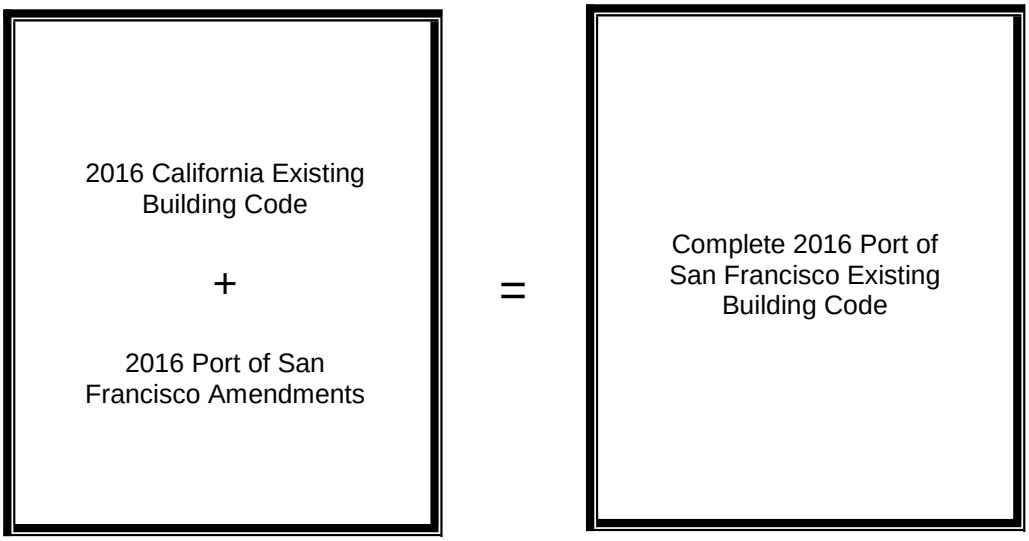
2016

PORT OF SAN FRANCISCO EXISTING BUILDING CODE

Based on the 2016
California Existing
Building Code

The complete 2016 Port of San Francisco Existing Building Code adopts and amends the 2016 edition of the California Existing Building Code

Effective Date: January 1, 2017



PUBLISHER'S NOTE

To simplify the use of the Port of San Francisco amendments with corresponding sections of the 2016 California Codes, explanatory remarks appearing in italics are provided at the beginning of each amendment indicating whether the Port of San Francisco Amendments to the 2016 California Codes are adding, revising, or replacing a section or portion of a section.

Should you find publication (e.g., typographical) errors or inconsistencies in this code or wish to offer comments toward improving its format, please address your comments to:

Port of San Francisco Engineering Division -
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Chapter 1
SCOPE AND ADMINISTRATION

No Port of San Francisco Amendments.

Chapter 2
DEFINITIONS

SECTION 202 – GENERAL DEFINITIONS

Add the following section:

DISPROPORTIONATE DAMAGE. A condition of earthquake-related damage where:

1. **The 0.3-second spectral acceleration at the building site as estimated by the United States Geological Survey for the earthquake in question is not more than 0.40 g; and**
2. **In any story, the vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of the structure in any horizontal direction has been reduced by more than 10 percent from its pre-damage condition.**

Chapter 3
PROVISIONS FOR ALL COMPLIANCE METHODS

SECTION 301 – ADMINISTRATION

301.1.4.2 Replace item 2 as follow:

301.1.4.2 Compliance with Port of San Francisco Building Code-level seismic forces.

1. ***All compliance methods shall be subject to review and appropriateness by the Port Real Estate Division and Building Permit Group, as to applicability to Port of San Francisco tenants.***

2. Except where these requirements are triggered by Section 403.12, structures or portions of structures that comply with the requirements of the applicable chapter in Appendix A as specified in Items 2.1 through 2.5 and subject to the limitations of the respective Appendix A chapters shall be deemed to comply with this section.

301.2 Add the following section:

301.2 Minimum Lateral Force for Existing Buildings.

301.2.1 General. This section is applicable to existing buildings when invoked by Port of San Francisco Existing Building Code (PSFEBC) Section 403. This section may be used as a standard for voluntary upgrades.

An existing building or structure which has been brought into compliance with the lateral force resistance requirements of the Port of San Francisco Building Code in effect on or after the dates shown in Table 301.2.1, shall be deemed to comply with this section except when a vertical extension or other alterations are to be made which would increase the mass or reduce the seismic resistance capacity of the building or structure. Where multiple building types apply, the later applicable date shall be used. Where none of the building types apply, compliance shall be at the discretion of the Chief Harbor Engineer. Building type definitions are given in ASCE 41-13, Table 3-1.

TABLE 301.2.1– DATES REQUIRED TO DEMONSTRATE BUILDING COMPLIANCE

Building Type	Date of Compliance	Model Code (for reference)
For structures not supported on marine piers and wharves (i.e., landside structures):		
Wood Frame, wood shear panels (Types W1 & W2)	1/1/1984	UBC 1976
Wood Frame, wood shear panels (Type W1A)	7/1/1999	UBC 1997
Floor areas greater than 3,000 ft2 per level		
Steel moment-resisting frame (Types S1 & S1a)	12/28/1995	UBC 1994
Steel concentrically braced frame (Types S2 & S2a)	7/1/1999	UBC 1997
Steel eccentrically braced frame (Types S2 & S2a)	1/1/1990	UBC 1988
Buckling-restrained braced frame (Types S2 &S2a)	1/1/2008	IBC 2006
Light metal frame (Type S3)	1/1/2008	IBC 2006
Steel frame w/ concrete shear walls (Type S4)	12/28/1995	UBC 1994

Steel plate shear wall (Type S6)	**1/1/2008**	**IBC 2006**
Reinforced concrete moment-resisting frame (Type C1)	**12/28/1995**	**UBC 1994**
Reinforced concrete shear walls (Types C2 & C2a)	**12/28/1995**	**UBC 1994**
Tilt-up concrete (Types PC1 & PC1a)	**7/1/1999**	**UBC 1997**
Precast concrete frame (Types PC2 & PC2a)	**1/1/2008**	**IBC 2006**
Reinforced masonry (Type RM1)	**7/1/1999**	**UBC 1997**
Flexible diaphragms		
Reinforced masonry (Type RM2)	**12/28/1995**	**UBC 1994**
Stiff diaphragms		
Seismic isolation or passive dissipation	**7/1/1992**	**UBC 1991**

For structures supported on marine piers and wharves (i.e. waterside structures):

All structures (including bulkhead)[1]	**5/21/1973**	**UBC 1973**

[1] **Existing building or structures, supported on marine piers and wharves, that have previously been brought into compliance include Piers 1, 1.5, 3 bulkhead, 5, 15, 29 (substructure), 27 (substructure; superstructure is new), 39, 48 (substructure only), and the Ferry Building (superstructure; by review, substructure was deemed to be in compliance).**

301.2.2 Wind forces. Buildings and structures shall be capable of resisting wind forces as prescribed in Port of San Francisco Building Code Section 1609.

301.2.3 Seismic forces. Buildings and structures shall comply with the reduced Port of San Francisco Building Code-level seismic forces, as defined in Section 301.1.4.2.

When upper floors are exempted from compliance by Section 403.12.2, the lateral forces generated by their masses shall be included in the analysis and design of the lateral force resisting systems for the strengthened floor. Such forces may be applied to the floor level immediately above the topmost strengthened floor and distributed in that floor in a manner consistent with the construction and layout of the exempted floor.

SECTION 314 –EXISTING HIGH-RISE BUILDINGS [SFM]

Not Used

SECTION 326 –EXISTING BUILDINGS OR OTHER STRUCTURES LOCATED ON A MILITARY BASE SELECTED FOR CLOSURE

Not Used

SECTION 327 –WORK PRACTICES FOR LEAD-BASED PAINT ON PRE-1979 BUILDINGS AND STEEL STRUCTURES

327 Add the following new section:

SECTION 327 — WORK PRACTICES FOR LEAD-BASED PAINT ON PRE-1979 BUILDINGS AND STEEL STRUCTURES

327.1 General. Any buildings, structures, and properties on which the original construction was completed on or before December 31, 1978, or any steel structures to which lead-based paint disturbance or removal, including surface preparation, additions, alterations, repairs, or demolitions are made, shall comply with the requirements of this section.

327.1.1 Purpose, intent and scope.

327.1.1.1 Purpose. The purpose of this section is to ensure that any person undertaking activities that result in the disturbance or removal of interior or exterior lead-based paint on pre-1979 buildings, structures and properties and on steel structures uses work practices that minimize or eliminate the risk of lead contamination of the environment.

327.1.1.2 Intent. The intent of this section is to encourage safe work practices for activities resulting in the disturbance or removal of lead-based paint while providing a reasonable level of health and safety for the occupants and the public at large.

327.1.1.3 Scope.

327.1.1.3.1 Interior. The requirements of this section apply to any activity resulting in the disturbance or removal of lead-based paint in the interior of pre-1979 buildings, structures and properties or portions thereof with one of the following occupancy classifications: Group E for Day Care and Group R, Divisions 1, 2 and 3. The requirements of this section with regard to the interior of a facility shall include, but are not limited to, residential-based family child-care facilities licensed by the State of California.

327.1.1.3.2 Exterior. The requirements of this section apply to any activity resulting in the disturbance or removal of lead-based paint on the exterior of any pre-1979 buildings, structures and properties and any steel structures.

327.2 Definitions. Except as otherwise specified herein, the terms used in this section shall have the same meanings as those set forth in Port of San Francisco Building Code Chapter 2.

ACCREDITED LABORATORY means a laboratory that operates within the EPA National Lead Laboratory Accreditation Program.

ADJACENT PROPERTIES means properties that adjoin the regulated area, including but not limited to properties next to and at the corners of lot lines.

CERTIFIED LEAD INSPECTOR/ASSESSOR means any person licensed or certified by the California Department of Health Services (DHS), as authorized by the United States Environmental Protection Agency (EPA), in accordance with 40 CFR Part 745, subparts L or Q, to perform risk assessment and/or lead-based paint inspection.

CLEARANCE INSPECTION means an on-site limited investigation using visual observation and sampling techniques performed by an independent certified lead inspector/assessor to verify the absence of lead-based paint hazards, as specified in Title 17, California Code of Regulations, Division 1, Chapter 8: Accreditation, Certification and Work Practices for Lead-Based Paint and Lead Hazards. Any analytical testing of sample(s) collected during such inspection shall be performed by an accredited laboratory.

COMMON AREA means any interior part of a multi-unit residential building that is accessible to all occupants, including but not limited to: corridor, hallways, lobbies, laundry rooms, storage areas, stairways, porches and interior play areas.

CONTAINMENT AND BARRIER SYSTEMS refers to various measures that prevent the migration of work debris beyond the regulated area, and usually includes the use of disposable polyethylene plastic sheeting that is at least 6 mils thick (or two layers each 3 mils thick) to protect the ground, floor or other interior surfaces, and to seal off windows, doors and ventilation openings.

CONTRACTOR means any person, whether or not in possession of a valid State contractor's license, who undertakes to or offers to undertake to or purports to have the capacity to undertake to or submits a bid to, or does, by himself or herself or by or through others, any action that may or will disturb or remove lead-based paint. For purpose of this section, "contractor" shall also include subcontractors.

DISTURB OR REMOVE LEAD-BASED PAINT means any action that creates friction, pressure, heat or a chemical reaction upon any lead-based paint on an interior or exterior surface so as to abrade, loosen, penetrate, cut through or eliminate paint from that surface. This term shall include all demolition and surface preparation activities that are performed upon any surface containing lead-based paint.

EXTERIOR means the outside of a building or steel structure and the areas around it within the boundaries of the property, including without limitations the outside of any

detached structures, including but not limited to outside and common walls, stairways, fences, light wells, breezeways, sheds, and garages.

HEPA means a high efficiency particulate air filter.

