an acceptable existing condition per Bulletin Section B1.2.6, or
- 3b. Design and execution of a retrofit in accordance with Bulletin Section B1.2.7 and other applicable codes and regulations.

Where retrofit is required but the provisions of Bulletin Section B1.2.7 cannot be satisfied, the building shall be considered ineligible for compliance with SFBC Chapter 34B using FEMA P-807.

B1.2.1.4

Reserved.

B1.2.1.5

Reserved

B1.2.2. Definitions

CB1.2.2. *In some instances, the notation and terminology differ slightly from those in FEMA P-807 Chapters 1-7.*

B1.2.2.1. Terminology. Terms used in Bulletin Section B1 shall have the meanings provided here. Terms not defined here shall have the meanings provided in the building code.

CENTER OF STRENGTH. At each story, the location in plan that represents the weighted average location of the load in all wall lines, at the drift associated with the story strength.

DRIFT. For a given story, the calculated or postulated lateral deflection within that story divided by the story height, normally expressed as a percentage.

FIRST STORY. The story of interest with respect to evaluation or retrofit, spanning vertically between the first floor and the second floor. Depending on the building and its relationship to grade, the story designated as the First Story can be an underfloor area or cripple story, a basement, the first story above grade, or another story above grade. The First Story can be partial in plan. For a building with multiple stories of interest, the First Story can vary as each story of interest is analyzed.

LOAD-DRIFT CURVE. For a wall assembly, wall line, or story, the relationship characterizing the variation of shear resistance versus drift, for the full range of relevant drifts. For a wall assembly, the load value is given in units of force per unit length. For wall lines and stories, the load value is given in units of force.

LOAD-ROTATION CURVE. For a story, the relationship characterizing the variation of torsional resistance versus story rotation, for the full range of relevant rotations, given in units of torque as a function of rotation angle.

PROBABILITY OF EXCEEDANCE (POE). The desired or calculated probability that the structure will respond beyond the drift limits representing the desired performance level, in at least one direction, when subjected to a specified hazard level. Within SFBC Chapter 34B and this Bulletin, *POE* means the probability of exceeding the drift limits associated with Onset of Strength Loss.

CB1.2.2.1. *As used in SFBC Chapter 34B and this Bulletin, POE is identical to what FEMA P-807 Chapters 1 through 7 typically call "drift limit POE."*

QUALIFYING WALL LINE. For purposes of checking eligibility of floor or roof diaphragms, a wall

line that contributes substantially to the peak story strength and has an adequate load path connecting it to the diaphragms it affects.

CB1.2.2.1, continued. See FEMA P-807 Section 2.6.4 for discussion of rules for “qualifying” wall lines. The definition is subject to the judgment of the engineer of record and the Department.

SPECTRAL CAPACITY. For a given POE, the highest level of spectral acceleration a structure can sustain without responding beyond the drift limits representing the desired performance level, given as a multiple of the acceleration of gravity, and calculated separately in each principal direction.

SPECTRAL DEMAND. See Bulletin Section B1.2.1.2.1. The spectral demand is given as a multiple of the acceleration of gravity.

STORY. For purposes of applying engineering criteria in SFBC Section 3406B and this Bulletin, see the building code definition and this Bulletin’s definition of First Story. The definition in SFBC Section 3403B applies only to the counting of stories for determining scope per SFBC Section 3402B.

STORY STRENGTH. The maximum load value from the story load-drift curve, calculated separately in each principal direction.

STORY STRENGTH, BASE-NORMALIZED. The story strength divided by the total seismic weight of the building.

STORY STRENGTH, STORY-NORMALIZED. The story strength divided by the sum of the tributary floor weights of all the floors above the story in question.

STORY TORSIONAL STRENGTH. The maximum torsional resistance value from the story load-rotation curve.

STRENGTH DEGRADATION RATIO. In each direction, a value between 0.0 and 1.0 calculated as the first story strength divided by the load corresponding to a drift of 3 percent from the first story load-drift curve.

TORSION COEFFICIENT. A value that need not be taken greater than 1.4, calculated as the first story torsional demand divided by the first story torsional strength.

TORSIONAL ECCENTRICITY. The absolute value of the plan distance, in x and y components, between the second story center of strength and the first story center of strength.

TRIBUTARY FLOOR WEIGHT. The total seismically active weight tributary to a single floor level comprising dead load and applicable live load, snow weight, and other loads as required by the building code.

UPPER STORY. Any story above the first story.

WALL ASSEMBLY. A unique combination of sheathing materials over wood-stud framing.

WALL LINE. A collection of full-height and partial-height wall segments or frames within a single story that satisfies the rules in Bulletin Section 1.2.5.1.2.

CB1.2.2.1, continued. A wood-frame wall line is generally assumed to contribute strength only in the direction parallel to its length. A wall line expected to contribute strength in a direction other than parallel to its length, such as a cantilever column or fixed-based moment frame, must be modeled appropriately.

WALL SEGMENT. A portion of wood-frame wall made from a single wall assembly. For purposes of this definition, any sheathed run of wood-stud framing that could contribute to a story’s lateral strength or stiffness shall be considered a potential wall segment, whether or not the framing and sheathing were intentionally designed, detailed, sized, or located to contribute that strength or stiffness.

B1.2.2.2. Notation

- A_U The base-normalized upper-story strength, calculated separately for each direction.
- A_W The weak-story ratio, calculated separately for each direction.
- C_D The strength degradation ratio, calculated separately for each direction.
- C_T The torsion coefficient.
- C_U The minimum of the story-normalized story strengths of any of the upper stories, calculated separately for each direction.
CB1.2.2.2. *Where the story strength is roughly constant for all upper stories, C_U will generally be the story-normalized strength of the second story.*
- COS_i The plan location, in x and y coordinates, of the center of strength of story i .
- e_x, e_y The x and y components, respectively, of the torsional eccentricity.
- f_w The load-drift curve for wall line w .
- F_i The load-drift curve for story i , calculated separately for each direction.
- h_w The floor-to-ceiling height of wall line w .
- H_1 The floor-to-ceiling height of the tallest first story wall line, determined separately in each direction.
- I A subscript index indicating floor or story. Story i is between floor i and floor $i+1$.
- L_w The length of wall line w , taken as the longest possible length of wall that satisfies the rules in Bulletin Section 1.2.5.1.2, including the length of any openings within it.
- L_x The overall building dimension in the x direction.
- L_y The overall building dimension in the y direction.
- POE** Probability of Exceedance
- Q_{open} The adjustment factor for openings in a wall line.
- Q_{ot} The adjustment factor for overturning of a wall line.
- Q_s The story height factor for the first story, calculated separately for each principal direction.
- S_c The spectral capacity, calculated separately for each direction.
- S_d The spectral demand.
- t_i The load-rotation curve for story i .
- T_i The story torsional strength of story i .
- V_{1r} The story strength of the retrofitted first story, calculated separately for each direction.
- V_i The story strength of story i , calculated separately for each direction.
- V_U The story strength of the upper story that determines the value of C_U .
C1.2.2.2, continued. *Where the story strength is roughly constant for all upper stories, V_U will generally be the second story strength.*
- w A subscript index indicating a single wall line.
- W The total seismic weight of the building, equal to the sum of all the tributary floor weights.
- W_i The tributary floor weight of floor i .
- WSP** Wood structural panel
- x A subscript index indicating one of two principal directions.
- $\alpha_{POE,0}$ The **POE** adjustment factor for a C_D value of 0.0.
- $\alpha_{POE,1}$ The **POE** adjustment factor for a C_D value of 1.0.
- δ_j Drifts at which load-drift curves are characterized. See Table 1.2.5.1.1.
- Δ_i In each direction, the drift at which the story strength of story i occurs.
- τ_1 The first story torsional demand.

B1.2.3. Eligibility

B1.2.3.1. General. Buildings that do not comply with the requirements of Bulletin Section 1.2.3 are not eligible for the procedures in this chapter.

Exception: Buildings in which all aspects of non-compliance will be eliminated through alteration or retrofit are eligible for the procedures in this chapter.

B1.2.3.1.1. Massing

1. The building has no more than four stories above grade plane at any point around its perimeter.
2. The building's wood-framed stories are not supported by an above-grade podium structure.

CB1.2.3.1.1. *Item 1 relies on the building code's definition of story above grade plane. Item 2 is referring to a concrete podium structure generally extending at least one story above grade and topped by a concrete diaphragm that provides a base for wood framing above. Item 2 is not intended to rule out concrete foundation elements or stem walls that extend above grade.*

B1.2.3.1.2. Upper stories

1. The upper-story seismic force-resisting systems are bearing wall or building frame systems of wood-frame walls with shear panels.
2. The upper-story floor-to-floor heights are between 8 feet and 12 feet and are constant within each story.
3. In each upper story, in each principal direction, the distance from the center of strength to the center of mass of the floor below it is no more than 25 percent of the corresponding building dimension.

CB1.2.3.1.2 *The intent of this approximate rule is to ensure that no upper story is prone to significant torsion, and that inertial forces from upper stories should transfer to the first story near the geometric center of the second floor. See FEMA P-807 Section 2.6.2.*

4. No upper story or floor above an upper story has a weight irregularity as defined by ASCE/SEI 7-05 Table 12.3-2, Type 2.
5. No upper story has a vertical geometric irregularity as defined by ASCE/SEI 7-05 Table 12.3-2, Type 3.

B1.2.3.1.3. First story, basement and foundation

1. The first story height may vary, but the maximum first story height, from top of foundation to top of second floor framing is between 8 feet and 15 feet.
2. The first story seismic force-resisting systems are bearing wall or building frame systems of wood-frame walls with shear panels or combine such systems with steel moment-resisting frame systems, steel cantilever column systems, or steel buckling-restrained braced frame systems.

CB1.2.3.1.3. *FEMA P-807 is not suitable for evaluating or designing concentrically braced frames, concrete shear walls, or reinforced masonry shear walls. See FEMA p-807 Section 6.5. If these systems exist or are proposed for as retrofit elements, compliance must be demonstrated using one of the other methods allowed by SFBC Section 3406B.2.*

3. The first story includes no full-height concrete or masonry walls.
CB1.2.3.1.3, continued. *Buildings with full-height concrete or masonry walls at the full perimeter of the story of interest are expected to be exempt from SFBC Chapter 34B. Buildings with a combination of full-height concrete or masonry walls and other systems (wood-frame walls, steel moment frames, etc.) might be required to comply with SFBC Chapter 34B but will not be able to use FEMA P-807 to demonstrate compliance.*
4. The first story walls and frames have continuous concrete footings or concrete slab-on-grade foundations. If some or all of the first floor is raised over a crawl space, the crawl space has concrete stem walls to the underside of the first floor framing.
CB1.2.3.1.3, continued. *Concrete stem walls are considered to provide a base similar to a concrete foundation. Wood-framed cripple walls, whether braced or unbraced by sheathing of any type, are not adequate to meet this provision.*
5. First story walls and frames may be partial height over a concrete or reinforced masonry retaining wall or foundation stem wall, but any partial-height wall or frame is at least four feet tall from top of stem wall to underside of second floor framing.
6. If the building has a basement, the basement walls and the floor diaphragm just above them are capable of transferring seismic forces between the foundation and the first story, and the basement story is laterally stronger than the first story above it.