INTERIOR means the inside of a building, including but not limited to the inside of any detached structures, interior common walls, common areas, and overhangs (projections).

LEAD means metallic lead and all inorganic compounds of lead.

LEAD-BASED PAINT or LEAD PAINT means (1) any paint, varnish, shellac, or other coating on surfaces with lead in excess of 1.0 mg/cm^2 (milligram per square centimeter) as measured by x-ray fluorescence (XRF) detector or laboratory analysis or in excess of 0.5 percent by weight, also expressed as 5,000 ppm (parts per million), 5,000 mg/g (micrograms per gram), or 5,000 mg/kg (milligrams per kilogram) as measured by laboratory analysis; or (2) any paint, varnish, shellac, or other coating found in the interior or on the exterior of pre-1979 buildings, structures, or properties or on the exterior of any steel structures, unless such paint, varnish, shellac or other coating is shown, by a lead-based paint testing, that it does not have the characteristics specified in (1).

LEAD-BASED PAINT TESTING means testing of surfaces, by laboratory analysis of bulk sample or measurement using x-ray fluorescence detector, to determine the presence of lead-based paint performed by an independent certified lead inspector/assessor. Where laboratory analysis is used as a method of testing bulk paint samples, the laboratory shall be an accredited laboratory.

PERSON shall have the same meaning as that defined in Port of San Francisco Building Code Chapter 2 and shall also include any department, agency, or commission of the City and County of San Francisco, and State or federal agencies and departments to the extent allowable by law.

PRE-1979 BUILDING means any building whose original construction was completed on or before December 31, 1978.

PROHIBITED PRACTICES means any work practice that disturbs or removes lead-based paint using any of the following methods: (1) open flame burning or torching; (2) heat guns without containment and barrier systems, or operating above 1,100 degrees Fahrenheit (611.1 degrees Celsius) or causing the charring of paint; (3) hydroblasting or high-pressure washing without containment and barrier systems; (4) dry manual sanding or scraping, or machine sanding or grinding, or abrasive blasting or sandblasting without containment and barrier systems or a HEPA vacuum local exhaust tool.

REGULATED AREA means an area in the interior of any pre-1979 buildings, structures or properties with one of the following occupancy classifications: Group E for Day Care and Group R, Divisions 1, 2 and 3; or on the exterior of any pre-1979 buildings or any steel structures, in which work is being performed that disturbs or removes lead-based paint,

and to which access is restricted in order to prevent migration of work debris. "Regulated area" shall also include any area contaminated with work debris as a result of a breach or lack of containment and barrier system, which constitutes a violation of the requirement set forth in Section 327.4.2.

RESPONSIBLE PARTY means either (1) the tenant of the property where the tenant or the tenant's employees or persons otherwise under the control of the tenant are performing the activities regulated under this section; or (2) the tenant and the contractor where the tenant has entered into a contract with another to carry out the activities regulated under this section.

STEEL STRUCTURE means any structure that is not a building and which has exterior surfaces made of steel or other metal, such as bridges, billboards, walkways, water towers, steel tanks and roadway or railway overpasses.

WORK DEBRIS means any debris, including without limitations paint chips and dust, resulting from any activity that disturbs or removes lead-based paint.

327.3 General Prohibitions. No person shall disturb or remove lead-based paint through the use of prohibited practices, or in any other way that generates work debris during demolition or work on the interior of Occupancy Group E for Day Care and Group R, Divisions 1, 2 and 3 or exterior of any pre-1979 buildings or any steel structure except in accordance with the requirements of this section.

For purposes of this section, all paint on the exterior of any pre-1979 building or any steel structure shall be presumed to be lead-based paint. Any person seeking to rebut this presumption shall establish through lead-based paint testing, or other means satisfactory to the Chief Harbor Engineer, that the paint on the building or steel structure in question is not lead-based paint.

***Exemption*: Not used**

327.4 Performance Standards.

327.4.1 Restrict access. Any person performing work subject to this section shall restrict access by third parties to the regulated area, except as authorized by this section or until the regulated area is cleaned in accordance with Section 327.4.4. This subsection shall not apply to regulated areas that are required for access or egress during the course of the work, such as common areas, and where no alternative exists for access or egress, in which case dust generation and migration shall be controlled through the use of HEPA-attached tools or other feasible containment and barrier systems that allow for access or egress.

327.4.2 Containment and barrier systems. Any person performing work subject to this section shall establish containment and barrier systems that contains the work debris within the regulated area.

327.4.2.1 Protect ground. Any person performing exterior work subject to this section shall, to the maximum extent possible, protect the ground from contamination by work debris by laying 6 mil plastic (or two layers each 3 mil thick) on the ground extending at least 10 feet (3048 mm) from the work surface when possible.

327.4.2.2 Protect floor and furnishings. Any person performing interior work subject to this section shall protect with the use of 6 mil plastic (or two layers each 3 mil thick) any floors and other interior horizontal surfaces, carpets, rugs, drapes, curtains, blinds, shades and furniture in the regulated areas from work debris when it is impracticable to remove such items from the regulated areas during the course of the work.

327.4.3 Prevent migration. Any person performing work subject to this section shall make all reasonable efforts to prevent the migration of work debris beyond the established containment and barrier systems during the course of the work. Such efforts may include, but are not limited to, providing secure 6 mil plastic (or two layers each 3 mil thick) protective covering, bagging, shrouding, and/or other safe containment and barrier systems to prevent the migration of work debris; covering and sealing any windows, vent openings and doors in the regulated area to prevent migration; and instituting measures to prevent the tracking of dust from the regulated areas.

327.4.4 Clean up standards. At the completion of any work that disturbs or removes lead-based paint or when access to the regulated areas are required by State law or local ordinance during the course of such work, the responsible party shall:

327.4.4.1 For interior work, make all efforts to remove all visible work debris from the regulated areas. Such efforts shall include but are not limited to wet clean with detergent any exposed interior horizontal hard surfaces in the regulated areas and HEPA vacuum the regulated areas.

327.4.4.2 For exterior work, make all efforts to remove all visible work debris from the regulated areas.

327.5 Notification Requirements.

327.5.1 Notification to the Chief Harbor Engineer. Except as otherwise authorized by this section, prior to the commencement of exterior work subject to this section, the tenant or contractor shall provide written notice to the Chief Harbor Engineer, either in person, by U.S. mail or by fax, of the following:

327.5.1.1 The address and location of the project;

327.5.1.2 The scope of work, including the specific location of the work to be performed;

327.5.1.3 The methods and tools for paint disturbance and/or removal;

327.5.1.4 The approximate age of the building or steel structure;

327.5.1.5 The anticipated job start and completion dates for work subject to this section;

327.5.1.6 Whether the building is residential or nonresidential, and whether it is owner-occupied or rental property;

327.5.1.7 The dates by which the responsible party has or will fulfill any residential occupant or adjacent property notification requirements as described in Sections 327.5.4, 327.5.5 and 327.5.6 below; and

327.5.1.8 The name, address, telephone number and, if available, pager number of the party who will perform the specified work.

327.5.1.9 The Chief Harbor Engineer shall make available to the public a form containing blank spaces for the information required by Sections 327.5.1.1 to 327.5.1.8, inclusive.

327.5.1.10 In lieu of the submission of the form set forth in Section 327.5.1.9, the tenant or contractor may submit the Lead Work Pre-Job Notification form required by the California Division of Occupational Health and Safety pursuant to Section 1532.1 of Title 8 of the California Code of Regulations.

327.5.2 De minimis exemption. Any person performing exterior work that disturbs or removes less than 100 square feet or 100 linear feet of lead-based paint in total shall be exempted from the requirements of Section 327.5.1.

327.5.3 Sunset. Unless extended by the Port Commission, the requirements of Section 327.5.1 shall terminate three years from this effective date of this subparagraph.

327.5.4 Post sign. Not later than the commencement of work subject to this section, the tenant or, where the tenant has entered into a contract with a contractor to perform work subject to this section, the contractor shall post signs in a location or locations clearly visible at the access points to interior regulated areas, such as at the entrances of the affected residential unit(s) or common areas, and in the case of exterior work, shall post signs in a location or locations clearly visible to adjacent properties stating the following:

LEAD WORK IN PROGRESS
PUBLIC ACCESS TO REGULATED AREA
PROHIBITED
POSTED IN ACCORDANCE WITH
PORT OF SAN FRANCISCO EXISTING BUILDING CODE SECTION 327.5.4

327.5.5 Requirements for sign. The sign required by Section 327.5.4 shall be not less than 24 inches (609.6 mm) square and shall be in large boldface capital letters no less than ½ inch (12.7 mm) in size. The Chief Harbor Engineer shall make available to the public a sign that complies with these requirements and states the required information in English, Chinese and Spanish. The sign required by this section shall remain in place until the work subject to this section has been completed. Where it is not possible to post signs in a

conspicuous location or locations clearly visible at the access points to interior regulated areas, such as at the entrances of the affected residential unit(s) or common areas, and in the case of exterior work, in a location or locations clearly visible to the adjacent properties, the tenant or, where the tenant has entered into a contract with a contractor to perform work subject to this section, the contractor shall provide the notice in written form, such as a letter or memorandum, to the occupants of adjacent properties.

327.5.6 Not used

327.5.7 Not used

327.5.8 Not Used

327.6 Inspection and Sampling.

327.6.1 Authority to inspect. The Chief Harbor Engineer is authorized to inspect the interior or exterior of any building or steel structure upon which work subject to the requirements of this section is being performed for the purpose of determining whether the work is being carried out in accordance with the requirements of this section. This inspection authority shall be exercised in accordance with Port of San Francisco Building Code Section 104A.2.3.

327.6.2 Response to complaint. Upon receiving a complaint, the Chief Harbor Engineer shall (1) review the complaint; (2) determine whether a valid notification form has been filed with the Chief Harbor Engineer for the property in compliance with the requirements of Section 327.5.1; and (3) where deemed necessary by the Chief Harbor Engineer, conduct an inspection at the job site within two business days to determine the validity of the complaint.

327.6.3 Evaluation of complaint. When determining the validity of a complaint, if the Chief Harbor Engineer is not able to observe the actual performance of any work practices constituting violations of Sections 327.3, 327.4 and/or 327.5, the Chief Harbor Engineer shall investigate and consider the following:

327.6.3.1 The containment and barrier systems, work measures and work tools being used by the responsible party;

327.6.3.2 The color(s) of paint being disturbed or removed by the responsible party;

327.6.3.3 The color(s), quantities, nature and locations of work debris;

327.6.3.4 The color(s), locations and conditions of paint on buildings or steel structures adjacent to the regulated area, including without limitations adjacent properties, to determine if such paint could be a source of the work debris;

327.6.3.5 Any work being performed on adjacent properties which could be a source of the work debris; and

327.6.3.6 A record of clearance inspection of the regulated area performed after the completion of the work regulated under this section or records of any lead-based paint testing performed for the regulated area, if available; and

327.6.3.7 Any other relevant evidence that the Chief Harbor Engineer determines in the exercise of his or her discretion would help to determine whether a violation of this section has occurred.

327.6.4 Authority of Chief Harbor Engineer. The Chief Harbor Engineer or the Department of Public Health may also collect paint, dust and soil samples from the property where the work is being performed and from adjacent properties in order to determine the validity of a complaint. The Chief Harbor Engineer shall have the authority to order a clearance inspection of the regulated area if he or she determines that there has been a violation of the requirements of Section 327.3 or 327.4.

327.7 Enforcement. In addition to the enforcement authorities granted to the Chief Harbor Engineer by Port of San Francisco Building Code Chapter 1, whenever the Chief Harbor Engineer determines that a violation of the provisions of this section has occurred, the Chief Harbor Engineermay assess an administrative fee against the responsible parties pursuant to Section 327.8. The notice of fee shall be served on the party against whom the fee is being assessed. The notice of fee shall be final and shall be adopted by the Chief Harbor Engineer as a Chief Harbor Engineer's Order if the responsible party fails to appeal the notice of fee as provided for in Subsection 327.8.

327.8 Penalties.

Not used

327.9 Administrative Enforcement Procedures.

327.9.1 Action by the Chief Harbor Engineer. If the responsible parties failed to comply with the notice of violation, Stop Work Order and/or notice of fee issued pursuant to this code, the Chief Harbor Engineer may:

327.9.1.1 Refer the matter for a hearing in accordance to the provision of this subsection; or

327.9.1.2 Issue another notice of violation, Stop Work Order, and/or notice of fee, if appropriate; or

327.9.1.3 In the case where the responsible party is a contractor, file a complaint with the State Contractor Licensing Board.

327.9.2 Notice of hearing. Notice of any hearing conducted under this section shall be given in accordance with Port of San Francisco Building Code Chapter 1.

327.9.3 Hearing. Any hearing held pursuant to this section shall be conducted in accordance with Port of San Francisco Building Code Chapter 1.

327.9.4 Decision. Except as otherwise provided for in this subsection, any decision issued pursuant to this subsection shall be issued in accordance with Port of San Francisco Building Code Chapter 1A.

327.9.4.1 *not used*

327.9.5 Posting and service of order. The Chief Harbor Engineer's order shall be posted and served in accordance with Port of San Francisco Building Code Chapter 1A.

327.9.6 Appeal of order. Any person may appeal the nonmonetary portion of the Chief Harbor Engineer's order issued pursuant to Section 327.9.4, provided that such appeal is in writing and filed with the Chief Harbor Engineer pursuant to Port of San Francisco Building Code Chapter 1A. Upon the determination that all requirements to make an appeal have been met, the monetary portion of the Chief Harbor Engineer's order shall be stayed pending the appeal.

327.9.6.1 *not used*

327.9.7 Referral to the City Attorney's Office. *Not used*

327.10 Miscellaneous.*not used*

SECTION 328 –ASBESTOS INFORMATION AND NOTICE

328 Add the following section:

SECTION 328 — ASBESTOS INFORMATION AND NOTICE

328.1 Definitions. For the purpose of this chapter the following definitions shall apply:

ASBESTOS means naturally occurring fibrous hydrated mineral silicates, chrysotile, crocidolite, amosite, fibrous tremolite, fibrous anthophyllite and fibrous actinolite.

ASBESTOS-CONTAINING CONSTRUCTION MATERIAL means any manufactured construction material, including structural, mechanical and building material, which contains more than one percent asbestos by weight.

ASBESTOS-RELATED WORK means any activity which by disturbing asbestos-containing construction materials may release asbestos fibers into the air and which is not

related to its manufacture, the mining or excavation of asbestos-bearing ore or materials, or the installation or repair of automotive materials containing asbestos.

MISCELLANEOUS MATERIAL means interior building material on structural components, structural members or fixtures, such as floor and ceiling tiles, and does not include surfacing material or thermal system insulation.

NONRESIDENTIAL BUILDING means any building as defined in this code except:

1. **A building which is used exclusively as a single-dwelling unit or multiple-dwelling units and is not occupied as a mixed residential-commercial use;**

2. **A building owned or operated by the state or federal government and exempt from the building permit requirements under Port of San Francisco Building Code Section 106A.2;**

3. **A school building as defined in 15 U.S.C. 2642.**

SURFACING MATERIAL means material in a building that is sprayed-on, troweled-on or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members or other materials on surfaces for acoustical, fireproofing or other purposes.

THERMAL SYSTEM INSULATION means material in a building applied to pipes, fittings, boilers, breeching, tanks, ducts or other interior structural components to prevent heat loss or gain, or water condensation, or for other purposes.

TRANSFER OF TITLE means the conveyance of title to real property by one or more persons as a result of sale or exchange, and including the execution of a real property sales contract as defined in Section 2985 of the California Civil Code and any change in ownership described in subdivisions (c) and (h) of Section 61 and subdivision (c) of Section 64 of the California Revenue and Taxation Code, with the following exceptions:

1. **Transfers pursuant to court order, including, but not limited to, transfers ordered by a probate court in administration of an estate, transfers pursuant to a writ of execution, transfers by a trustee in bankruptcy, transfers by eminent domain or transfers resulting from a decree for specific performance;**

2. **Transfers to a mortgage by a mortgagor in default, transfers to a beneficiary of a deed of trust by a trustor in default, transfers by any foreclosure sale after default in an obligation secured by a mortgage, or transfer by a sale under a power of sale after a default in an obligation secured by a deed of trust or secured by any other instrument containing a power of sale;**

3. **Transfers by a fiduciary in the course of the administration of a guardianship, conservatorship or trust;**

4. **Transfers from one co-owner to one or more co-owners;**

5. **Transfers made to a spouse, or to a person or persons in the linear line of consanguinity of one or more of the transferors;**

6. **Transfers between spouses resulting from a decree of dissolution of a marriage or a decree of legal separation or from a property settlement agreement incidental to such decrees;**

7. **Transfers by the State Controller in the course of administering the Unclaimed Property Law, Chapter 7 (commencing with Section 1500) of Title 10 of Part 3 of the Code of Civil Procedure;**

8. **Transfers under the provisions of Chapter 7 (commencing with Section 3691) and Chapter 8 (commencing with Section 3771) of Part 6 of Division 1 of the Revenue and Taxation Code;**

9. **Transfers resulting by operation of law;**

10. **Transfers by which title to real property is reconveyed pursuant to a deed of trust.**

328.2 Asbestos Information Notice.

328.2.1 Nonresidential disclosure. The seller of any nonresidential building, except a nonresidential building for which a building permit to erect the structure was filed with the Port on or after January 1, 1979, shall disclose to the buyer, prior to transfer of title, what efforts, if any, the seller has made to determine if the building contains asbestos-containing construction materials and provide relevant documentation of these efforts.

328.2.2 Knowledge of seller. The seller of any nonresidential building, except a nonresidential building for which a building permit to erect the structure was filed with the Port on or after January 1, 1979, who knows that the nonresidential building contains asbestos-containing construction materials, shall provide notice to the buyer prior to transfer of title of the following:

1. **The existence of, conclusions from and a description or list of the contents of any survey conducted to determine the existence and location of asbestos-containing construction materials within the nonresidential building. The seller shall provide copies of any documentation of the final survey results, including any documentation of the inspector's, laboratory's or consultant's asbestos inspection qualifications and state certification.**

2. **Locations within the nonresidential building identified by the survey or known to the seller where asbestos-containing construction materials in the form of surfacing material, thermal system insulation or miscellaneous material are present.**

3. **Any final operation and management plans prepared for the seller by consultants, agents or employees of the seller identifying procedures or handling restrictions to minimize or prevent disturbance, release or exposure to the asbestos-containing construction material.**

4. **Results of any bulk sample analysis or air monitoring conducted for or by the seller or within the seller's control, including reference to sampling and laboratory procedures utilized, and copies of the laboratory reports, monitoring data and sampling procedures.**

5. **Information in a final survey or other document prepared for the seller by consultants, agents or employees of the seller that (a) assesses the condition of asbestos-containing construction material in the form of surfacing material, thermal system insulation or miscellaneous material; or (b) evaluates the potential for exposure to building occupants.**

328.3 Asbestos-Related Work Sign Posting and Affidavits. In addition to any other requirements for notice set forth in this code, any person filing an application for a building permit to perform work in an apartment house or a residential hotel [as defined in Section 41.4(p) of the San Francisco Administrative Code], which work includes asbestos-related work as defined in this code, shall comply with the following requirements:

328.3.1 Sign posting. Prior to commencement and for the duration of any asbestos-related work, post a sign readable at 20 feet (6.096 m) at each noncontiguous location where any asbestos-related work is performed in the apartment house or residential hotel, or in any appurtenant buildings thereto and facilities supplied in connection with the use or occupancy thereof, including garage and parking facilities, stating "Danger - Asbestos. Cancer and Lung Hazard. Keep Out." Notwithstanding this requirement, if an tenant or contractor of the tenant subject to the requirements of California Labor Code Sections 6501.5 et seq., and regulations promulgated pursuant there-to, is in compliance with the requirements for posting locations of asbestos-related work, such tenant or contractor shall be deemed to have complied with this requirement.

328.3.2 Time of posting. Unless the requirement for plans and specifications is waived by the Chief Harbor Engineer pursuant to Port of San Francisco Building Code Section 106A.3.2, provide a notice at least 72 hours prior to commencement of any asbestos-related work to the residential tenants in the building. The notice shall advise the residential tenants of the nature of the asbestos-related work to be performed, the date and time the work is scheduled to commence, the specific location or locations in the building where the work will occur, the name and address of the person or firm performing the work and the name and telephone number of a person to contact on site if the residential tenant has questions or concerns. The notice shall be provided in one of the following ways:

1. **At least 72 hours prior to commencement and for the duration of any asbestos-related work, post a notice containing the required information in a conspicuous common area of the apartment house or residential hotel measuring 15 inches by 15 inches (381 mm x 381 mm); or**

2. **Mail, by first-class registered mail, a notice containing the required information to each person who rents or leases residential space in the apartment house or residential hotel, postmarked at least five days plus 72 hours prior to commencement of any asbestos-related work; or**

3. **Personally deliver a notice containing the required information to each person who rents or leases residential space in the apartment house or residential hotel, at least 72 hours prior to commencement of the asbestos-related work.**

328.3.2.1 Affidavits. *Not used*

328.3.3 Apartment house and residential hotel exclusions. *Not used*

SECTION 329 –EARTHQUAKE EVALUATION OF PRIVATE SCHOOL STRUCTURES

Not Used

Chapter 4
PRESCRIPTIVE COMPLIANCE METHOD

SECTION 401 – GENERAL

401.1.2 Add the following section:

401.1.2 General. Buildings, structures and property to which additions, alterations or repairs are made shall comply with all the requirements of this code for new facilities, except as specifically provided in this section, in the San Francisco Housing Code and in other applicable ordinances and regulations. See Section 401.5 for provisions requiring installation of smoke detectors in existing Group R, Division 3 Occupancies.

401.5 Add the following section:

401.5 Additions, alterations or repairs to Group R Occupancies. When the valuation of an addition, alteration or repair to a Group R Occupancy exceeds $1,000 and a permit is required, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke alarms shall be installed in accordance with Port of San Francisco Building Code Section 907.

EXCEPTION: **Repairs to the exterior surfaces of a Group R Occupancy are exempt from the requirements of this section.**

401.6 Add the following section:

401.6 Homeless Shelters. Notwithstanding any other provision of this section, any addition, alteration, repair, installation, change or reconstruction of any building or structure, which is made in order to initiate, expand or continue a facility which, as approved by an authorized government agency, shelters otherwise homeless persons and which is operated by an organization exempt from federal income tax under Internal Revenue Code Sections 501(c)(3) or 501(d), shall meet only those requirements of this code which are determined by the Chief Harbor Engineer, pursuant to rules and regulations adopted by the Chief Harbor Engineer in accordance with Port of San Francisco Building Code Section 104A.1, after consultation with the Fire Department, to be necessary or appropriate to prevent a life hazard, or to prevent the building or structure from being or

becoming substandard. With respect to minimum lateral force requirements, said bulletin shall not waive any requirement which can be satisfied by work eligible to receive financial assistance from the State of California. Any provisions waived by said bulletin shall be applied when homeless shelter use ceases and may be applied when homeless shelter use is reduced.

SECTION 402 – ADDITIONS

402.6 Add the following section:

402.6 High-rise buildings. Any existing building or structure to which an addition is made which causes the building or structure to fall within the scope of Port of San Francisco Building Code Section 403 shall comply with the provisions of that section.

402.7 Add the following section:

402.7 Horizontal additions. Horizontal additions shall meet the following requirements:

When the cumulative area of horizontal additions, excluding basement additions, exceeds 30 percent of the area of the original building or structure, excluding basements, and the additions are structurally interconnected to, or not separated to comply with ASCE 7-10 Section 12.12.3, the entire structure shall comply with Section 301.2.