B1.2.3.1.4. Floor and roof diaphragms. Floor and roof diaphragms shall satisfy the eligibility requirements of this subsection.

Exception: Diaphragms shown to have no deficiencies or irregularities that would prevent development of the strength of any seismic force-resisting wall or frame or would otherwise control the overall seismic response of the structure need not satisfy the eligibility requirements in this subsection.

CB1.2.3.1.4. *The intent of these approximate rules for diaphragms is to ensure that the structure does not develop a premature mechanism or failure mode. See FEMA P-807 Section 2.6.4 for additional explanation and guidance.*

1. No portion of the second floor diaphragm between qualifying wall lines has an aspect ratio greater than 2:1.
2. The second floor diaphragm does not cantilever more than 25 feet from a qualifying wall line.
3. If the second floor diaphragm cantilevers more than 10 feet from a qualifying wall line, diaphragm chords are adequate to develop the lesser of the strength of the diaphragm or the diaphragm forces associated with the peak strength of the qualifying wall line.
4. No floor or roof diaphragm has a reentrant corner irregularity in which either projecting leg of the diaphragm beyond the reentrant corner is longer than 15 percent of the corresponding plan dimension of the building, unless each leg of the diaphragm satisfies the aspect ratio and cantilever rules of this subsection.
CB1.2.3.1.4, continued. *This provision differs from the irregularity defined in ASCE/SEI 31-03 or as Type 2 in ASCE/SEI 7-05 Table 12.3-1 in order to limit diaphragm demands. See FEMA P-807 Section 2.6.4.*
5. No floor or roof diaphragm has a vertical offset unless load path components are present and adequate to develop the diaphragm strength across the offset.

6. No floor or roof diaphragm has cutouts or openings within it such that, along any line across the diaphragm, the sum of the opening widths along that line is more than 25 percent of the overall diaphragm dimension along that line.

B1.2.4. Building Survey

B1.2.4.1. General. Structural components shall be investigated in accordance with Bulletin Section B1.2.4 as needed to confirm eligibility per Bulletin Section B1.2.3 and to support structure characterization per Bulletin Section B1.2.5, evaluation per Bulletin Section B1.2.6, and retrofit design per Bulletin Section B1.2.7.

B1.2.4.2. Wall framing and sheathing. The investigation shall determine the length and location in plan of all wall segments and wall lines in all stories as needed to calculate load-drift curves.

The investigation shall determine the size and location of openings in each wall line as needed to calculate adjustment factors for openings and adjustment factors for overturning.

The investigation shall determine all unique frames or wall assemblies in the first story and representative wall assemblies in the upper stories. Where sheathing includes wood structural panels or where sheathing load-drift data is a function of nailing, the investigation shall also determine the nail size and edge nail spacing. Panel edge nailing shall be investigated over at least five nail spaces and as needed to confirm a reliable spacing assumption.

***CB1.2.4.2.** Unless building-specific conditions indicate a need for more extensive investigation, the minimum recommended investigation should include one location of each distinct wall assembly in the first story and in any upper story, but not less than one perimeter and one interior wall line in the first story and in any upper story. If prior investigation reports based on destructive investigation are available, they may be relied on. If original drawings are available, they may be relied on to reduce the scope of investigation, but some investigation is still necessary to confirm the reliability of the drawings.*

B1.2.4.3. Floor and roof framing and diaphragm. The investigation shall determine the construction of floor and roof framing and diaphragm sheathing, including the direction of framing and the mechanism of gravity load transfer, as needed for calculation of adjustment factors for overturning. The second floor shall be investigated. Subject to approval of the Department, the roof and upper floors need not be investigated in detail where there is evidence that their relevant attributes are similar to those of the second floor.

B1.2.4.4. Load path components. The investigation shall determine the nature of the load path components and connections for transfer of forces between diaphragms and walls or frames as needed to confirm that the wall line will participate in resisting drift.

***CB1.2.4.4.** For non-WSP sheathing, the intent is to confirm that fastening reasonably conforms to conventional construction requirements. For existing WSP shear walls with nail spacing closer than six inches, it should be confirmed at representative locations that shear wall top and bottom connection capacity is appropriate to the sheathing capacity.*

The investigation shall determine the presence or absence of hold-down hardware at the base of all first story walls, as well as the adequacy of installation of representative types at representative locations.

The investigation shall confirm that anchors are provided at the base of the first story walls.

Table B1.2.4.4 shows where the load path may be assumed adequate or is subject to investigation or confirmation. Table B1.2.4.4 applies only to walls whose strength is counted in the analysis. For any condition subject to investigation, the load path may be assumed lacking, and the corresponding wall strength may be ignored, but only if assumed so consistently throughout the building.

CB1.2.4.4. *The load path may be assumed lacking, but not selectively so as to “correct” torsion or other irregularities. This provision is similar to ASCE 31 and ASCE 41 limits on the designation of secondary components.*

Exception: Wherever the strength of two stories is being compared, an adequate load path must be assumed for all walls and partitions in the upper story.

CB1.2.4.4, continued. *The exception prevents underestimating the upper story strength. The exception will apply for calculations of weak story or soft story ratio in ASCE 31/41, IEBC A4, and other code-based procedures; application of the 1.3 cap on retrofit strength for ASCE 41 and IEBC A4 retrofits; and calculation of spectral capacity with FEMA P-807.*

The adequacy of an investigated load path may be confirmed by the judgment of the design professional, without calculations, but is subject to approval by the Department. Judgment should be based on the presence of a positive connection with multiple or redundant attachments distributed over the length of the wall line. For partitions perpendicular to floor framing above, blocking between floor joists nailed to the partition top plate (through a lath nailer, if present) should be deemed adequate for partitions with non-WSP sheathing.

Table B1.2.4.4. Investigation Requirements for Load Path between Partitions and Floor Framing Above

Condition	First / Target Story	Second / Upper Stories
Perimeter walls with non-WSP sheathing	May be assumed adequate	May be assumed adequate
Demising walls/partitions between units or between units and common areas	May be assumed adequate	May be assumed adequate
Any wall or partition with WSP sheathing where the top of the panel is nailed directly to a header beam, floor girder, or rim joist	May be assumed adequate	May be assumed adequate
Any wall or partition with WSP sheathing where the top of the panel is nailed only to a single or double top plate.	Confirm or provide load path	Confirm or provide load path
Room partitions within units, perpendicular to floor framing above	Investigate	May be assumed adequate
Room partitions within units, parallel to floor framing above	Investigate	Investigate

B1.2.4.5. Foundation elements. The investigation shall determine the nature of the existing foundation elements and supporting soils as needed for calculation of adjustment factors for overturning.

B1.2.5. Structure Characterization

B1.2.5.1. Story strength

B1.2.5.1.1. Wall assemblies. For each wall assembly present, a load-drift curve shall be computed by summing contributions from Table B1.2.5.1.1 at each drift level for each layer of sheathing. With approval of the Department, test results specific to the wall assembly or its components may be used in place of Table B1.2.5.1.1.

CB1.2.5.1.1 See FEMA P-807 Section 4.4 and Appendix F regarding the development of Table B1.2.5.1.1 and the use of alternate test data.

The values in Table B1.2.5.1.1 are subject to the following additional requirements:

1. Horizontal wood sheathing or wood siding shall be at least 1/2" thick and fastened to existing studs with at least two nails per board per stud. Otherwise, the expected strength shall be taken as 0.
2. Where siding panel edges are lapped, each panel shall be nailed separately. Otherwise, the expected strength shall be taken as 0.

Table B1.2.5.1.1. Expected Strength for Load-Drift Curves [plf]

Sheathing Material	Drift, δ_j [%]								
	0.5	0.7	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Stucco	333	320	262	0	--	--	--	--	--
Horizontal wood sheathing or wood siding	85	96	110	132	145	157	171	0	--
Diagonal wood sheathing	429	540	686	913	0	--	--	--	--
Plaster on wood lath	440	538	414	391	0	--	--	--	--
Plywood panel siding (T1-11), 6d@6	354	420	496	549	565	505	449	0	--
Gypsum wallboard	202	213	204	185	172	151	145	107	0
Plaster on gypsum lath	402	347	304	0	--	--	--	--	--
WSP, 8d@6	521	621	732	812	836	745	686	0	--

AB-107

WSP, 8d@4	513	684	826	943	1,018	1,080	1,112	798	0
WSP, 8d@3	1,072	1,195	1,318	1,482	1,612	1,664	1,686	1,638	0
WSP, 8d@2	1,393	1,553	1,713	1,926	2,096	2,163	2,192	2,130	0
WSP, 10d@6	548	767	946	1,023	1,038	1,055	1,065	843	0
WSP, 10d@4	707	990	1,275	1,420	1,466	1,496	1,496	1,185	0
WSP, 10d@3	940	1,316	1,696	1,889	1,949	1,990	1,990	1,576	0
WSP, 10d@2	1,120	1,568	1,999	2,248	2,405	2,512	2,512	2,231	0

B1.2.5.1.1.1. Wall assemblies without wood structural panel sheathing. The assembly load drift curve is the sum of the load drift curves for each of the sheathing layers.

B1.2.5.1.1.2. Wall assemblies with wood structural panel sheathing. The assembly load drift curve is whichever of the following two load-drift curves has the larger peak strength:

1. The assembly load-drift curve using 50 percent of the strength of the wood structural panel layers and 100 percent of the strength of the other sheathing materials.
2. The assembly load-drift curve using 100 percent of the strength of the wood structural panel layers and 50 percent of the strength of the other sheathing materials.

B1.2.5.1.2. Wall line assignment. Each segment of sheathed wall framing within a story shall be assigned to a wall line. Wall lines shall satisfy the following rules:

1. Full-height wall segments separated by window or door openings but connected by sheathed segments and continuous framing above or below the opening shall be assigned to the same wall line, unless other rules require them to be treated separately.
2. Wall segments assigned to the same wall line shall not be offset out-of-plane from adjacent segments by more than four feet.
3. At bay windows, the wall segments within the common plane shall be assigned to the same wall line if they satisfy the other rules, but the wall segments within the cantilevered portions of the bay shall not be counted toward the wall-line strength.
4. Wall segments of different heights, including wall segments along a stepped foundation, shall be assigned to separate wall lines.
5. A wall segment of varying height due to a sloped foundation shall be assigned to a separate wall line, and its height shall be taken as the average height of the segment.
6. Wall segments of different wall assemblies shall be assigned to separate wall lines.
7. Where hold-downs exist at each end of a wall segment, that segment may be considered a separate wall line.
8. Wall segments less than one foot long shall be treated as openings.
9. Wall segments between openings with height-to-length ratios greater than 8:1 shall be treated as openings.
10. Steel elements (moment frames, cantilever columns, etc.) shall be assigned to separate wall lines.

11. Wall segments or frames considered to have significant damage, deterioration, or construction defects may be counted toward a wall line's strength but shall have their load-drift strength values reduced.

B1.2.5.1.3. Wall line load-drift curve. For each wall line, a load-drift curve shall be computed by multiplying the applicable wall assembly load-drift curve by the wall line's length and by applicable adjustment factors per Bulletin Equation B1.2.5.1.3-1.

$$f_w = (v_w)(L_w)(Q_{open})(Q_{ot}) \quad \text{(Equation B1.2.5.1.3-1)}$$

where:

f_w is the load-drift curve of wall line w , expressed as a function of drift.

v_w is the load-drift curve of the wall assembly associated with wall line w , as derived per Bulletin Section 1.2.5.1.1 and adjusted for height variation per Bulletin Section 1.2.5.1.3.1.

B1.2.5.1.3.1. Adjustment for height variation. Where first story wall lines in a given direction are of different heights, the load-drift curve of the wall assembly of each wood-frame wall line shall be adjusted to account for increased drift demands in all but the tallest first story wall line. This may be done by shifting the assembly load-drift curve from the standard set of drifts given in Table B1.2.5.1.1 to an adjusted set of drifts for each wall line, given by Equation B1.2.5.1.3.1-1.

$$\delta_{jh} = (\delta_j)(h_w/H_1)^{0.7} \quad \text{(Equation B1.2.5.1.3.1-1)}$$

B1.2.5.1.3.2 Adjustment for openings. Each wall line load-drift curve shall account for the effects of openings within it. This may be done by applying the adjustment factor for openings, given by Equation B1.2.5.1.3.2-1 and Equation B1.2.5.1.3.2-2.

$$Q_{open} = 0.92a - 0.72a^2 + 0.80a^3 \quad \text{(Equation B1.2.5.1.3.2-1)}$$

$$a = \frac{1}{\left(1 + \frac{\sum A_o}{h_w \sum L_f}\right)} \quad \text{(Equation B1.2.5.1.3.2-2)}$$

where:

$\sum A_o$ = sum of the areas of the openings within the wall line

$\sum L_f$ = sum of the lengths of the full-height wall segments within the wall line.

B1.2.5.1.3.3. Adjustment for overturning. Each wall line load-drift curve shall account for the effects of overturning demand and resistance. This may be done by applying the adjustment factor for overturning, given by Equation B1.2.5.1.3.3-1 or, for existing upper-story wall lines only, by Table B1.2.5.1.3.3.

$$Q_{ot} = 0.4 \left(1 + 1.5 \frac{M_r}{M_{ot}} \right) \leq 1.0 \quad \text{(Equation B1.2.5.1.3.3-1)}$$

where M_{ot} is the overturning demand on the wall line and M_r is the resisting moment due to all available dead loads tributary to the wall line plus the effects of any tie-down hardware.

CB1.2.5.1.3.3. See FEMA P-807 Section 4.5.3.2 for guidance on calculating Q_{ot} .

Table B1.2.5.1.3.3. Default Adjustment Factor for Overturning, Q_{ot} , for Existing Upper Story Wall Lines

Number of stories above	Perpendicular to Framing	Parallel to Framing	Unknown or mixed
Two or more	0.95	0.85	0.85
One	0.85	0.80	0.80
None (Top story)	0.75	0.75	0.75

B1.2.5.1.4. Story load-drift curves. For each story, in each direction, a load-drift curve shall be computed by adding the load-drift curves of all the walls in that story and aligned in that direction.

CB1.2.5.1.4. Where all the wall line load-drift curves are mapped to the same set of drifts, the summation is straightforward. Where some first story wall lines have load-drift curves mapped to a height-adjusted set of drifts, load values at the standard drift values should be determined by linear interpolation. Once interpolated values are calculated, the various load-drift curves can again be added in a straightforward way based on the standard drift values. See FEMA P-807 Section 4.6 for additional discussion.

B1.2.5.2. First story torsion

B1.2.5.2.1. Center of strength. The center of strength for the first and second stories shall be determined based on the wall line loads at the drift at which the story strength in the corresponding story and direction occurs.

CB1.2.5.2.1. FEMA P-807 Section 4.6.4 illustrates the calculation of the center of strength.

B1.2.5.2.2. First story torsional demand. The first story torsional demand represents the effect of the first story strength acting at the torsional eccentricity, given by Equation B1.2.5.2.2-1.

$$\tau_1 = e_x V_{1y} + e_y V_{1x} \quad \text{(Equation B1.2.5.2.2-1)}$$

B1.2.5.2.3. First story load-rotation curve. For the first story, a load-rotation curve shall be derived, relating torsion about the story center of strength to the resulting rotation of the story, assuming a rigid second floor diaphragm and accounting for the load-drift behavior of each first story wall line. The load-rotation curve shall consider rotation angles up to at least the rotation

AB-107

associated with 5 percent in-plane drift in at least one first story wall line.

CB1.2.5.2.3. *FEMA P-807 Section 4.6.6 illustrates one method for calculating of the load-rotation curve, dividing the rotation range of interest into ten even increments.*

B1.2.5.3. Characteristic coefficients

B1.2.5.3.1. Base-normalized upper-story strength. The base-normalized upper-story strength shall be calculated for each principal direction per Equation B1.2.5.3.1-1.

$$A_U = \frac{V_U}{W} \quad (\text{Equation B1.2.5.3.1-1})$$

B1.2.5.3.2. Weak-story ratio. The weak-story ratio shall be calculated for each principal direction per Equation B1.2.5.3.2-1.

$$A_W = \frac{V_1}{V_U} \quad (\text{Equation B1.2.5.3.2-1})$$

B1.2.5.3.3. Strength degradation ratio. The strength degradation ratio, C_D , shall be calculated for each principal direction based on the first story load-drift curves.

CB1.2.5.3.3. *FEMA P-807 Section 4.7.4 illustrates the calculation of the strength degradation ratio.*

B1.2.5.3.4. Torsion coefficient. The torsion coefficient, given by Equation B1.2.5.3.4- 1, need not be taken greater than 1.4.

$$C_T = \frac{\tau_1}{T_1} \quad (\text{Equation B1.2.5.3.4-1})$$

B1.2.5.3.5. Story height factor. The story height factor shall be calculated for each principal direction per Equation B1.2.5.3.5-1, where H_1 is given in inches.

$$Q_s = 0.55 + 0.0047 H_1 \quad (\text{Equation B1.2.5.3.5-1})$$

B1.2.6. Evaluation

B1.2.6.1. Evaluation relative to the performance objective. Subject to the additional requirements of Bulletin Section B1.2.1.3, any eligible structure shall be deemed to comply with the requirements of this Bulletin if its spectral capacity in each principal direction exceeds the spectral demand.

B1.2.6.1.1. Spectral capacity. Spectral capacity in each direction shall be calculated from Equations B1.2.6.1.1-1 through B1.2.6.1.1-5, using drift limit *POE* adjustment factors given in Table B1.2.6.1.1 for the drift limit *POE* specified in Bulletin Section B1.2.1.2. Drift limit *POE* adjustment factors for intermediate values of drift limit *POE* shall be calculated by linear interpolation.

CB1.2.6.1.1. *SFBC Chapter 34B does not require the calculation of a POE. However, given a spectral demand, the POE of a structure can be calculated. See FEMA P-807 Section 5.4.2 or Appendix B model provision 6.2.*

$$S_c = C_D^3 S_{c1} + (1 - C_D^3) S_{c0} \tag{Equation B1.2.6.1.1-1}$$

$$S_{c1} = \alpha_{POE,1} S_{\mu1} \tag{Equation B1.2.6.1.1-2}$$

$$S_{c0} = \alpha_{POE,0} S_{\mu0} \tag{Equation B1.2.6.1.1-3}$$

$$S_{\mu1} = (0.525 + 2.24A_W)(1 - 0.5C_T)Q_s A_U^{0.48} \tag{Equation B1.2.6.1.1-4}$$

$$S_{\mu0} = (0.122 + 1.59A_W)(1 - 0.5C_T)Q_s A_U^{0.60} \tag{Equation B1.2.6.1.1-5}$$

Table B1.2.6.1.1. Drift limit probability of exceedance adjustment factors.

POE	$\alpha_{POE,1}$	$\alpha_{POE,0}$
2%	0.36	0.29
5%	0.44	0.37
10%	0.53	0.46
20%	0.66	0.60
30%	0.77	0.73
50%	1.00	1.00
60%	1.14	1.16
70%	1.30	1.37

80%	1.52	1.66
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B1.2.6.2

Reserved.

B1.2.7. Retrofit

B1.2.7.1. Retrofitted first story strength. The first story strength of the retrofitted structure shall account for all existing unaltered elements, existing altered elements, new elements provided to increase story strength, and new elements provided in accordance with Section 1.2.1.3 to correct aspects of eligibility or building survey non-compliance.

Exception: Out-of-plane or weak axis strength of existing or retrofit elements need not be considered where the sum of those strengths is deemed insignificant to the total story strength.

C1.2.7.1. The Exception is intended to allow wood frame walls and pin-based frames to be ignored in their weak directions, and to allow the Department to accept the engineer’s judgment or to require modeling of fixed-based frames and cantilever columns in their weak directions.

B1.2.7.2. Retrofit compliance. The retrofit design shall demonstrate that both of the following conditions are true:

1. The retrofitted structure’s spectral capacity in each principal direction exceeds the spectral demand.
2. The first story strength of the retrofitted structure in each principal direction satisfies Equation 1.2.7.2-1.

$$V_{r} \leq 1.1V_{U}(0.11A_{U} + 1.22) \tag{Equation B1.2.7.2-1}$$

CB1.2.7.2. The intent of Equation B1.2.7.2-1 is to ensure that over-strengthening the first story is not miscounted as beneficial. Given the maximum POE, if the required first story strength cannot be achieved without exceeding this limit, it indicates that the proposed retrofit would push failure to the second story and would not achieve its intended effect. Where the exception to Bulletin Section B1.2.1.2.3 is applied, the higher POE value will give the same spectral capacity for less first story strength, effectively allowing a lighter retrofit that might satisfy the equation.

FEMA P-807 Section 6.2.1 provides formulas for estimating the strength of the retrofitted first story needed to reach the required spectral capacity, but use of the estimating formulas is not required.