For the purpose of this section, the term "original building or structure" shall mean the building or structure as it existed on the day of its original construction. The combined building or structure may be used for more restrictive occupancy classifications as determined in Port of San Francisco Building Code Chapter 3 only when the structure as a whole meets the requirements in this code for such occupancy.

SECTION 403 – ALTERATIONS

403.12.1 Add the following section:

403.12.1 Non-structural alterations. Whenever alteration work in a building or structure involves substantial changes to elements such as walls, partitions or ceilings, on 2/3 or more of the number of stories excluding basements, the building or structure as a whole shall comply with Section 301.2. The term "substantial change" includes the addition, removal, repair or modification of such elements. All such work included in alteration permits issued within two years of the date of a permit application shall be included in the determination of whether the application is proposing substantial change to the building or structure.

403.12.2 Add the following section:

403.12.2 Structural alterations. When more than 30 percent, cumulative since May 21, 1973, of the floor and roof areas of the building or structure have been or are proposed to be involved in substantial structural alteration, the building or structure shall comply with Section 301. The areas to be counted towards the 30 percent shall be those areas tributary

to the vertical load carrying components (joists, beams, columns, walls and other structural components) that have been or will be removed, added or altered, as well as areas such as mezzanines, penthouses, roof structures and infilled courts and shafts.

EXCEPTIONS:

1. **When such alterations involve only the lowest story of a wood frame building or structure and Section 407 does not apply, only the lateral force resisting components in and below that story need comply with Section 301.2, or**

Not used

403.13 Add the following section:

403.13 Mandatory Seismic Retrofit. Submittal documents shall include plans indicating locations and construction of existing, new and modified building elements used to comply with Chapter 4B.

SECTION 404 – REPAIRS

404.1.1 Add the following new section:

404.1.1 Repairs. Unless otherwise approved by the Chief Harbor Engineer, all structural damage shall be repaired.

Repairs to buildings or structures which have sustained substantial structural damage to vertical elements of the lateral force resisting system shall comply with the minimum lateral force design requirements of Section 301.2 or with the code under which the building or structure was designed, whichever is more restrictive.

Damage may be caused by events or a combination of events, including, but not limited to, fire, explosion, structural pest or wood-destroying organism attack, earthquake, wind storm, vehicular impact, ground subsidence or failure, or the collapse or dislodgement of any portion of any adjacent building or structure. The removal or alteration of structural elements as part of the work described in an approved building permit application shall not be considered to be "damage."

404.2.1 Replace with the following section:

404.2.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the Chief Harbor Engineer within 60 days of completion of the evaluation. The evaluation shall establish whether the damaged building, if repaired to its predamage state, would comply with the provisions of this code for wind and earthquake loads. Evaluation for earthquake loads shall be required if the substantial structural damage was caused by or related to earthquake effects or if the

building is in Seismic Design Category C, D, E or F.

Wind loads for this evaluation shall be those prescribed in Port of San Francisco Building Code Section 1609. Earthquake loads for this evaluation, if required, shall be according to section 301.2.

404.4.1 Add the following section:

404.4.1 Disproportionate Damage. Buildings with Disproportionate Damage shall be subject to the requirements of Section 404.2 for earthquake evaluation and rehabilitation as if they had substantial structural damage to vertical elements of the lateral-force-resisting system.

Permit application for required rehabilitation work shall be submitted to the Port within 1 year after the earthquake..

404.4.2 Add the following section:

404.4.2. Other damage. For damage less than substantial structural damage that is not Disproportionate Damage, repairs shall be allowed that restore the building to its predamage state, based on material properties and design strengths applicable at the time of original construction. New structural members and connections used for this repair shall comply with the detailing provisions of this code for new buildings of similar structure, purpose and location.

SECTION 407 – CHANGE OF OCCUPANCY

407.4.1 Add the following section:

407.4.1 Change of occupancy. In addition to the other requirements of this code, the term "comply with the requirements of this code for such division or group of occupancy," as used in this section, shall also mean compliance with the lateral force provisions of Section 301.2 when the change results in an increase of more than 10 percent in the occupant load of the entire building or structure, and which also increases the occupant load by more than 100 persons as compared to the occupant load for which the building was originally designed. For purposes of performing occupant load calculations, see PBC Chapter 10. For specific pier shed elements, see PBC Section 1004.7.

EXCEPTIONS:

1. **When a change of occupancy or use involves only one story of a building or structure, only the lateral force resisting elements in that story and all lateral force resisting elements below need comply with Section 301.2.**

2. **A change from a Group R, Division 3 to a Group R, Division 1 or Division 2 Occupancy caused by the construction of a third dwelling unit in the lowest story of a building or structure shall comply with Section 301.2 as provided in Exception 1 above.**

SECTION 409 – MOVE STRUCTURES

409.2 Add the following section:

409.2 Removal of Debris. Immediately after the building is moved and before it is occupied at the new site, the permittee must remove all debris and all walls and footings above grade at the site from which it has been moved, except where such walls provide support to adjacent buildings, structures or property. All excavated areas must be filled in or protected by substantial fences not less than 5 feet (1524 mm) in height.

Chapter 4A
EARTHQUAKE HAZARD REDUCTION IN UNREINFORCED MASONRY BEARING WALL BUILDINGS

Add Chapter as follows:

Chapter 4A

EARTHQUAKE HAZARD REDUCTION IN UNREINFORCED MASONRY BEARING WALL BUILDINGS

(NOTE: The time limits for compliance with the provisions of Chapters 4A and 4B had passed, but the ordinance and the time limits therein are still in effect.)

SECTION 401A — PURPOSE

The purpose of this chapter is to promote public safety and welfare by reducing the risk of death or injury that may result from the effects of an earthquake on existing unreinforced masonry bearing wall buildings.

The provisions of this chapter are intended as minimum standards for structural seismic resistance for earthquake ground shaking and are established primarily to reduce the risk of life loss or injury. Compliance with these provisions will not necessarily prevent loss of life or injury, or prevent earthquake damage to rehabilitated structures, or protect against the release of hazardous materials, or protect the function of essential facilities.

These provisions are not intended to mitigate ground failure hazards such as liquefaction.

Time limits are given for tenants of unreinforced masonry bearing wall buildings to submit an inventory of each building and an evaluation of the degree of risk presented by the building. Priorities and time limits are established for work to be completed.

Requirements for seismic strengthening of unreinforced buildings are contained in Chapter 4B.

SECTION 402A — SCOPE

The provisions of this chapter shall apply to all existing buildings having one or more bearing walls of unreinforced masonry as defined in Chapter 4B.

EXCEPTIONS:

1. **Buildings housing Group R Occupancies containing less than five dwelling units or guest rooms and used solely for residential purposes.**
2. **Buildings accessory to and on the same lot as those described in Exception 1.**
3. **Buildings which have been brought into full compliance with the requirements of SFEBC Section 301.2 in effect on or after May 21, 1973.**

Compliance with the provisions of Chapters 4A and 4B does not supersede the requirement for compliance with SFEBC Section 301.2 when otherwise required under SFEBC.

A permit issued solely for compliance with any of the procedures of Chapters 4A and 4B of this code shall not be considered "substantial change" or "structural work" as defined in SFEBC and compliance with SFEBC Section 301.2 will not be required.

SECTION 403A — DEFINITIONS

For the purpose of Chapters 4A and 4B, certain terms are defined as follows:

BOLTS-PLUS is the installation of shear and tension anchors at the roof and floors and, when required, the bracing of the unreinforced masonry bearing walls upon evaluation of the height-to- thickness ratio of these walls.

POOR SOIL is all soil lying bayward of the line indicating the landward limit of Bay Mud deposits as shown on the U.S. Geological Survey Map MF-1376, title "Map Showing the 200-feet thickness contour of surficial deposits and the landward limit of Bay Mud deposits of San Francisco, California," by William B. Joyner, 1982.

EXCEPTION: **A building need not be considered as being located on poor soil when a subsurface exploration demonstrates that the soil is not underlain by Bay Mud.**

UNREINFORCED MASONRY BEARING WALL BUILDING is a building or structure having at least one unreinforced masonry bearing wall.

SECTION 404A — COMPLIANCE REQUIREMENTS

404A.1 General. The tenant of each unreinforced masonry bearing wall building within the scope of this chapter and Chapter 4B shall cause a structural analysis to be made of the building by a registered civil or structural engineer or licensed architect, and, if the building does not meet the minimum standards specified in this code except as provided for in Chapters 4A and 4B, the tenant shall cause the building to be structurally altered to conform to such standards or cause the building to be demolished pursuant to the program implementation schedule set forth.

404A.2 Program Implementation. The requirements stated in Section 404A.1 above shall be accomplished by submitting to the Chief Harbor Engineer the following:

404A.2.1 Inventory form. The tenant is required to submit to the Port, within the time limits set forth in Table 4A-A, a properly completed inventory form, signed and sealed by the tenant's civil or structural engineer or architect. See Port of San Francisco Building Code Section 110A, Table 1A-S for the applicable fee for the review of the inventory form. A failure to respond within the time limits set forth in Table 4A-A is a violation of this code.

404A.2.2 Risk assessment.

404A.2.2.1 General. When filling out the required information on the inventory form, the tenant's architect or civil or structural engineer shall assign to the building a relative level of risk depending upon the occupancy, soil conditions at the site and the density of the population exposed.

404A.2.2.2 Level of risk assigned.

1. **Level 1 buildings are buildings containing Groups A Occupancies with an occupant load of 300 or more; or Group E Occupancies, and those buildings greater than three stories in height which are located on poor soil.**
2. **Level 2 buildings are all non-Level 1 buildings which are located on poor soil in the Downtown, North of Market/Civic Center, South of Market, South of Market Residential and Chinatown Unreinforced Masonry Building Study Areas as delineated on Figure 4A-1.**
3. **Level 3 buildings are buildings in the above areas which are not located on poor soil and buildings located on poor soil outside the above areas.**
4. **Level 4 buildings are all other unreinforced masonry bearing wall buildings.**

404A.2.3 Engineering reports. The tenant shall engage a registered civil or structural engineer or licensed architect to prepare an engineering report on the building when:

1. **A tenant desires to demolish a qualified historical building or any building**

containing a nonexempt Group R Occupancy rather than retrofit the building, and a report is requested by the Chief Harbor Engineer or the representativeof the Planning Department; or

2. **The Bolts-plus level of strengthening is proposed; or**
3. **Strengthening to comply with the State Historical Building Code is proposed; or**
4. **The tenant believes the building complies with Chapters 4A and 4B without any further alteration.**

The engineering report shall detail applicable retrofit requirements of the least restrictive retrofit procedure for which the building qualifies. The required retrofit measures shall be developed schematically, and a conceptual construction cost estimate shall be included. If the Bolts-plus level of strengthening defined above and described in Exception 1 to Section 409B.2 is proposed, the necessary measures for compliance with the Special Procedure of Section 411B shall also be designated, and a second cost estimate for this option shall also be included in the report. If the engineering report demonstrates that no deficiencies exist, and the report is approved by the Port, the structure will be considered to conform to the requirements of this chapter. Except as noted in 1. above, the report shall be submitted not later than the date when the application for the building permit to either strengthen or demolish the building would otherwise be required. The format and content of the engineering report shall comply with the provisions of rules and regulations to be issued by the Chief Harbor Engineer pursuant to Port of San Francisco Building Code Section 104A.2.1 after consultation with the Seismic Safety Retrofit Bond Program Board. See Port of San Francisco Building Code Section 110A, Table 1A-S for the applicable fee for the review of the engineering report.

404A.2.4 Application for building permit. The tenant shall submit to the Port an application for a structural alteration permit accompanied by structural plans, specifications and calculations for the proposed mitigation solution or a permit application to demolish the building. Time limits for submission of the application and for permit processing and approval are established in Table 4A-A.