B1.2.7.3 Additional requirements where the Exception to Bulletin Section B1.2.1.2.3 is applied. The retrofit design shall demonstrate that all of the following additional conditions is true:

1. The first story strength of the retrofitted structure in each principal direction satisfies Equation 1.2.7.3-1.

AB-107

2. *Reserved.*
3. The retrofit design satisfies the requirements of Bulletin Section B1.2.7.3.2.

$$V_{ir} \geq 0.9V_u(0.11A_u + 1.22) \quad (\text{Equation B1.2.7.3-1})$$

B1.2.7.3.1

Reserved.

B1.2.7.3.2 Minimized torsional eccentricity. Retrofit elements shall be located along perimeter wall lines so as to minimize the torsional eccentricity of the retrofitted structure, or so as to satisfy Equations B1.2.7.3.2-1 and B1.2.7.3.2-2. This requirement may be waived with the approval of the Department to accommodate other building or planning code requirements or to avoid disproportionate construction costs.

$$e_x \leq 0.10L_x \quad (\text{Equation B1.2.7.3.2-1})$$

$$e_y \leq 0.10L_y \quad (\text{Equation B1.2.7.3.2-2})$$

B1.2.7.4 Design criteria for retrofit elements. Retrofit elements shall conform to the following general requirements and to the applicable requirements in Bulletin Sections B1.2.7.4.1 through B1.2.7.4.8.

CB1.2.7.4. *See Bulletin Section B1.2.3.1.3 for discussion of retrofit systems for which FEMA P-807 is suitable.*

1. Where retrofit elements are sized based on unit strengths from codes or standards, the expected strength, without strength reductions or resistance factors, may be used.
CB1.2.7.4, continued. *The allowance of expected strength, which is typically greater than nominal strength (see Bulletin Section A3.2.2) is appropriate because FEMA P-807 requires retrofit elements to be ductile (or, in ASCE 31 or ASCE 41 terms, deformation-controlled).*
2. The load-drift curve of each retrofit element type shall be based on expected material properties, including overstrength. The full expected capacity, without strength reduction or resistance factors, shall be used to calculate load-drift curves and peak strengths.
3. Each retrofit element shall be such that a load-drift curve based on similar elements alone would have a strength degradation ratio, C_D , greater than or equal to 0.8.
4. The load-drift curve of each retrofit element type shall be defined up to five percent interstory drift or as needed to fully characterize the retrofit design per Bulletin Section 1.2.5.

5. Materials and systems for all retrofit elements shall be generally consistent with provisions of the building code for new construction of the same occupancy and risk category. 2012 IBC Section 3401.4.2 and other provisions that allow like materials for alterations do not apply to retrofits mandated by SFBC Chapter 34B. However, the Department may waive restrictions on certain systems based on building height, irregularity, seismic design category, or other conditions not related to the critical deficiencies of the story being evaluated or retrofitted.

CB1.2.7.4, continued. *FEMA P-807 presumes that retrofit elements will be reliably ductile (as indicated by the requirement for a minimum C_D value in item 3 above). Systems detailed as special should generally be deemed to comply with this requirement, but systems detailed as intermediate or ordinary may also be shown to be adequate. The final sentence of this provision allows intermediate and ordinary steel frames to be used in seismic design category D and E; see also ASCE 7-10 Sections 12.2.5.6 and 12.2.5.7.*

6. Design criteria for load path components and connections shall be appropriate to the performance objective and shall be based on the building code for new construction, appropriate provisions of other criteria allowed by SFBC Section 3406B.2, or principles of capacity design.

B1.2.7.4.1. Wood structural panel shear walls. Load-drift curves for wood structural panel retrofit elements shall be calculated in accordance with Bulletin Section B1.2.5. Existing shear walls modified by replacing sheathing materials or by adding supplemental wood structural panels shall be considered retrofit elements.

B1.2.7.4.2. Steel special moment-resisting frames. Steel retrofit elements that conform to the requirements of AISC 341-05 or AISC 341-10 for Special Moment Frames shall be deemed to comply with the provision requiring a C_D value greater than or equal to 0.8. The load-drift curve may be characterized per FEMA P-807 Figure 6-7 as follows: $V_y = ZF_{ye}$ with post-yield strengthening up to $1.2V_y$ at d_{max} , with $d_{max} = d_y + 4\%$.

B1.2.7.4.3. Steel intermediate moment-resisting frames. For steel retrofit elements that conform to the requirements of AISC 341-05 or AISC 341-10 for Intermediate Moment Frames, the load-drift curve may be characterized per FEMA P-807 Figure 6-7 as follows: $V_y = ZF_{ye}$ with no post-yield strengthening, and $d_{max} = d_y + 2\%$.

B1.2.7.4.4. Steel ordinary moment-resisting frames. For steel retrofit elements that conform to the requirements of AISC 341-05 or AISC 341-10 for Ordinary Moment Frames, the load-drift curve may be characterized per FEMA P-807 Figure 6-7 as follows: V_y per AISC 360 Chapter F, using F_{ye} instead of F_y , $d_{max} = 2\%$.

B1.2.7.4.5. Steel special cantilever columns. For steel retrofit elements that conform to the requirements of AISC 341-10 for Special Cantilevered Column systems, the load-drift curve may be characterized per FEMA P-807 Figure 6-7 as follows: $V_y = ZF_{ye}$ with no post-yield strengthening, and $d_{max} = d_y + 2\%$.

B1.2.7.4.6. Steel ordinary cantilever columns. FEMA P-807 shall not be used to demonstrate compliance of steel ordinary cantilever columns as retrofit elements.

B1.2.7.4.7. Steel buckling-restrained braced frames. Steel retrofit elements that conform to the requirements of AISC 341-05 or AISC 341-10 for buckling-restrained braced frames shall be deemed to comply with the provision requiring a C_D value greater than or equal to 0.8.

CB1.2.7.4.7. FEMA P-807 Section 6.5.5 offers further guidance on characterizing and designing these elements.

B1.2.7.4.8. Damping systems. FEMA P-807 may be used to demonstrate compliance of hysteretic damping systems that rely on the yielding of steel components by modeling the retrofit elements as bi-linear systems similar to other structural steel systems. The Department is authorized to require third party peer review at the expense of the permit applicant.

FEMA P-807 shall not be used to demonstrate compliance of other damping systems, including viscous- or friction-damped systems.

CB1.2.7.4.8. Viscous- and friction-damped systems cannot be designed with FEMA P-807 because the FEMA P-807 surrogate models did not include these mechanisms.

B1.2.7.5 Design criteria for load path elements and components. The retrofit design shall confirm or provide a load path from the second floor diaphragm through the first story seismic force-resisting elements and their foundations, to the supporting soils. The ultimate strength of load path components shall be reduced with strength reduction factors as needed to ensure that the load-path elements are able to develop the strength and the intended mechanism of first story wall and frame elements. Specific design criteria may be derived from principles of capacity design, from other criteria allowed by SFBC Section 3406B.2, or from building code provisions for new construction involving the overstrength factor, Ω_o .

B1.2.7.5.1. Foundations and overturning. New foundation elements shall be provided as needed to resist bearing, sliding, and overturning forces associated with the retrofit elements acting at their strength. Connections and load path components related to wall or frame overturning shall not assume any acting dead load except for the self-weight of the retrofit element unless the retrofit element incorporates existing gravity load-carrying framing or unless the design and construction explicitly transfer existing dead load to the retrofit element. The weight of foundation elements may be considered if adequately connected.

B1.2.7.5.2. Second floor diaphragm. The second floor diaphragm shall be strengthened as needed to ensure that expected forces can be transferred between the diaphragm and the first-story elements.

B1.2.7.5.3. Fixed-base frame columns. Moment-resisting frame systems and cantilever column systems whose capacity assumes other than a pin-based condition shall be provided with connection details demonstrated to develop the assumed fixity and the assumed column strength. In general, an anchor-bolted base plate without substantial embedment within a foundation element is not considered to provide a fixed-base condition.

B1.3. Design quality assurance

AB-107

B1.3.1. Structural calculations. Structural calculations and documentation of evaluations and retrofit designs using FEMA P-807 shall include, at minimum:

1. Plans and/or elevations for each floor level identifying each wall line and showing the wall assembly, length, location, and openings.
2. A schedule of wall assemblies and load drift curves for existing, altered, and new elements.
3. A list or schedule of wall lines with overturning and opening adjustments.
4. Derivation of characteristic coefficients.
5. Spectral capacity calculations.
6. Site-specific spectral demand calculations.

B1.3.2. Use of the FEMA P-807 Weak Story Tool

Reserved

B2. Application of ASCE 41-13 to evaluation and retrofit design

Further development of this section is expected as needed to address issues specific to Chapter 34B. The sections outlined below cover broad issues consistent with Chapter 34B. Otherwise, use of this standard is subject to existing Department procedures for implementation of SFBC 104A.2.8, Alternate materials, design, and methods of construction.

B2.1. Intent of 3406B.2 item 2

SFBC Section 3406B.2 item 2 allows the use of ASCE 41-13 as follows:

2. ASCE 41-13, Seismic Evaluation and Rehabilitation [sic] of Existing Buildings, with the performance objective of Structural Life Safety in the BSE-1E earthquake.

B2.2. Required scope of work

- No nonstructural evaluation or retrofit is required.
- For typical buildings (eligibility requirements to be defined) retrofit of the first story only shall be deemed to comply with the intent of Chapter 34B.
- Retrofit strength need not exceed 1.3 times the strength of the story above. Wherever the strength of two stories is being compared, an adequate load path must be assumed for all walls and partitions in the upper story.

CB2.2. *This requirement prevents underestimating the upper story strength. It will apply for calculations of weak story or soft story ratio in ASCE 31/41, IEBC A4, and other code-based procedures; application of the 1.3 cap on retrofit strength for ASCE 41 and IEBC A4 retrofits; and calculation of spectral capacity with FEMA P-807.*

B3. Application of ASCE 41-06 to evaluation and retrofit design

Further development of this section is expected as needed to address issues specific to Chapter 34B. The sections outlined below cover broad issues consistent with Chapter 34B. Otherwise, use of this standard is subject to existing Department procedures for implementation of SFBC 104A.2.8, Alternate materials, design, and methods of construction.

B3.1. Intent of 3406B.2 item 3

SFBC Section 3406B.2 item 3 allows the use of ASCE 41-06 as follows:

3. ASCE 41-06, Seismic Rehabilitation of Existing Buildings, with the performance objective of Structural Life Safety in the BSE-1 earthquake with earthquake loads multiplied by 75 percent.