404A.2.5 Commencement and completion of construction. Construction work shall commence and a Certificate of Final Completion and Occupancy or final inspection of work under a demolition permit shall be obtained within the time limits set forth in Table 4A-A.

404A.2.6 Transfer of title. *Not used*

SECTION 405A — ADMINISTRATION

405A.1 Service of Notice. The Chief Harbor Engineer shall have issued, not later than February 15, 1993, a notice to comply with Section 404A.1 to the tenant of each building known by the Port to be within the scope of this chapter. The notice shall be accompanied by an informational letter or brochure and a sample inventory form. If, on or before February 15, 1993, a tenant of an unreinforced masonry bearing wall building has knowledge that he or she owns such a building, then failure of the Chief Harbor Engineer

to issue a notice or failure of the tenant to receive such a notice shall not relieve the tenant of the obligation to comply with the provisions of Chapters 4A and 4B within the time limits set forth in Table 4A-A. A tenant is presumed to have knowledge that he or she occupies an unreinforced masonry bearing wall building if the building is on the inventory list of potential hazardous unreinforced masonry bearing wall buildings required by Section 8877(a) of the California Government Code.

For buildings not known to the Port to be unreinforced masonry bearing wall buildings and whose tenants have no knowledge that the buildings are unreinforced masonry bearing wall buildings, the time limits set forth in Table 4A-A shall commence upon the tenants having actual or constructive knowledge that their buildings are unreinforced masonry bearing wall buildings.

405A.2 Appeal from Notice. The tenant or the tenant's agent may appeal the Chief Harbor Engineer's notice to the Port Building Code Review Board in accordance with Port of San Francisco Building Code Section 105A.7.

405A.3 Processing and Recordation. Within 30 days of receipt of the inventory form, the Chief Harbor Engineer shall review it and either approve it as submitted or reject it and return it for correction. Inventory forms returned for correction shall be revised by the tenant's architect or engineer and returned to the Port within 30 days of the date of the Port's initial rejection. The Chief Harbor Engineer shall cause to be recorded with the Assessor-Recorder's Office a notice of the requirement for structural alteration or demolition and the inventory form. The Chief Harbor Engineer may cause such a notice to be recorded upon expiration of the time limits for submittal of the inventory form as stated in Table 4A-A.

405A.4 Enforcement. Whenever an inventory form has not been submitted or a notice issued by the Chief Harbor Engineer to structurally alter or demolish an unreinforced masonry bearing wall building has not been complied with within the time limits set forth in Table 4A-A, the Chief Harbor Engineer shall have the power to abate the building in accordance with Port of San Francisco Building Code Section 102A.

405A.5 Removal from Inventory. After all of the retrofit work required by this chapter and Chapter 4B has been completed in any building to the satisfaction of the Chief Harbor Engineer and a Certificate of Final Completion and Occupancy has been issued in accordance with Port of San Francisco Building Code Section 109, or after a final inspection of building demolition work has been made, or if the Chief Harbor Engineer finds that no retrofit work is required, the Chief Harbor Engineer shall remove that building from the inventory list of potentially hazardous unreinforced masonry bearing wall buildings required by Section 8877(a) of the California Government Code. The Chief Harbor Engineer shall thereupon cause to be filed with the Assessor-Recorder's Office a release of any notice or Abatement Order recorded under Section 405A.3 or 405A.4. Additionally, the Port shall furnish to each tenant upon satisfactory completion of a retrofit a sign, on a standard Port form, of the same size as that required by California Government Code Section 8875.8, stating "This building has been seismically retrofitted to reduce the risk of death or injury in the event of a major earthquake pursuant to Chapters 4A and 4B of the Port of San Francisco Existing Building Code." The sign shall also indicate the retrofit

procedure used and shall bear the signature of the Chief Harbor Engineer. The posting of the sign shall be at the option of the tenant.

405A.6 Voluntary Seismic Strengthening. The tenant of a building that is exempt from compliance with this chapter may voluntarily retrofit the building using the procedures for seismic strengthening set forth in Chapter 4B.

405A.7 Application of Future Retrofitting Legislation. It is the present intent of the Board of Supervisors that, absent a compelling public safety necessity, buildings strengthened pursuant to Chapter 4B will not be subject to future mandatory seismic retrofitting legislation adopted by the Board.

405A.8 Phased Strengthening. Other provisions of this code notwithstanding, an unreinforced masonry bearing wall building may be strengthened in phases under multiple alteration permits, provided:

1. **A complete structural analysis accompanied by plans, specifications and calculations for the proposed mitigation solution is submitted to the Port with the first alteration permit application; and**
2. **A phasing program is submitted to and approved by the Port as part of the review of the first alteration permit application; and**
3. **Each subsequent alteration permit application clearly indicates the further work proposed and the work completed to date; and**
4. **The engineer or architect responsible for the structural design for the strengthening program provides structural requirements observation in accordance with Port of San Francisco Building Code Section 1704.6; and**
5. **All of the required strengthening work is completed within the time limits set forth in Table 4A-A.**

SECTION 406A — EXISTING UTILITY, FIRE PROTECTION, LIFE-SAFETY SYSTEMS, HOMELESS SHELTERS AND DISABLED ACCESS REQUIREMENTS

This chapter does not require alteration of existing electrical, plumbing, mechanical, fire protection or life-safety systems which are in compliance with the code in effect at the time of their construction or installation. The application of PSFEBC Section 401.6 relating to homeless shelters does not waive the requirement for compliance with the provisions of this chapter and Chapter 4B within the time limits set forth in Table 4A-A. This section does not exempt any building from compliance with the requirements of State or Federal disability access regulations.

SECTION 407A — ENERGY CONSERVATION

The provisions of California Code of Regulations, Title 24, Part 6, the California Energy Code, are not applicable to buildings altered as required by this chapter, unless the alteration work also constitutes a change in use as defined in PSFEBC Section 407, or increases the conditioned space or alters the lighting or mechanical systems.

Chapter 4B
SEISMIC STRENGTHENING PROVISIONS FOR UNREINFORCED MASONRY BEARING WALL BUILDINGS

Add Chapter as follows:

Chapter 4B

SEISMIC STRENGTHENING PROVISIONS FOR UNREINFORCED MASONRY BEARING WALL BUILDINGS

(NOTE: The time limits for compliance with the provisions of Chapters 4A and 4B had passed, but the ordinance and the time limits therein are still in effect.)

SECTION 401B — PURPOSE

The purpose of this chapter is that stated in Section 401A.

SECTION 402B — SCOPE

402B.1 General. The seismic strengthening of unreinforced masonry bearing wall buildings shall comply with the provisions of this chapter when strengthening either is mandated by Chapter 4A or is done voluntarily under Section 405A.6. The elements regulated by this chapter shall be determined in accordance with Table 4B-A. Except as provided herein, other structural provisions of this code shall apply.

402B.2 Essential and Hazardous Facilities. The provisions of this chapter are not intended to apply to the strengthening of buildings or structures in Risk Categories III and IV of ASCE 7-10 Table 1.5-1. Such buildings or structures shall be strengthened to meet the requirements of this code for new buildings of the same occupancy category or to such other criteria as has been established by the Chief Harbor Engineer.

402B.3 Unreinforced Masonry Private School Buildings. *Not used*

402B.4 Qualified Historical Buildings. Qualified historical buildings shall be strengthened to comply with this chapter or the alternative provisions contained in Title 24, California Code of Regulations, Part 8, the State Historical Building Code.

402B.5 Party Wall Buildings. In buildings separated by party walls, all segments sharing the party walls shall be strengthened at the same time whenever feasible. When such action is not feasible, a party wall in any segment undergoing strengthening shall be provided with the capacity to resist a reasonable estimate of the shear forces generated by the adjacent unstrengthened segments.

402B.6 Buildings of Mixed Construction. When buildings having at least one bearing wall of unreinforced masonry also utilize other structural systems, the following requirements shall apply:

402B.6.1 Masonry-wood or steel mix. When the lower stories of the building are of unreinforced masonry bearing wall construction and the upper stories are of wood frame or steel stud construction, the unreinforced masonry stories shall be strengthened to meet the requirements of the general procedure of this chapter and the other stories need not be strengthened.

402B.6.2 Masonry-concrete mix. When a building is of mixed unreinforced masonry bearing wall construction and reinforced concrete or masonry construction, the entire building shall be strengthened in accordance with a program developed by the tenant's architect or engineer and approved by the Chief Harbor Engineer.

SECTION 403B — DEFINITIONS

For the purpose of this chapter, the applicable definitions in this code shall also apply.

COLLAR JOINT is the vertical space between adjacent wythes and may contain mortar.

CROSSWALL is a new or existing wall that meets the requirements of Section 411B.3. A crosswall is not a shear wall.

CROSSWALL SHEAR CAPACITY is the allowable shear value times the length of the crosswall, vcLo.

DIAPHRAGM EDGE is the intersection of the horizontal diaphragm and a shear wall.

DIAPHRAGM SHEAR CAPACITY is the allowable shear value times the depth of the diaphragm, vuD.

ESSENTIAL FACILITY is any building or structure classified in Risk Category IV of ASCE 7-10 Table 1.5-1.

HAZARDOUS FACILITY is any building or structure classified in Risk Category III of 7-

10 Table 1.5-1.

NORMAL WALL is a wall perpendicular to the direction of seismic forces.

OPEN FRONT is an exterior building wall line, without vertical elements of the lateral force resisting system in one or more stories.

PARTY WALL is a wall common to two or more buildings located on separate parcels of land.

POINTING is the partial reconstruction of the bed joints of an unreinforced masonry wall as defined in Section 416B.

QUALIFIED HISTORICAL BUILDING is a building or structure as defined in the June 1, 1990, Edition of Title 24, California Code of Regulations, Part 8, Section 8-302.

UNREINFORCED MASONRY includes burned clay, concrete or sand-lime brick, hollow clay or concrete block, plain concrete and hollow clay tile. These materials shall comply with the requirements of Section 406B.

UNREINFORCED MASONRY WALL is a masonry wall in which the area of reinforcing steel is less than 25 percent of the minimum steel ratios required by this code for reinforced masonry. To qualify, reinforcing steel must have been installed in grouted cells within the masonry.

UNREINFORCED MASONRY BEARING WALL is an unreinforced masonry wall which provides the vertical support for a floor or roof for which the total superimposed load exceeds 200 pounds per linear foot (298 kg/m) of wall.

YIELD STORY DRIFT is the lateral displacement of one level relative to the level above or below at which yield stress is first developed in a frame member.

SECTION 404B — SYMBOLS AND NOTATIONS

404B.1 For the purpose of this chapter, the applicable symbols and notations in this code shall apply.

A = cross sectional area of unreinforced masonry pier or wall, square inches.

Ab = total area of the bed joints above and below the test specimen for each in-place shear test.

Cp = numerical coefficient as specified in Table 4B-C for Special Procedure diaphragm shear transfer.

D = in-plane width dimension of pier, inches, or depth of diaphragm, feet.

DCR = demand-capacity ratio specified in Section 411B.4.2.

Fwx = force applied to a wall at level x, pounds.

H = least clear height of opening on either side of a pier, inches.

h/t = height-to-thickness ratio of an unreinforced masonry wall. Height, h, is measured between wall anchorage levels and/or slab-on-grade.

L = span of diaphragm between shear walls, or span between shear wall and open front, feet.

Lo = length of crosswall, feet.

Li = effective span for an open front building specified in Section 411B.8, feet.

PD = superimposed dead load at the location under consideration, pounds. For determination of the rocking shear capacity, dead load at the top of the pier under consideration shall be used.

pD+L = stress resulting from the dead plus actual live load in place at the time of testing, pounds per square inch (psi).

Pw = weight of wall, pounds.

Va = vaA, the allowable shear in any unreinforced masonry pier, pounds.

Vca = total shear capacity of crosswalls in the direction of analysis immediately above the diaphragm level being investigated, åvcLo, pounds.

Vcb = total shear capacity of crosswalls in the direction of analysis immediately below the diaphragm level being investigated, åvcLo, pounds.

Vp = shear force assigned to a pier on the basis of its relative shear rigidity, pounds.

Vr = pier rocking shear capacity of any unreinforced masonry wall or wall pier, pounds.

Vtest = load at incipient cracking for each in-place shear test per Section 414B, pounds.

Vwx = total shear force resisted by a shear wall at the level under consideration, pounds.

va = allowable shear stress for unreinforced masonry, pounds per square inch (psi).

vc = allowable shear value for a crosswall sheathed with any of the materials given in Table 4B-D or 4B-E, pounds per foot.

vt = mortar shear strength as specified in Section 406B.3.3.4, pounds per square inch (psi).

vto = mortar shear test values as specified in Section 406B.3.3.4, pounds per square inch (psi).

vu = allowable shear value for a diaphragm sheathed with any of the materials given in Table 4B-D or 4B-E, pounds per foot.

∑vuD = sum of diaphragm shear capacities of both ends of the diaphragm, pounds.

∑∑vuD = for diaphragms coupled with crosswalls, ∑∑vuD includes the sum of shear capacities of both ends of diaphragms coupled at and above the level under consideration.

W = total seismic dead load as defined in Port of San Francisco Building Code Chapter 16, pounds.

Wd = total dead load tributary to a diaphragm, pounds.

∑wd = total dead load to all the diaphragms at and above the level under consideration, pounds.

Ww = total dead load to an unreinforced masonry wall above the level under consideration or above an open front building, pounds.

Wwx = dead load of an unreinforced masonry wall assigned to Level x halfway above and below the level under consideration, pounds.

SECTION 405B — GENERAL REQUIREMENTS

405B.1 General. All buildings shall have a seismic resisting system conforming with ASCE 7-10 Section 12.2, except as modified by this chapter.

405B.2 Alterations and Repairs. Alterations and repairs required to meet the provisions of this chapter shall comply with all other applicable structural requirements of this code unless specifically provided for in this chapter.

405B.3 Requirements for Plans. In addition to the requirements of Port of San Francisco Building Code Section 106A.3.3 of this code, the following construction information shall be included in the plans required by this chapter:

1. **Dimensioned floor and roof plans showing existing walls and the size and spacing of floor and roof framing members and sheathing materials. The plans shall indicate all existing and new crosswalls and shear walls and their materials of construction. The location of these walls and their openings shall be fully dimensioned and drawn to scale on the plans.**
2. **Dimensioned wall elevations showing openings, piers, wall classes as defined in Section 406B.3.3.6, thickness, heights, wall shear test locations, and cracks or damaged portions requiring repairs. Where the exterior face is veneer, the type of veneer, its thickness and its bonding and/or ties to the structural wall masonry shall also be noted.**
3. **The type of interior wall and ceiling materials and framing.**
4. **The extent and type of existing wall anchorage to floors and roof when used in the design.**

5. **The extent and type of parapet and appendage corrections which were previously performed, if any.**

6. **Repair details, if any, of cracked or damaged unreinforced masonry wall walls required to resist forces specified in this chapter.**

7. **All other plans, sections and details necessary to delineate required retrofit construction.**

8. **The design procedure used shall be stated on both the plans and the permit application.**

9. **Details of the anchor prequalification program required by Section 415B ~~1615C~~, if utilized, including location and results of all tests.**

10. **In buildings with party walls, the details of construction on both sides of each party wall shall be shown. Where required by Section 411B.1, Item 5 the tenants' consent statements shall be included with the plans.**

SECTION 406B — MATERIALS REQUIREMENTS

406B.1 General. All materials permitted by this chapter, including their appropriate allowable design values and those existing configurations of materials specified herein, may be utilized to meet the requirements of this chapter.

406B.2 Existing Materials. All existing materials utilized as part of the required vertical load- carrying or lateral force-resisting system shall be in sound condition or shall be repaired or removed and replaced with new materials. All unreinforced masonry materials shall comply with the following requirements:

1. **The construction (lay-up) of the masonry units complies with Section 406B.3.2 and the quality of bond between the units has been verified to the satisfaction of the Chief Harbor Engineer.**

2. **Concrete masonry units are verified to be load-bearing units complying with ASTM Standard Specification C 90 or such other standard as is acceptable to the Chief Harbor Engineer.**

3. **Hollow clay tile units are verified to be structural load-bearing units complying with ASTM Standard Specification C 34 or such other standard as is acceptable to the Chief Harbor Engineer.**

4. **The compressive strength of plain concrete walls shall be determined based on cores taken from each class of concrete wall. The location and number of tests shall be the same as prescribed for strength tests in Sections 406B.3.3.2 and 406B.3.3.3.**

406B.3 Existing Unreinforced Masonry Walls.

406B.3.1 General. All unreinforced masonry walls utilized to carry vertical loads or seismic

forces parallel and perpendicular to the wall plane shall be tested as specified in this section. All masonry that does not meet the minimum standards established by this chapter shall be removed and replaced with new materials, repaired or alternatively shall have its structural functions replaced with new materials and shall be anchored to supporting elements.

406B.3.2 Construction (lay-up) of walls.

406B.3.2.1 Multi-wythe solid brick. The facing and backing shall be bonded so that not less than 10 percent of the exposed face area is composed of solid headers extending not less than 4 inches (101.6 mm) into the backing. The clear distance between adjacent full-length headers shall not exceed 24 inches (609.6 mm) vertically or horizontally. Where the backing consists of two or more wythes, the headers shall extend not less than 4 inches (101.6 mm) into the most distant wythe or the backing wythes shall be bonded together with separate headers whose area and spacing conform to the foregoing. Wythes of walls not bonded as described above shall be considered as veneer. Veneer wythes shall not be included in the effective thickness used in calculating the height to thickness and the shear capacity of the wall.

406B.3.2.2 Grouted or ungrouted hollow concrete or clay block and structural hollow clay tile. These materials shall be laid in a running bond pattern.

Other lay-up patterns may be acceptable if their performance can be justified as being at least equal to those specified above.

406B.3.3 Mortar.

406B.3.3.1 Tests. The quality of mortar in all masonry walls shall be determined by performing in-place shear tests in accordance with Section 414B. Alternative methods of testing may be approved by the Chief Harbor Engineer for masonry walls other than brick.

406B.3.3.2 Location of tests. The shear tests shall be taken at locations representative of the mortar conditions throughout the entire building, taking into account variations in workmanship at different building height levels, variations in weathering of the exterior surfaces, and variations in the condition of the interior surfaces due to deterioration caused by leaks and condensation of water and/or by the deleterious effects of other substances contained within the building. The exact test locations shall be determined at the building site by the engineer or architect in responsible charge of the structural design work. An accurate record of all such tests and their location in the building shall be recorded, and these results shall be submitted to the Port for approval as part of the structural analysis.

406B.3.3.3 Number of tests. The minimum number of tests per class shall be as follows:

1. **At each of both the first and top stories, not less than two tests per wall or line of wall elements providing a common line of resistance to lateral forces.**
2. **At each of all other stories, not less than one test per wall or line of wall elements providing a common line of resistance to lateral forces.**

3. In any case, not less than one test per 1,500 square feet (139.355 m2) of wall surface nor less than a total of eight tests.

406B.3.3.4 Minimum quality of mortar.

1. Mortar shear test values, vto, in psi shall be obtained for each in-place shear test in accordance with the following equation:

$$vto = (Vtest/Ab) - pD+L \quad (4B\text{-}1)$$

2. The mortar shear strength, vt, is the value in psi that, after discarding the lowest 20 percent of the mortar shear test values, vto, is the lowest of the remaining 80 percent of the mortar shear test values.

3. Any unreinforced masonry bearing wall with vto, or with mortar shear strength, vt, less than 30 psi (206.84 kPa) shall be either removed, entirely pointed and retested or have its structural function replaced and shall be anchored to supporting elements in accordance with Section 406B.3.1 and Section 413B.8. When existing mortar in any wythe is pointed to increase its shear strength and retested, the condition of the mortar in the adjacent bed joints of the inner wythe or wythes and the opposite outer wythe shall be examined for extent of deterioration. The shear strength of any wall class shall be no greater than that of the weakest wythe of that class.

406B.3.3.5 Collar joints. The collar joints shall be inspected at the test locations during each in- place shear test, and estimates of the percentage of the surfaces of adjacent wythes which are covered with mortar shall be reported along with the results of the in-place shear tests.

406B.3.3.6 Unreinforced masonry classes. All existing unreinforced masonry shall be categorized into one or more classes based on quality of construction, state of repair, deterioration and weathering. A class shall be characterized by the allowable masonry shear stress determined in accordance with Section 408B.2. Classes shall be defined for whole walls, not for small areas of masonry within a wall.

406B.3.3.7 Pointing. All deteriorated mortar joints in unreinforced masonry bearing walls shall be pointed according to Section 416B. Nothing shall prevent pointing of any deteriorated masonry wall joints before the tests are made, except as required in Section 407B.1.

SECTION 407B — QUALITY CONTROL

407B.1 Pointing. All preparation and mortar pointing shall be performed with special inspection.

EXCEPTION: At the discretion of the Chief Harbor Engineer, incidental pointing may be performed without special inspection.

407B.2 Masonry Shear Tests. In-place shear tests shall comply with Section 414B.

407B.3 Existing Wall Anchors. Existing wall anchors utilized as all or part of the required tension anchors shall be tested in pullout according to Section 415B. The minimum number of anchors tested shall be four per floor, with two tests at walls with joists framing into the wall and two tests at walls with joists parallel to the wall, but not less than 10 percent of the total number of existing tension anchors at each level.

407B.4 New Bolts. Twenty-five percent of all new embedded bolts resisting only shear forces in unreinforced masonry walls shall be tested using a calibrated torque wrench in accordance with Section 415B.

***EXCEPTION*: The number of bolts tested may be reduced to 10 percent when special inspection in accordance with Section 1704 is provided during installation but in no case shall less than two bolts per 500 square feet (46.45 m2) of wall or four bolts per wall be tested.**

All new embedded bolts resisting tension forces or a combination of tension and shear forces shall be subject to periodic special inspection in accordance with Port of San Francisco Building Code Section 1704 prior to placement of the bolt and grout or adhesive in the drilled hole. Five percent of all embedded bolts resisting tension forces, but not less than two bolts, shall be subject to a direct tension test and an additional 20 percent, but not less than three bolts, shall be tested using a torque calibrated wrench. Testing shall be performed in accordance with Section 415B.

New through bolts and existing bolts installed under the Parapet Safety Program need not be tested.

SECTION 408B — ALLOWABLE DESIGN VALUES

408B.1 Allowable Values.

408B.1.1 Existing materials. Allowable values for existing materials are given in Table 4B-D, and for new materials in Table 4B-E.

408B.1.2 Values not specified. Allowable values not specified in this chapter shall be as specified elsewhere in this code.

408B.2 Masonry shear. The allowable unreinforced masonry shear stress, va shall be determined for each masonry class from the following equation:

$$va = 0.1vt + 0.15PD/A \qquad (4B\text{-}2)$$

The mortar shear test value, vt, shall be determined in accordance with Section 406B.3.3, and shall not exceed 100 psi (689.476 kPa) for the determination of va.

The one-third increase in allowable values of this code for short-term loading is not allowed for va.

408B.3 Masonry Compression. Where any increase in dead plus live compression stress occurs, the allowable compression stress in unreinforced masonry shall not exceed 100

psi (689.476 kPa). The one-third increase in allowable stress of this code is allowed.

408B.4 Masonry Tension. Unreinforced masonry shall be assumed as having no tensile capacity.