B3.2. Required scope of work

- No nonstructural evaluation or retrofit is required.
- For typical buildings (eligibility requirements to be defined) retrofit of the first story only shall be deemed to comply with the intent of Chapter 34B.
- Retrofit strength need not exceed 1.3 times the strength of the story above. Wherever the strength of two stories is being compared, an adequate load path must be assumed for all walls and partitions in the upper story.
CB2.2. *This requirement prevents underestimating the upper story strength. It will apply for calculations of weak story or soft story ratio in ASCE 31/41, IEBC A4, and other code-based procedures; application of the 1.3 cap on retrofit strength for ASCE 41 and IEBC A4 retrofits; and calculation of spectral capacity with FEMA P-807.*

B4. Application of ASCE 31-03 to evaluation

Further development of this section is expected as needed to address issues specific to Chapter 34B. The sections outlined below cover broad issues consistent with Chapter 34B. Otherwise, use of this standard is subject to existing Department procedures for implementation of SFBC 104A.2.8, Alternate materials, design, and methods of construction.

B4.1. Intent of 3406B.2 item 4

SFBC Section 3406B.2 item 4 allows the use of ASCE 31-03 as follows:

4. For evaluation only, ASCE 31-03, Seismic Evaluation of Existing Buildings, with the performance level of Life Safety.

B4.2. Required scope of work

- No nonstructural evaluation is required.
- Wherever the strength of two stories is being compared, an adequate load path must be assumed for all walls and partitions in the upper story.
CB2.2. *This requirement prevents underestimating the upper story strength. It will apply for calculations of weak story or soft story ratio in ASCE 31/41, IEBC A4, and other code-based procedures; application of the 1.3 cap on retrofit strength for ASCE 41 and IEBC A4 retrofits; and calculation of spectral capacity with FEMA P-807.*

B5. Application of 2012 IEBC Appendix Chapter A4 to retrofit design

B5.1. Intent of 3406B.2 item 5

SFBC Section 3406B.2 item 5 allows the use of Chapter A4 as follows:

5. For retrofit only, 2012 International Existing Building Code (IEBC) Appendix A-4 [sic].

B5.2. Modifications and interpretations of IEBC Appendix Chapter A4. Compliance with SFBC Chapter 34B using 2012 IEBC Appendix Chapter A4 shall require compliance with that code chapter and its reference codes and standards except as otherwise modified, waived, or interpreted in Bulletin Section B5.2 and Bulletin Part A.

The following modifications and interpretations refer to Chapter A4 section numbers.

A401.1 Purpose

CA401.1. *This provision refers to “minimum standards.” In the context of Chapter A4, this means minimum standards for policy equivalence with other criteria when retrofit is triggered elsewhere in the IEBC. In the context of SFBC Chapter 34B, the provisions of Chapter A4 might or might not require the same scope of retrofit as other criteria allowed by SFBC Section 3406B.2. The other criteria are acceptable even if they require less retrofit scope or produce retrofit designs with lower capacity than Chapter A4.*

A401.2 Scope. Omit.

CA401.2. *When used for compliance with SFBC Chapter 34B, the scope and applicability of Chapter A4 is established by Ordinance 66-13. The absence of any condition listed by Section A401.2 has no bearing on compliance with Chapter 34B.*

A402 Definitions. Add, omit, or revise the following definitions as follows:

BUILDING CODE. The current San Francisco Building Code.

GROUND FLOOR. A target story, generally a basement story that extends above grade or the first story above grade plane. Alternately, depending on context, GROUND FLOOR might mean the floor level at the base of a target story.

TARGET STORY. Either of: A basement or underfloor space that extends above adjacent grade at any point; any story above grade plane with a wall layout or plan configuration substantially different from the wall layout or plan configuration of the story above.

CA402. *Target Story is used to define the critical story or stories of interest instead of Chapter A4’s reliance on soft, weak, and open front wall lines. In many cases, the key target story will be the first story above grade plane. In other cases, the key target story will be a basement story that extends above grade. Some buildings might have more than one target story.*

A403.1. Omit the exception and revise the first sentence as follows:

A403.1 General. All modifications required ... the ~~International Building Code~~ building code provisions for new construction, except as modified by this chapter and applicable Administrative Bulletins.

CA403.1. *The exception is not necessary because Section A404 is omitted. See below.*

A403.2. Omit the exception and revise the provision as follows:

A403.2 Scope of analysis. This chapter requires the alteration, repair, replacement or addition of structural elements and their connections to meet the strength and stiffness requirements herein. The lateral-load-path analysis shall include the resisting elements and connections from the wood diaphragm immediately above any ~~soft, weak or open-front wall lines~~ target story to the foundation soil interface ~~or to the uppermost story of a podium structure comprised of steel, masonry, or concrete structural systems that supports the upper, woodframed structure.~~ Stories above the uppermost target story ~~with a soft, weak, or open-front wall line~~ shall be considered in the analysis but need not be modified. The lateral-load-path analysis for added structural elements shall also include evaluation of the allowable soil-bearing and lateral pressures in accordance with the building code. Where any portion of a building within the scope of this chapter is constructed on or into a slope ~~steeper than one unit vertical in three units horizontal (33 percent slope),~~ the lateral force-resisting system at and below the ~~base level diaphragm~~ first story above grade plane shall be analyzed for the effects of concentrated lateral forces at the base caused by this hillside condition.

A403.3. Correct Δ_0 to Ω_0 in multiple places. Also, add the following sentences at the end of the section:

A403.3 Design base shear and design parameters. ... Despite any other requirement of Section A403.3 or A403.4, the total expected strength of retrofit elements added to any target story need not exceed 1.3 times the expected strength of the story immediately above, as long as the retrofit elements are located symmetrically about the center of mass of the story above or so as to minimize torsion in the target story.

***CA403.3.** The added sentence implements the SEAONC recommendation to cap the required strength, consistent with FEMA P-807.*

Add the following subsection:

A403.3.1 Story strength. Calculation of story strength and identification of irregularities in Section A403.3 shall be based on the expected strength of all wall lines, even if sheathed with nonconforming materials. Wherever the strength of two stories is being compared, an adequate load path must be assumed for all walls and partitions in the upper story. The strength of a wall line may be reduced to account for inadequate overturning resistance.

***CA403.3.1.** The expected strength of the story above may be calculated using the FEMA P-807 criteria given in Bulletin Section B1.2.5.1. The requirement to assume an adequate load path prevents underestimating the upper story strength. It will apply for calculations of weak story or soft story ratio in ASCE 31/41, IEBC A4, and other code-based procedures; application of the 1.3 cap on retrofit strength for ASCE 41 and IEBC A4 retrofits; and calculation of spectral capacity with FEMA P-807.*

A403.5. Revise the subsection heading and the provision as follows:

A403.5. Deformation Compatibility and P Δ effects. The requirements of the building code shall apply, except as modified herein. All structural framing elements and their connections not required by design to be part of the lateral force-resisting system shall be designed and/or detailed to be adequate to maintain support of ~~design dead plus live~~ expected gravity loads when subjected to the expected deformations caused by seismic forces. ~~The stress analysis of~~

AB-107

~~cantilever columns shall use a buckling factor of 2.1 for the direction normal to the axis of the beam. Increased demand due to P Δ effects and story sidesway stability shall be considered in retrofit stories that rely on the strength and stiffness of cantilever columns for lateral resistance.~~

CA403.5. This revision is consistent with a change approved for the 2015 IEBC.

A403.8. Revise the provision as follows:

A403.8 Horizontal diaphragms. The strength of an existing horizontal diaphragm sheathed with wood structural panels or diagonal sheathing need not be investigated unless the diaphragm is required to transfer lateral forces from vertical elements of the seismic force-resisting system above the diaphragm to elements below the diaphragm because of an offset in placement of the elements.

~~Wood diaphragms with stories above shall not be allowed to transmit lateral forces by rotation or cantilever except as allowed by the building code; however, r~~ Rotational effects shall be accounted for when ~~unsymmetric~~ asymmetric wall stiffness increases shear demands.

Exception: Diaphragms that cantilever 25 percent or less of the distance between lines of lateral load-resisting elements from which the diaphragm cantilevers may transmit their shears by cantilever, provided that rotational effects on shear walls parallel and perpendicular to the load are taken into account.

CA403.8. This revision is consistent with a change approved for the 2015 IEBC.

A403.9.1 Revise the provision as follows:

A403.9.1 Gypsum or cement plaster products. Gypsum or cement plaster products shall not be used to provide lateral resistance in a ~~soft or weak story or in a story with an open front wall line, target story. whether or not new elements are added to mitigate the soft, weak or open front condition.~~

A404. Omit Section A404 entirely.

CA404. Section A404 applies to two-story buildings only. Two-story buildings are exempt from SFBC Chapter 34B.

A405.1. Revise the provision as follows:

A405.1 New materials. New materials shall meet the requirements of the *International Building Code*, building code, except where allowed by this chapter or applicable Administrative Bulletins.

A407 Quality Control. Omit Section A407 entirely.

CA407. Bulletin Sections A4 and A5, as well as AB 106, apply instead.

Part 6. Guidelines for alternative rational design bases

Further development of this section is expected as needed to address issues specific to Chapter 34B. The sections outlined below cover broad issues consistent with Chapter 34B. Otherwise, use of this standard is subject to existing Department procedures for implementation of SFBC 104A.2.8, Alternate materials, design, and methods of construction.

6.1 Intent of 3406B.2 item 6

SFBC Section 3406B.2 item 6 allows the use of alternative criteria as follows:

6. [The building shall satisfy] any other rational design basis deemed acceptable by the Department that meets or exceeds the intent of this Chapter.

6.2

Reserved



Wood-Frame Seismic Retrofit Program

SCREENING FORM INSTRUCTIONS

About the Screening Form

The purpose of the Screening Form is to confirm which buildings are subject to San Francisco's new Wood-Frame Seismic Retrofit Program and which buildings are exempt. If your building is exempt, the form will help you secure your exemption.

If you received a Screening Form with a letter from the Department of Building Inspection, you are required to complete and submit the form even if you believe your building is exempt from the program.

There is no fee to submit your Screening Form. However, in most cases, the form must be completed by a licensed design professional, who is allowed to negotiate a fee with you.

Deadline for submittal of completed Screening Form

Completed Screening Forms must be submitted by September 15, 2014.

The Department will NOT send you a reminder as the deadline approaches. Because you might need to research your property records or hire a licensed design professional, you should not wait until the deadline is near to begin working on the form.

How to submit the completed Screening Form

You may submit your completed form as a PDF file by email attachment or as a hard copy by U.S. mail. The Department does not allow submittal by fax.

Be sure to:

- Have your design professional (if required; see Section 2) stamp and sign the form in Section 5. Sign and date the form in Section 5.
- Submit all three pages of the form, even if some sections are not required.
- Keep a copy for your records.

By email attachment:

- Email your form to: softstory@sfgov.org
- In the subject line, please write "Screening Form submittal."

By U.S. mail:

- Mail your form to: Wood-Frame Seismic Retrofit Program
Department of Building Inspection
1660 Mission Street
San Francisco, CA 94103

SECTION 1 – ADMINISTRATIVE INFORMATION

Provide your **contact information** so that the Department can reach you with questions about your submittal.

You may have someone act on your behalf as your **authorized agent**. The authorized agent must be an individual empowered to make decisions on behalf of the owner. The Department will contact this individual with questions and approvals.