408B.5 Unreinforced Masonry Materials Other Than Solid Brick. The provisions of this chapter are primarily intended for brick construction but are also applicable to other unreinforced masonry materials when the following conditions are satisfied:

1. **The building does not exceed two stories in height.**
2. **In the case of hollow concrete and clay block, the shear stress is limited to that permitted by Equations 4B-1 and 4B-2 based on the net area in contact through the bed joints but not more than that calculated using a mortar shear strength, vt, of 100 psi (689.476 kPa).**
3. **In the case of plain concrete, the compressive strength (f´c) shall be not less than 900 psi (6,205.28 kPa) and the allowable shear strength is limited to not more than 0.02f´c.**
4. **In the case of all other unreinforced masonry materials, the shear stress is limited to 3 psi (20.684 kPa) based on the net area in contact through the bed joint.**

Unreinforced masonry not meeting the above criteria shall have its structural function replaced and shall be resupported, if required, in accordance with Section 413B.8.

408B.6 Existing Tension Anchors. The allowable resistance values of the existing anchors shall be 40 percent of the average of the tension tests of existing anchors having the same wall thickness and joist orientation. The one-third increase in allowable value of this code is not allowed for existing tension anchors.

408B.7 Foundations. For existing foundations, new total dead loads may be increased over existing dead load by 25 percent. New total dead load plus live load plus seismic forces may be increased over existing dead load plus live load by 50 percent.

EXCEPTION: **In buildings located in poor soil areas as defined in Chapter 4A, any increase in dead load shall require an evaluation of the existing foundation system.**

Higher values may be justified only in conjunction with a geotechnical investigation. A foundation investigation shall be also submitted with the building permit application when:

1. **A building has an existing full or partial pile supported, or similar foundation system or whenever the installation of such a system is proposed as part of the strengthening.**
2. **Whenever there is evidence of significant distress attributable to foundation or geotechnical conditions.**
3. **An investigation is required by Port of San Francisco Building Code Section 1803 or 1804.**

4. **It is desired to prove that the building is not on poor soil as permitted by the exception to Section 403A.**

SECTION 409B — SELECTION OF PROCEDURE

409B.1 General. Except as modified herein, the analysis and design relating to the structural alteration of existing buildings shall be in accordance with this code.

409B.2 Selection of Procedure. All buildings shall be analyzed by either the General Procedure of Section 410B or, when applicable, buildings may be analyzed by the Special Procedure of Section 411B.

EXCEPTIONS:

1. **A building may be strengthened to the Bolts-plus level by complying only with the requirements for wall anchorage (tension bolts), diaphragm shear transfer (shear bolts) and out-of-plane wall and parapet and appendage bracing, provided the entire building complies with all of the following requirements:**

   (1) **The building does not have any vertical irregularities of Types 1a or 1b (Soft Story), 4 (In-Plane Discontinuity) or 5a or 5b (Weak Story) as defined in ASCE 7-10 Table 12.3-2 or horizontal irregularities of Types 3 (Diaphragm Discontinuity) or 4 (Out-of-Plane Offset) as defined in ASCE 7-10 Table 12.3-1 or those irregularities are corrected.**

   (2) **The building does not contain any Group A Occupancies with an occupant load of 300 or more, or Group E, Group I or Group H-1, H-2 or H-4 Occupancies.**

   (3) **The building has a mortar shear strength, vt, as determined by Section 406B.3.3, of 30 psi (206.843 kPa) or more for all masonry classes.**

   (4) **The building has wood or plywood diaphragms at all levels above the base of building.**

   (5) **The building contains a maximum of six stories above the base of the building. The base shall be the ground level and basement or basements shall be excluded from the story count.**

   EXCEPTION: **In an otherwise qualifying building of greater than six stories, a maximum of six of the uppermost contiguous stories may be retrofitted using the Bolts-Plus Procedure, providing the building is not located on poor soil as defined in Section 403A. The masonry walls required by Item 7 below shall occupy not less than 50 percent of the wall length in the lowest two of the uppermost six stories. Nonqualifying stories and stories below the uppermost six shall be retrofitted to any other procedure for which they qualify.**

(6) **The building has or will be provided with crosswalls as defined in Section 411B.3 at a spacing that does not exceed 40 feet (12.192 m) on center. Any story which does not have or is not provided with complying crosswalls and all stories below that story shall be analyzed using the General Procedure of Section 410B or, where applicable, the Special Procedure of Section 411B. The floor structure that separates the Bolts-Plus and General or Special Procedure stories shall be investigated for its adequacy to act as a diaphragm in accordance with Section 410B.1 or, where the Special Procedure is applicable, Section 411B.4.**

(7) **The building has or will be provided with a minimum of two lines of vertical elements of the lateral force resisting system parallel to each axis. Masonry walls shall have wall piers with a height-to-width ratio that does not exceed 2 to 1 and shall occupy not less than 40 percent of the wall's length in order to be considered as providing a line of resistance. Existing moment frames and other lines of resistance added or altered to comply with this requirement shall fully comply with Section 412B. At least one line in each direction shall be a masonry or concrete shear wall.**

(8) **In buildings containing one or more party walls, the Bolts-Plus Procedure shall not be used unless each building sharing a party wall individually complies with all of the limitations set forth above and the tenant of each such building consents to the use of the procedure in writing.**

When the Bolts-Plus Procedure is applicable, the forces to be used for diaphragm shear transfer and irregularity correction shall be those specified in Sections 411B.5 and 411B.6 and h/t ratios shall be evaluated in accordance with Section 411B.7. When the intersection of the diaphragm span and demand capacity ratio falls outside the three regions of Figure 4B-1, the h/t ratios for "all other buildings" in Table 4B-B shall be used. The measures used to comply shall be part of, and be coordinated with, the complete strengthening scheme described in the engineering report required by Section 404A.2.3.

2. **Buildings which are strengthened to conform to the requirements of SFEBC Section 301.2 in effect on or after May 21, 1973, are exempt from compliance with the provisions of this chapter.**

SECTION 410B — GENERAL PROCEDURE

410B.1 Minimum Design Lateral Forces. Buildings shall be analyzed to resist minimum lateral forces assumed to act nonconcurrently in the direction of each of the main axes of the structure in accordance with the following:

$$V = 0.10\ W \qquad (4B\text{-}3)$$

EXCEPTION: **The lateral forces need not exceed those prescribed by Port of San**

Francisco Building Code Section 1613.

For buildings more than one story in height, the total force shall be distributed over the height of the building in accordance with the procedures of Port of San Francisco Building Code Chapter 16.

For the purpose of this chapter, a dynamic analysis need not be performed for those buildings with irregularities, as defined in ASCE 7-10 Table 12.3-2 and ASCE 7-10 Table 12.3-1 which would otherwise require such analysis. All other design and analysis requirements of those tables shall apply.

410B.2 Lateral Forces on Elements of Structures. Parts of structures shall be analyzed and designed as required in Port of San Francisco Building Code Chapter 16.

EXCEPTIONS:

1. **Unreinforced masonry walls for which height-to-thickness ratios do not exceed ratios set forth in Table 4B-B need not be analyzed for out-of-plane loading. Unreinforced masonry walls which exceed the allowable h/t ratios of Table 4B-B shall be braced according to Section 413B.5.**
2. **Parapets complying with Section 413B.6 need not be analyzed for out-of-plane loading.**
3. **Out-of-plane anchorage of the walls shall be designed to 0.3 times the mass of the wall.**

410B.3 Shear Walls (In-Plane Loading). Shear walls shall comply with Section 412B.

410B.4 Chords. When required by the structural analysis, chord forces of horizontal diaphragms shall be developed in existing materials or by the addition of new materials.

SECTION 411B — SPECIAL PROCEDURE

411B.1 Limits for Application. The Special Procedure of this section may only be applied to buildings with the following characteristics:

1. **The building is not an essential or hazardous facility.**
2. **Wood or plywood diaphragms at all levels above the base of structure.**
3. **A maximum of six stories above the base of the building. The base shall be the ground level, and basement or basements shall be excluded from the story count.**

   ***EXCEPTION*: An otherwise qualifying building of greater than six stories may also be retrofitted using the Special Procedure, provided the building is not located on poor soil as defined in Section 403A or does not contain any Group A Occupancies with an occupant load of 300 or more, or Group E, or Group I Occupancies.**

4. **Except for single-story buildings with an open front on one side only, a minimum of two lines of vertical elements of the lateral force resisting system complying with Section 412B parallel to each axis. At least one line in each direction shall be a masonry or concrete shear wall. Requirements for open front buildings are contained in Section 411B.8.**

5. **In buildings containing one or more party walls, the Special Procedure shall not be used unless each building sharing a party wall individually complies with all of the limitations set forth above, and the tenant of each such building consents to the use of the procedure in writing.**

411B.2 Lateral Forces on Elements of Structures. With the exception of the diaphragm provisions in Section 411B.4, elements of structures shall comply with Section 410B.2.

411B.3 Crosswalls. Crosswalls when used shall meet the requirements of this section.

411B.3.1 Crosswall definition. A "crosswall is a wood-framed wall sheathed with any of the materials described in Table 4B-D or 4B-E or other system as defined in Section 411B.3.5. Spacing of crosswalls shall not exceed 40 feet (12.19 m) on center measured perpendicular to the direction of consideration and shall be placed in each story of the building. Crosswalls shall extend the full story height between diaphragms.

EXCEPTIONS:

1. **Crosswalls need not be provided at all levels in accordance with Section 411B.4.2(4).**

2. **Existing crosswalls need not be continuous below a wood diaphragm at or within 4 feet (1.219 m) of grade, provided:**

   (1) Shear connections and anchorage requirements, Section 411B.5 are satisfied at all edges of the diaphragm.

   (2) Crosswalls with total shear capacity of 0.08åWd interconnect the diaphragm to the foundation.

   (3) The demand-capacity ratio of the diaphragm between the crosswalls that are continuous to their foundations shall be calculated as:

   $$DCR = (0.332W_d + V_{ca})/2v_uD \qquad (4B\text{-}4)$$

   and DCR shall not exceed 2.5.

411B.3.2 Crosswall shear capacity. Within any 40 feet (12.19 m) measured along the span of the diaphragm, the sum of the crosswall shear capacities shall be at least 30 percent of the diaphragm shear capacity of the strongest diaphragm at or above the level under consideration.

411B.3.3 Existing crosswalls. Existing crosswalls shall have a maximum height-to-length ratio between openings of 1.5 to 1. Existing crosswall connections to diaphragms need not be investigated as long as the crosswall extends to the framing of the diaphragm above

and below.

411B.3.4 New crosswalls. New crosswall connections to the diaphragm shall develop the crosswall shear capacity. New crosswalls shall have the capacity to resist an overturning moment equal to the crosswall shear capacity times the story height. Crosswall overturning moments need not be cumulative over more than two stories.

411B.3.5 Other crosswall systems. Other systems, such as moment resisting frames, may be used as crosswalls, provided that the yield story drift does not exceed 1 inch (25.4 mm) in any story.

411B.4 Wood Diaphragms.

411B.4.1 Acceptable diaphragm span. A diaphragm is acceptable if the point (L,DCR) on Figure 4B-1 falls within Regions 1, 2 or 3.

411B.4.2 Demand-capacity ratios. Demand-capacity ratios shall be calculated for the diaphragm at any level according to the following formulas:

1. **For a diaphragm without qualifying crosswalls at levels immediately above or below:**

$$DCR = 0.332Wd/\sum vuD \qquad (4B\text{-}5)$$

2. **For a diaphragm in a single-story building with qualifying crosswalls:**

$$DCR = 0.332Wd/(\sum vuD + Vcb) \qquad (4B\text{-}6)$$

3. **For diaphragms in a multi-story building with qualifying crosswalls in all levels:**

$$DCR = 0.332\sum Wd/(\sum\sum vuD + Vcb) \qquad (4B\text{-}7)$$

DCR shall be calculated at each level for the set of diaphragms at and above the level under consideration. In addition, the roof diaphragm shall also meet the requirements of Formula (4B-6).

4. **For a roof diaphragm and the diaphragm directly below if coupled by crosswalls:**

$$DCR = 0.332\sum W\,d/\sum\sum vuD \qquad (4B\text{-}8)$$

411B.4.3 Chords. An analysis for diaphragm flexure need not be made and chords need not be provided.