Condominium owners: Condominium units within a single building are sometimes assigned separate lot numbers. In these cases, separate owners might each receive a notice and form from DBI. However, only one Screening Form for the entire building should be submitted.

Replacement or supplemental form. If this is the first time a Screening Form is being submitted for your building, answer no. If you have already submitted a Screening Form but are now submitting a new or revised form to correct an error or provide additional information, answer yes.

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1660 Mission Street – San Francisco CA 94103
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SECTION 2 – VOLUNTARY STRUCTURAL WORK EXEMPTION

1. **AB-094**, which set criteria for voluntary retrofits, went into effect on May 26, 2009. If you completed a retrofit in compliance with AB-094 prior to June 18, 2013, answer yes and provide your AB-094 Permit Application Number.

By answering yes, you are claiming exemption from the program, so you need not complete Section 3, 4, or Section 5.1 of the Screening Form. Please complete Section 5.2 and submit the Screening Form.

2. **Other Retrofits**: SFBC Section 3402B Exception 1 exempts retrofits completed within the last 15 years if they satisfied the requirements now found in SFBC Section 1604.11. However, because this exemption will likely require more careful review of various documents (plans, calculations, etc.), owners seeking this exemption must submit documentation together with the separate **Optional Evaluation Form**, available at www.sfcapss.org/softstory. Please fill out all sections of the Screening Form and submit.

SECTION 3 – SCOPE VERIFICATION

Section 3 requires application of the San Francisco Building and Housing Codes and therefore is to be completed by a California licensed architect or civil or structural engineer (unless you answered yes to the question in Section 2). Section 3 determines if your building is exempt from the program; if the building is exempt, you may skip Section 4.

Type V (wood-frame) construction.

For this retrofit program, the structural elements of interest are the seismic force-resisting walls or frames in certain targeted stories – what SFBC Chapter 34B calls “critically vulnerable” stories. This requires a more specific understanding of “Type V” construction than is usually meant by the building code. Therefore, the design professional should answer this Screening Form question by using the Type V Worksheet provided here.

The correct answer to the Screening Form question is Yes if two conditions are true: 1. The building has a so-called Target Story, and 2. The Target Story has wood-frame walls.

A Target Story is a story that Chapter 34B intends to identify and retrofit, one that represents a potentially critical seismic vulnerability. Generally, a basement story, an underfloor area, or any story whose walls are substantially different from those of the next story up will be a Target Story.

The concept of a Target Story is needed to screen out those buildings that are technically made of wood but do not have the “critically vulnerable lower stories” or the “most critical vulnerabilities” contemplated by SFBC Section 3401B. As Section 3401B notes, the intent of this retrofit program is to “limit the structural retrofit work to the ground story or to a basement or underfloor area.” Thus, the uniform upper stories of a typical building were never intended to be subject to SFBC Chapter 34B. Similarly, buildings with uniform wall layouts in all stories, from foundation to roof, should be exempted. To be clear, these buildings might have seismic deficiencies and might benefit from retrofit, but they do not have the “critical” vulnerabilities targeted by SFBC Chapter 34B. The identification of Target Stories allows these buildings to be properly exempted from the program during the initial screening phase.

In more technical terms, Target Story may be defined as follows:

TARGET STORY: For purposes of SFBC Chapter 34B, a Target Story is any of:

- 1) A basement story or underfloor area that extends above grade at any point.
- 2) Any story above grade plane whose wall configuration is substantially different from the wall configuration of the story above, except that a story is not a Target Story if it is the topmost story or if the difference in configuration is primarily due to the story above being a penthouse, an attic with a pitched roof, or a setback story.

Notes on the definition:

- An “underfloor area” can be a crawl space or cripple story, finished or not. A partially below-grade story is generally any story that is not a “story above grade plane” as defined in 2010 CBC Chapter 2.
- “Any story above grade plane” can be the first story or any upper story. The first story above grade plane generally means the first story entirely at or above grade, but for sloped sites, see the definition in 2010 CBC Chapter 2. Also see Figure 1.
- In general, “wall configuration” may be measured by length, location, orientation, and openings. Wall construction and strength is also important, so “substantially different from” generally means “substantially weaker than.” However, the Screening Form is

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1660 Mission Street – San Francisco CA 94103
Office (415) 558-6699 – www.sfdbi.org



not meant to require any structural evaluation, so the judgment of the design professional and the Department will be applied to determine whether a story is "substantially different" from the story above. In practice, if substantial lengths of exterior walls or interior partitions do not line up from story to story, or door and window openings change substantially from story to story, the lower story might be deemed "substantially different." Wall configuration can be related to occupancy as well: The wall layout or openings of a non-residential first story is usually (but not always) different from the wall layout or openings of the residential stories above.

The following Type V Worksheet will guide you to the appropriate answer to the "Type V" question on the Screening Form. As noted above, the correct answer to the Screening Form question is yes if the building has a Target Story *and* if the Target Story walls are wood-frame. Thus, the worksheet has two steps: one to identify Target Stories, and one to check for wood-frame walls.

The worksheet questions are intended to capture most of the conditions found in San Francisco. However, since they might not cover every possible combination of grade slopes and structural systems, the answers to these questions and to the Screening Form questions are subject to review by the Department.

Type V Worksheet

Step 1. Answer the following questions to identify the building's Target Story or Stories. (Note: It is possible for a building to have more than one Target Story.) See the text above and Figure 1 for additional guidance.

	<u>Yes</u>	<u>No</u>
Does the building have a basement, underfloor area, or other partially below-grade story that extends at any point above the adjacent grade?	<input type="checkbox"/>	<input type="checkbox"/>

If Yes, the basement, underfloor area, or partially below-grade story is a Target Story.

Are the wall layout and major wall openings of any story above grade plane (not counting a top story or penthouse) substantially different from the wall layout and major wall openings of the next story above?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

If Yes, the lower of the two stories being compared is a Target Story.

Exception: If the difference between two stories is primarily due to a setback of the upper story, or if the upper story is an attic with a pitched roof (whether occupied or not), then the lower story need not be considered a Target Story.

If you answered No to BOTH of the Step 1 questions:

- Enter **No** as the answer to the Screening Form question about Type V construction.
- Check the box for "The building has no Target Stories."
- Skip Step 2.

If you answered Yes to EITHER of the Step 1 questions:

- Proceed to Step 2.

Step 2. Considering all of the Target Stories identified in Step 1, answer the following question.

	<u>Yes</u>	<u>No</u>
Does the seismic force-resisting system in any Target Story include any wood-frame wall elements of any height, length, or sheathing type, whether or not they conform to requirements for new construction?	<input type="checkbox"/>	<input type="checkbox"/>

The intent is to target wood-frame walls and cripple walls. If there are no wood-frame walls, and the non-wood wall or frame elements extend to the underside of wood floor framing with a rim joist or solid blocking, the Target Story is not considered to have wood-frame wall elements.

If you answered No to the Step 2 question:

- Enter **No** as the answer to the Screening Form question about Type V construction.
- Check the box for "The building has one or more Target Stories, but they are not wood-frame."

If you answered Yes to the Step 2 question:

- Enter **Yes** as the answer to the Screening Form question about Type V construction.

– End of Type V Worksheet –

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1660 Mission Street – San Francisco CA 94103
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Constructed before January 1, 1978

If the building was constructed after January 1, 1978, but under a permit applied for before that date, the response should still be yes. This question is about the date of original permitting and construction only. The date of any building addition, alteration, or retrofit is not of concern here. The adequacy of a past retrofit, whether done before or after January 1, 1978, is assessed separately, either in Section 2 or through the separate Optional Evaluation Form.

Stories

For this question, the number of stories may generally be understood as the number of stories above grade plane, and basement may generally be understood as any story that is not a story above grade plane, consistent with definitions in the San Francisco Building Code (which are identical to those in the 2010 California Building Code). In addition, per SFBC Section 3403B, "the first story of any building shall be considered a story, whether or not previously exempted from story count under an earlier edition of the San Francisco Building Code."

For this question, the number of stories is counted independent of whether a story is a Target Story or is of wood-frame construction.

Other conditions may generally be handled as follows:

- Mezzanines (as defined in the 2010 California Building Code) generally do not count as stories.
- In a building with a flat roof, the unfinished space between ceiling framing and roof framing need not be counted as a story.
- In a building with a pitched roof, if the attic space is enclosed by any vertical bearing walls of any height, so that a story sidesway mechanism is possible, the attic is to be counted as a story. Otherwise, for an attic with a pitched roof and no potential story sidesway mechanism, the attic shall be counted as a story if it contains one or more residential units distinct from units on floors below. The intent of this rule is to account for the additional risk posed by units in occupied attics. (Note: This rule has no bearing on the count of dwelling units required by the next question. If the building has fewer than five dwelling units, it is exempt from the program whether or not any unit is contained in an occupied attic.)
- For hillside buildings, the response should be Yes if at any point in plan, a vertical line would pass through three stories or through two stories and a basement or underfloor area that extends above grade.

Dwelling units

For this question, "dwelling units" shall be based on the definition in SFBC Section 3403B:

A dwelling unit shall include any individual residential unit within either an R-1 or an R-2 occupancy building. It shall also include a guestroom, with or without kitchen, within either a tourist or residential hotel or motel but shall not include a "housekeeping room." A dwelling unit shall include an area that is occupied as a dwelling unit, whether such is approved or unapproved for residential use.

SECTION 4 – ASSIGNMENT OF COMPLIANCE TIER

Section 4 requires application of the San Francisco Building and Housing Codes and therefore is to be completed by a California licensed architect or civil engineer (unless you answered yes to the question in Section 2, or the building is determined to be exempt in Section 3).

Section 4 assigns each building in the program to a compliance tier. The compliance tier determines the schedule for retrofit design and construction, but it has no impact on exemption from the program or on the deadline for submitting the Screening Form.

For reference, the compliance tier definitions from SFBC Section 3404B.3 and the related compliance deadlines from SFBC Section 3405B.2 and Table 34B-A are reproduced here:

3404B.3. Compliance tiers.

Each building not exempt from this Chapter shall be assigned to one of the following Compliance Tiers:

1. **Tier I:** Buildings that contain a Group A, E, R-2.1, R-3.1 or R-4 occupancy on any story.
2. **Tier II:** Buildings containing 15 or more dwelling units, except for buildings assigned to Tier I or Tier IV.
3. **Tier III:** Buildings not falling within the definition of another tier.
4. **Tier IV:** Buildings that contain a Group B or M occupancy on the first story or in a basement or underfloor area that has any portion extending above grade, and buildings that are in mapped liquefaction zones, except for buildings assigned to Tier I.



3405B.2. Compliance deadlines.

Compliance Tier	Submission of Screening Form and Optional Evaluation Form	Submittal of Permit Application with Plans for Seismic Retrofit Work	Completion of Work And Issuance of CFC ²
I	September 15, 2014	September 15, 2015	September 15, 2017
II	September 15, 2014	September 15, 2016	September 15, 2018
III	September 15, 2014	September 15, 2017	September 15, 2019
IV	September 15, 2014	September 15, 2018	September 15, 2020

² All time limits and extensions of Chapter 1A of this Code are applicable, except that all work is to be completed by December 31, 2020, as recommended in California Health & Safety Code Section 19160(1).

Compliance Tier Worksheet

The following questions are related to each other like the steps in a flowchart. Therefore, answer the questions in sequence, following the instructions after each one. Guidance on key terms follows the worksheet.

- | | <u>Yes</u> | <u>No</u> |
|--|--------------------------|--------------------------|
| Does the building contain a Group A, E, R-2.1, R-3.1, or R-4 occupancy on any story?
If Yes, the building is assigned to Tier I. Skip the remaining questions and indicate Tier I on the Screening Form.
If No, continue to the next question. | <input type="checkbox"/> | <input type="checkbox"/> |
| Does the building contain a Group B or M occupancy on the first story or on a partial basement story?
If Yes, the building is assigned to Tier IV. Skip the remaining questions and indicate Tier IV on the Screening Form.
If No, continue to the next question. | <input type="checkbox"/> | <input type="checkbox"/> |
| Is the building located in a mapped liquefaction zone?
If Yes, the building is assigned to Tier IV. Skip the remaining question and indicate Tier IV on the Screening Form.
If No, continue to the next question. | <input type="checkbox"/> | <input type="checkbox"/> |
| Does the building contain 15 or more dwelling units?
If Yes, the building is assigned to Tier II. Indicate Tier II on the Screening Form.
If No, the building is assigned to Tier III. Indicate Tier III on the Screening Form. | <input type="checkbox"/> | <input type="checkbox"/> |

– End of Compliance Tier Worksheet –

Occupancy A, E, R-2.1, R3.1, or R-4: Occupancies are defined in San Francisco Building Code Chapter 3. The response should be Yes even if the listed occupancy is contained in only part of the building or story, is part of a mixed occupancy, or is part of a temporary occupancy. The listed occupancies represent higher risks in the event of an earthquake in a deficient building. The intent of Chapter 34B is to include in Tier I any building with any portion of these occupancies.

Occupancy B or M on first story or partial basement: Occupancies are defined in San Francisco Building Code Chapter 3. The response should be Yes even if the Group B or Group M occupancy is not the only occupancy in the story. (If the story also contains one of the occupancies listed in the previous question, however, this question will be moot.) The intent of Chapter 34B is to allow more time for retrofit design and construction in Group B and Group M occupancies by assigning them to Tier IV, as long as no other critical condition exists that would assign them to Tier I or II.



For this question, “first story” and “partial basement story” should be understood to mean “any wood-frame Target Story” as described above in the instructions for Section 2. The intent of Chapter 34B is to allow additional compliance time only where the Group B or Group M occupancy might require complex solutions.

Liquefaction zone: Mapped liquefaction zones are shown as Zones of Required Investigation on the map titled “Seismic Hazard Zones, City and County of San Francisco (California Department of Conservation, Division of Mines and Geology, 2000). The map of liquefaction areas and a searchable database may be viewed at the Department of Building Inspection or online at www.sfcapss.org/softstory.

Chapter 34B does not require mitigation of the liquefaction hazard, but it is the intent of the chapter to allow more time for retrofit compliance where owners might choose to address liquefaction potential voluntarily.

Dwelling units: See the instructions for **Dwelling units** in Section 3. The same rules apply here.

SECTION 5 –DESIGN PROFESSIONAL & OWNER AFFIDAVIT

Section 5.1 is required whenever Section 3 or Section 4 is required. If you answered yes to the question 1 in Section 2 and therefore skipped Sections 3 and 4, you need not complete Section 5.1. If you will be using the **Optional Evaluation Form** (based on Section 2, statement 2) please complete Section 5.1.

Section 5.2 must be completed in all cases.



Figure 1. Examples of story counts, Target Stories, and Type V construction

<p><u>4 stories w/ first floor parking</u></p> <p>Basement: None.</p> <p>First story above grade plane: Wall layout in parking area differs from story above → Target Story. Wood frame walls → Check Type V: Yes on Screening Form.</p> <p>1st story above grade plane →</p>	
<p><u>3 stories above grade plane, plus basement</u></p> <p>Basement: Extends above grade → Target Story.</p> <p>First story above grade plane: If wall layout substantially matches story above, not a Target Story.</p> <p>1st story above grade plane →</p> <p>Basement →</p>	
<p><u>3 stories, plus underfloor area</u></p> <p>Underfloor area (unfinished crawl space): Target Story. If walls include wood-frame, check Type V: Yes on Screening Form. If walls are concrete stem walls, check No.</p> <p>First story above grade plane: Wall layout matches story above, so not a Target Story.</p> <p>1st story above grade plane →</p> <p>Crawl space →</p>	



Figure 1, continued. Examples of story counts, Target Stories, and Type V construction

2 stories above grade plane, plus partial basement

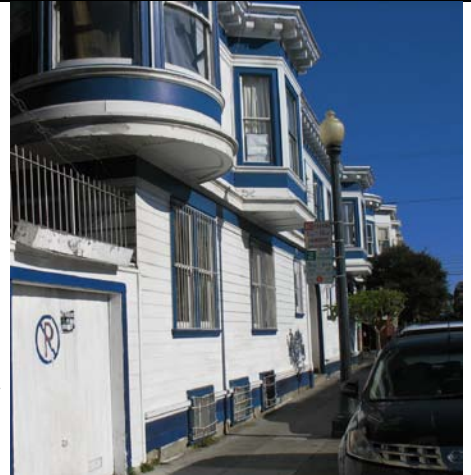
Basement or underfloor area (indicated by windows / vents at grade): Target Story, even though underfloor area exists under only part of building.

First story above grade plane: Not a Target Story if wall layout substantially matches story above.

2nd story above grade plane →

1st story above grade plane →

Partial basement or underfloor area →



Sloped site w/ 5 floor levels

Story 1: Partial below-grade story → Target Story.

Story 2: Story above grade plane, configuration / wall layout does not match story above (see right side of photo) → Target Story.

Story 3: Story above grade plane, configuration / wall layout matches story above, so not a Target Story.

Story 4: Story above grade plane, configuration / wall layout differs from story above (see right side of photo), but not a Target Story because change in layout is due to setback.

4 →
 3 →
 2 →
 1 →



4 stories, including concrete podium

Basement: None.

First story above grade plane: Wall layout (parking level) differs from story above → Target Story. But Target Story is concrete podium structure, with no wood frame walls → Check Type V: No on Screening Form.

Concrete podium structure (3 wood-frame stories above) →





Wood-Frame Seismic Retrofit Program

SCREENING FORM – NO FEE

City records indicate that a building located on the block and lot shown below is subject to San Francisco Building Code Chapter 34B: Mandatory Earthquake Retrofit of Wood-Frame Buildings. The building owner or the owner's authorized agent shall complete and submit this Screening Form (Section 3404B.2). Sections 3 through 5.1 of this form, if needed, are to be completed by a California licensed architect or civil or structural engineer. Submittal of this Screening Form is required even if the building has completed voluntary seismic strengthening or if the building in its current condition is believed to satisfy the retrofit requirements of SFBC Section 3406B (see Section 2).

A separate document, **Screening Form Instructions**, provides explanation and instructions for this Screening Form.

Submit the completed Screening Form either:

- As a pdf attachment to softstory@sfgov.org, with "Screening Form submittal" in the subject line, or
- As a hardcopy by U.S. mail to Wood-Frame Seismic Retrofit Program, Department of Building Inspection, 1660 Mission Street, San Francisco, CA 94103

BLOCK / LOT NUMBER _____

OWNER NAME _____

OWNER ADDRESS _____

SECTION 1 – ADMINISTRATIVE INFORMATION

Owner telephone _____ Owner email _____

Owner mailing address (if different from above) _____

Authorized agent (optional) _____ Agent telephone _____ Agent email _____

Agent mailing address _____

CONDOMINIUM OWNERS: Please submit one Screening Form and one set of contact information for each building. Please list all lot numbers comprising the building here:

Does this Screening Form replace or supplement a previously submitted Screening Form for the same building? Yes No

Department of Building Inspection
1660 Mission Street – San Francisco CA 94103
Office (415) 558-6699 – www.sfdbi.org



BLOCK / LOT NUMBER _____

SECTION 2 – VOLUNTARY STRUCTURAL WORK EXEMPTION

If the answer to question one (1) is yes, Screening Form Sections 3, 4, and Section 5.1 need not be completed. Section 5.2 must be completed in all cases.

- | | <u>Yes</u> | <u>No</u> |
|--|--------------------------|--------------------------|
| 1. Has voluntary seismic strengthening been completed under Administrative Bulletin AB-094, Definition and Design Criteria for Voluntary Seismic Upgrade of Soft Story, Type-V (wood frame) Buildings? | <input type="checkbox"/> | <input type="checkbox"/> |

If yes, AB-094 Permit Application Number: _____

2. In addition to the exemption for AB-094 retrofits, this program (SFBC Section 3402B) also exempts certain retrofits completed within the last 15 years. To qualify for that exemption, complete and submit this Screening Form as well as the separate **Optional Evaluation Form**.

SECTION 3 – SCOPE VERIFICATION

- | | <u>Yes</u> | <u>No</u> |
|---|--------------------------|--------------------------|
| 1. Is the building of Type V (wood-frame) construction? <i>(This question applies only to Target Stories. Use the Type V Worksheet in the Screening Form Instructions to answer this question.)</i> | <input type="checkbox"/> | <input type="checkbox"/> |
| If No, indicate also which of these conditions is true: | | |
| <input type="checkbox"/> The building has no Target Stories. | | |
| <input type="checkbox"/> The building has one or more Target Stories but they are not wood-frame. | | |
| 2. Was the building originally constructed before January 1, 1978, or was a permit for construction applied for before January 1, 1978? | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Is the building three or more stories, or two stories over a basement or underfloor area that extends above grade? | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Does the building contain five or more dwelling units? | <input type="checkbox"/> | <input type="checkbox"/> |

CONCLUSION: Is the response to ALL FOUR of the preceding questions Yes?

If Yes: The building is subject to SFBC Chapter 34B. Complete and submit this Screening Form.

If No: The building is exempt from SFBC Chapter 34B. Complete and submit this Screening Form, but skip Section 4. The Department will confirm the exemption in writing.

Note: Even if the building is subject to SFBC Chapter 34B, it might not require retrofit. An owner may show that retrofit is not required by submitting a separate Optional Evaluation Form with supporting documents. The **Optional Evaluation Form** is available at www.sfcapss.org/softstory.

SECTION 4 – ASSIGNMENT OF COMPLIANCE TIER

Indicate the compliance tier. Use the Compliance Tier Worksheet in the Screening Form Instructions to find the compliance tier.

Tier I Tier II Tier III Tier IV

Department of Building Inspection
1660 Mission Street – San Francisco CA 94103
Office (415) 558-6699 – www.sfdbi.org



BLOCK / LOT NUMBER _____

SECTION 5 –DESIGN PROFESSIONAL & OWNER AFFIDAVIT

Please see instructions.

5.1 DESIGN PROFESSIONAL

Under penalty of perjury, I certify that the information provided in Sections 3 and 4 of this Screening Form is based on my personal review of the building and its records, or review by others acting under my direct supervision, and is correct to the best of my knowledge.

Date stamped and signed

Firm name

Design Professional telephone

Design Professional email

[Professional Stamp Here]

5.2 OWNER/ AGENT

Under penalty of perjury, I certify that the information provided in Sections 1 and 2 of this Screening Form is correct to the best of my knowledge.

- Owner
- Agent

Signature

Date

FOR DBI USE ONLY

Form appears incomplete / more information needed regarding:

SECTION 2: AB-094 Retrofit

SECTION 3: Scope Verification

Wood-Frame

Pre- 1978

Stories

Units

SECTION 4: Compliance Tier

SECTION 5: Professional and Owner / Agent
Statement s

Building is subject to the ordinance.

The form appears complete and is assumed correct based
on design professional and owner / agent statements.

DBI Reviewer: _____

Date: _____



BLOCK / LOT NUMBER _____

SECTION 2 – BASIS FOR COMPLIANCE WITH SFBC CHAPTER 34B
(SFBC Section 3402B Exception 1 and Section 3402B.2.2)

Yes No

Was the building seismically strengthened to meet or exceed the standards of SFBC Section 1604.11 or its predecessor provisions since June 17, 1998?

If yes, complete EITHER Section 3 if you are submitting documentation of the past retrofit OR Section 4 if you are submitting new evaluation documentation.

Notes:

1. Exemption for voluntary seismic retrofit completed under AB-094 (SFBC Section 3402B Exception 1) is covered in Screening Form Section 2. If an AB-094 retrofit has been completed, do not submit this Optional Evaluation Form.
2. For buildings retrofitted prior to June 17, 1998 (and therefore not eligible for exemption under SFBC Section 3402B Exception 1), answer the next question and complete Section 4 as appropriate.

Are you declaring that the building already meets the criteria of SFBC Section 3406B.2?

If yes, skip Section 3 and complete Section 4.

SECTION 3 – DOCUMENTATION OF PREVIOUS RETROFIT
(SFBC Section 3402B Exception 1)

Indicate which of the following items you are submitting to document that the previous retrofit satisfies all of the following:

- The retrofit meets or exceeds the standards of SFBC Section 1604.11 or its predecessor provisions.
- The retrofit was permitted after June 17, 1998.
- The retrofit was properly permitted, completed, and maintained.

Approved Permit Application	<input type="checkbox"/>	Original structural calculations / design criteria	<input type="checkbox"/>
Approved Structural Plans	<input type="checkbox"/>	Original construction documents	<input type="checkbox"/>
Certificate of Final Completion	<input type="checkbox"/>	Original soil or geotechnical report	<input type="checkbox"/>
		Original product literature	<input type="checkbox"/>

SECTION 4 –EVALUATION DOCUMENTS
(SFBC Section 3402B Exception 1)

If you completed Section 3, you may skip Section 4.

With reference to SFBC Section 3406B.2, which criteria are you using to demonstrate compliance of the existing building?

FEMA P-807
 ASCE 41-13
 ASCE 41-06
 ASCE 31-03
 Other

If Other, describe briefly: _____

Notes:

1. Your submittal will be reviewed using the criteria noted above and Administrative Bulletin 107. Design professionals are advised to review AB-107 requirements for each set of criteria before submitting evaluation documents.

BLOCK / LOT NUMBER _____



2. Structural calculations for retrofits performed before June 17, 1998 are not necessarily sufficient to comply with SFBC Chapter 34B. They may be submitted as reference, but evaluation with one of the listed criteria is still required.

Indicate which of the following items you are submitting as evidence that the building meets the criteria noted above:

- | | | | |
|---|--------------------------|--|--------------------------|
| Building condition assessment report(s) | <input type="checkbox"/> | Structural plans for previous retrofit (see Note 2 above) | <input type="checkbox"/> |
| Structural investigation report(s) | <input type="checkbox"/> | Structural calculations for previous retrofit (see Note 2 above) | <input type="checkbox"/> |
| Soil / geotechnical report | <input type="checkbox"/> | | |
| Structural calculations | <input type="checkbox"/> | | |
| Structural software verification | <input type="checkbox"/> | | |

SECTION 5 –DESIGN PROFESSIONAL & OWNER AFFIDAVIT

5.1. Design Professional:

_____ Date stamped and signed

_____ Firm name

_____ Design Professional telephone

_____ Design Professional email

[Professional Stamp Here]

5.2. Owner / Agent:

- Owner
 Agent

_____ Signature

_____ Date

FOR DBI USE ONLY

DBI has approved the evaluation showing that the existing building has been strengthened to meet or exceed the standards of SFBC Section 1604.11 or its predecessor provisions since June 17, 1998. DBI to send a letter confirming compliance with SFBC Chapter 34B.

DBI has approved the evaluation showing that the existing building meets the criteria of SFBC Section 3406B.2 without additional retrofit. DBI to send a letter confirming compliance with SFBC Chapter 34B.

DBI has reviewed the materials submitted but cannot approve the evaluation as submitted. DBI to send a letter giving the reason(s) for non-approval.

_____ DBI Reviewer

_____ Date reviewed

No. AB-

Date : August 11, 2013

Subject : Plan Check; Inspection

TITLE : Guidelines for the Structural Review of Special Moment Frame Beam Lateral Bracing used in Light Frame Wood Construction for Seismic Applications.

Purpose : The purpose of this Administrative Bulletin is to establish a guideline for the structural design, analysis, plan check review and approval of Special Moment Frame Beam Lateral Bracing in Light Frame Wood Construction for Seismic Applications.

References : AISC 360-10, Specification for Structural Steel Buildings
AISC 341-10, Seismic Provisions for Structural Steel Buildings
Paul McEntee, "Steel Moment Frames – History and Evolution", Structural Engineering Magazine-February 2009.

Discussion :

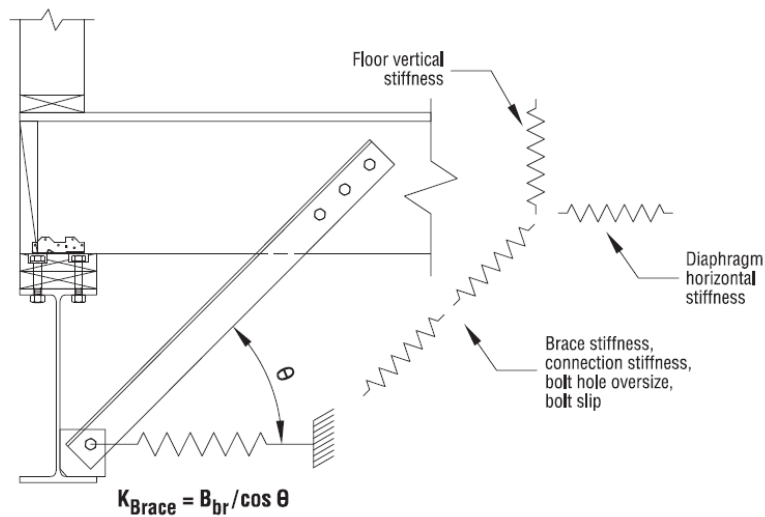
Beams in Typical Special Moment Frames have the tendency, without lateral bracing, to twist or buckle out-of plane. AISC 360-10 Appendix 6 provides beam bracing stiffness and strength requirements and AISC 341-10, Section D2 provides the lateral bracing requirements at the beam's plastic hinge. This administrative bulletin covers the nodal bracing of these requirements. The lateral bracing provides stability for the beam prior to the occurrence of the plastic hinge. Special Moment Frame, when incorporated into the structure's lateral force resisting system, is expected to experience an inelastic deformation. The absence of the lateral bracing will lead to a reduction in the frame capacity and performance, which is due to the occurrence of the beam buckling failure during or prior to the formation of the plastic hinge.

Plan check review and approval of the Special Moment Frame Beam Lateral Bracing for any project shall be on a case-by-case basis in accordance with this Administrative Bulletin.

The following requirements shall be the basis for plan check review and approval for beam lateral bracing of typical special moment frames used in seismic lateral force resisting systems of light frame wood construction:

1. Both flanges of beams shall be laterally braced between the points of supports with a maximum spacing of $L_b = 0.086r_y E / F_y$.
2. The inflection point shall not be considered a braced point unless bracing is provided at that location.
3. Braces shall meet the specifications of AISC360-10:
 - a. Strength between the points of support:
 - i. $P_{rb} = 0.02M_r C_d / h_o$ (A-6-7)
 - b. Stiffness between the points of support:
 - i. $B_{br} = 1 / \phi (10M_r C_d / L_b h_o)$ (A-6-8) LRFD

- II. $B_{br} = \Omega(10M_r C_d / L_b h_o)$ (A-6-8) ASD
4. Required Flexural Strength of beam:
- $M_r = R_y F_y Z$ (D1-1a) LRFD
 - $M_r = R_y F_y Z / 1.5$ (D1-1b) ASD
5. Bracing is required at concentrated forces, changes in cross section and where plastic hinges occur.
6. Special Bracing adjacent to the plastic hinges shall meet AISC 341-10 Seismic provisions requirements.
- Strength of lateral bracing
 - $P_u = 0.06 R_y F_y Z / h_o$ (D1-4a) LRFD
 - $P_a = (0.06 / 1.5) R_y F_y Z / h_o$ (D1-4b) ASD
 - Strength of torsional bracing
 - $M_u = 0.06 R_y F_y Z$ (D1-5a) LRFD
 - $M_a = (0.06 / 1.5) R_y F_y Z$ (D1-5b) ASD
7. Deflection due to the oversized bolt or screw holes, the floor vertical movement, and the diaphragm horizontal movement shall be accounted for to meet the brace stiffness requirement in the aforementioned section 3b.



For propriety special moment frames with the latest technologies, some of the pre-manufactured frames may not require AISC 360-10 beam bracing requirements, AISC 341-10 special beam bracing adjacent to plastic hinges or both. The propriety special moment frames shall be recognized by a current ICC-ES evaluation report in accordance with ICC-ES Acceptance Criteria for Steel Moment Frame Connection Systems (AC129). The beam bracing design shall be in compliance with the Lateral Bracing Requirements of a current ICC-ES evaluation report.