411B.4.4 Collectors. An analysis of diaphragm collector forces shall be made for the transfer of diaphragm edge shears into vertical elements of the lateral force resisting system. Collector forces may be resisted by new or existing elements.

411B.4.5 Diaphragm openings.

411B.4.5.1 Forces. Diaphragm forces at corners of openings shall be investigated and shall be developed into the diaphragm by new or existing materials.

411B.4.5.2 Demand-capacity ratio. In addition to the demand-capacity ratios of Section 411B.4.2, the demand-capacity ratio of the portion of the diaphragm adjacent to an opening

shall be calculated using the opening dimension as the span.

411B.4.5.3 End quarter of diaphragm. Where an opening occurs in the end quarter of the diaphragm span, vuD for the demand-capacity ratio calculation shall be based on the net depth of the diaphragm.

411B.5 Diaphragm Shear Transfer. Diaphragms shall be connected to shear walls with connections capable of developing a minimum force given by the lesser of the following formulas:

$$V = 0.2CpWd \qquad \text{(4B-9)}$$

using the Cp values in Table 4B-C, or

$$V = vuD \qquad \text{(4B-10)}$$

411B.6 Shear Walls (In-Plane Loading).

411B.6.1 Wall story force. The wall story force distributed to a shear wall at any diaphragm level shall be the lesser value calculated as:

1. **For buildings without crosswalls:**

$$Fwx = 0.132\ (Wwx + Wd\ /2) \qquad \text{(4B-11)}$$

but need not exceed

$$Fwx = 0.132Wwx + vuD \qquad \text{(4B-12)}$$

2. **For buildings with crosswalls in all levels:**

$$Fwx = 0.1\ (Wwx + Wd\ /2) \qquad \text{(4B-13)}$$

but need not exceed

$$Fwx = 0.1\ [Wwx + \sum Wd\ (vuD/\sum\sum vuD)] \qquad \text{(4B-14)}$$

and need not exceed

$$Fwx = 0.1W\ wx + vuD \qquad \text{(4B-15)}$$

411B.6.2 Wall story shear. The wall story shear shall be the sum of the wall story forces at and above the level of consideration.

$$Vwx = \sum Fwx \qquad \text{(4B-16)}$$

411B.6.3 Shear wall analysis. Shear walls shall comply with Section 412B.

411B.6.4 Moment frames. Moment frames used in place of shear walls shall be designed as required in Port of San Francisco Building Code Chapter 16 except that the forces shall

be as specified in Section 411B.6.1 and the story drift ratio shall be limited to 0.005, except as further limited by Section 412B.4.2.

411B.7 Out-of-Plane Forces - Unreinforced Masonry Walls.

411B.7.1 Allowable unreinforced masonry wall height-to-thickness ratios. The provisions of Section 410B.2 are applicable except the allowable height-to-thickness ratios given in Table 4B-B shall be determined from Figure 4B-1 as follows:

1. **In Region 1, height-to-thickness ratios for buildings with crosswalls may be used if qualifying crosswalls are present in all stories.**
2. **In Region 2, height-to-thickness ratios for buildings with crosswalls may be used whether or not qualifying crosswalls are present.**
3. **In Region 3, height-to-thickness ratios for "all other buildings" shall be used whether or not qualifying crosswalls are present.**

411B.7.2 Walls with diaphragms in different regions. When diaphragms above and below the wall under consideration have demand-capacity ratios in different regions of Figure 4B-1, the lesser height-to-thickness ratio shall be used.

411B.8 Open Front Design Procedure. A single-story building with an open front on one side and crosswalls parallel to the open front may be designed by the following procedure:

1. **Effective diaphragm span, Li, for use in Figure 4B-1 shall be determined in accordance with the following formula:**

$$Li = 2\,[(Ww / Wd)L + L]x \qquad (4B\text{-}17)$$

2. **Diaphragm demand-capacity ratio shall be calculated as:**

$$DCR = 0.332\,(Wd + W\,w) / [(vuD) + Vcb] \qquad (4B\text{-}18)$$

SECTION 412B — ANALYSIS AND DESIGN

412B.1 Analysis of Vertical Elements of the Lateral Force-Resisting System. General. The following requirements are applicable to both the General Procedure and Special Procedure.

412B.2 Existing Unreinforced Masonry Walls.

412B.2.1 Flexural rigidity. Flexural components of deflection may be neglected in determining the rigidity of an unreinforced masonry wall.

412B.2.2 Shear walls with openings. Wall piers shall be analyzed according to the following procedure which is diagrammed in Figure 4B-2:

412B.2.2.1 For any pier:

1. **The pier shear capacity shall be calculated as:**

$$Va = vaAx \qquad (4B\text{-}19)$$

2. The pier rocking shear capacity shall be calculated as:

$$Vr = 0.5PDD/H \qquad (4B\text{-}20)$$

412B.2.2.2 Pier behavior. The wall piers at any level are acceptable if they comply with one of the following modes of behavior:

1. Rocking controlled mode. When the pier rocking shear capacity is less than the pier shear capacity, i.e., Vr < Va for each pier in a level, forces in the wall at that level, Vwx, shall be distributed to each pier in proportion to PDD/H.

   For the wall at that level:

$$Vwx < \sum \text{å} Vr \qquad (4B\text{-}21)$$

2. Shear controlled mode. Where the pier shear capacity is less than the pier rocking capacity, i.e., Vr < Va in at least one pier in a level, forces in the wall at the level, Vwx, shall be distributed to each pier in proportion to D/H.

   For each pier at that level:

$$Vp < Va \qquad (4B\text{-}22)$$

and

$$Vp < Vr \qquad (4B\text{-}23)$$

If Vp < Va for each pier and Vp > Vr for one or more piers, such piers shall be omitted from the analysis, and the procedure shall be repeated for the remaining piers, unless the wall is strengthened and reanalyzed.

412B.2.2.3 Masonry pier tension stress. Unreinforced masonry wall piers need not be analyzed for tension stress.

412B.2.3 Shear walls without openings. Shear walls without openings shall be analyzed as for walls with openings except that Vr shall be calculated as follows:

$$Vr = (0.50PD + 0.25Pw)\, D/H \qquad (4B\text{-}24)$$

412B.3 Plywood Sheathed Shear Walls. Plywood sheathed shear walls may be used to resist lateral forces for buildings with wood diaphragms analyzed according to provisions of Section 410B. Plywood sheathed shear walls may not be used to share lateral forces with other materials along the same line of resistance.

412B.4 Combinations of Vertical Elements.

412B.4.1 Lateral force distribution. Lateral forces shall be distributed among the designated vertical resisting elements in a line in proportion to their relative rigidities except that moment frames shall comply with Section 412B.4.2.

412B.4.2 Moment-resisting frames. A moment frame shall not be used with an

unreinforced masonry wall in a single line of resistance unless the wall has piers that are capable of sustaining rocking in accordance with Section 412B.2.2 and the frames are designed to carry 100 percent of the lateral forces, and the story drift ratio shall be limited to 0.0025.

412B.5 Shear Force. The shear force used in the design of any party wall shall be the sum of the shear forces contributed by each building sharing that wall.

SECTION 413B — DETAILED SYSTEM DESIGN REQUIREMENTS

413B.1 Wall Anchorage.

413B.1.1 Anchor locations. All unreinforced masonry walls shall be anchored at the roof and floor levels as required in Section 410B.2. Ceilings of plaster, gypsum board or similar heavier materials, when not attached directly to roof or floor framing, and abutting masonry walls, shall be either anchored to the walls at a maximum spacing of 6 feet (1.829 m) or removed.

413B.1.2 Anchor requirements. Anchors shall consist of bolts installed through the wall as specified in Table 4B-E, or by an approved equivalent at a maximum anchor spacing of 6 feet (1.829 m). All existing wall anchors shall be secured to the joists to develop the required forces.

413B.1.3 Minimum wall anchorage. Anchorage of masonry walls to each floor or roof shall resist a minimum force determined in accordance with Port of San Francisco Building Code Chapter 16 or 200 pounds per linear foot (298 kg/m), whichever is greater, acting normal to the wall at the level of the floor or roof. Anchor spacing shall not exceed 6 feet (1.829 m) on center. Existing through-the-wall anchors, if used, must meet the requirements of this chapter or must be upgraded.

413B.1.4 Anchors at corners. At the roof and floor levels, both shear and tension anchors shall be provided within 2 feet (0.609 m) horizontally from the inside of the corners of the walls.

413B.1.5 Anchors with limited access. When access to the exterior face of the masonry wall is prevented, wall anchors conforming to Item 4.b. in Table 4B-E may be used.

413B.1.6 Anchors at interior and party walls. When floor or roof framing aligns vertically at party and interior masonry walls, continuous anchors shall be utilized to directly connect the floor or roof framing on either side of the wall. Where the roof or floor framing is offset more than the least depth of any adjacent framing, the intervening wall section shall be investigated for cross wythe shear assuming that the diaphragm to wall tensions on either side of the wall are acting in opposite directions.

413B.2 Diaphragm Shear Transfer. Bolts transmitting shear forces shall have a maximum bolt spacing of 6 feet (1.829 m) and shall have nuts installed over malleable iron or plate washers when bearing on wood and heavy cut washers when bearing on steel.

413B.3 Collectors. Collector elements shall be provided which are capable of transferring the seismic forces originating in other portions of the building to the element providing the resistance to those forces.

413B.4 Ties and Continuity. Ties and continuity shall conform to SFEBC Section 301.2.

413B.5 Wall Bracing.

413B.5.1 General. Where a wall height-to-thickness ratio exceeds the specified limits, the wall may be laterally supported by vertical bracing members per Section 413B.5.2 or by reducing the wall height by bracing per Section 413B.5.3.

413B.5.2 Vertical bracing members. Vertical bracing members shall be attached to floor and roof construction for their design loads independently of required wall anchors. Horizontal spacing of vertical bracing members shall not exceed one-half the unsupported height of the wall nor 10 feet (3.048 m). Deflection of such bracing members at design loads shall not exceed one-tenth of the wall thickness.

413B.5.3 Intermediate wall bracing. The wall height may be reduced by bracing elements connected to the floor or roof. Horizontal spacing of the bracing elements and wall anchors shall be as required by design but shall not exceed 6 feet (1.829 m) on center. Bracing elements shall be detailed to minimize the horizontal displacement of the wall by the vertical displacement of the floor or roof.

413B.6 Parapets. Parapets and appendages not conforming to this chapter shall be removed, or stabilized or braced to ensure that the parapets and appendages remain in their original position.

EXCEPTIONS:

1. **Parapets, appendages and roof-to wall-tension anchors which have already been removed, stabilized or braced to comply with Chapter 4C of this code or previous codes pursuant to an application filed before the effective date of this ordinance need not be reanalyzed or restrengthened.**

2. **Parapets whose heights do not exceed 3 times their thicknesses need not be removed, stabilized or braced, provided they are located either immediately adjacent to a normally inaccessible court or yard or another building. In the case of an adjoining building, the top of the parapet of the building under consideration shall not be more than 12 inches (0.305 m) above the top of the parapet of the adjoining building. In order to qualify for this exception, the tenant must execute an agreement with the Port to voluntarily abate any hazard that may arise as a result of changed conditions such as demolition of the adjacent building or development or occupancy of the adjoining court or yard. The tenant must record the agreement with the County Recorder on a form satisfactory to the Port and supply a copy of the recorded agreement to the Port.**

Parapets previously exempted that would not be exempted under Exception 2 above shall be removed, or stabilized or braced when the building is strengthened.

The maximum height of an unbraced unreinforced masonry parapet above the lower of either the level of tension anchors or roof sheathing shall not exceed 1½ times the thickness of the parapet wall. If the required parapet height exceeds this maximum height, a bracing system designed for the forces determined in accordance with Port of San Francisco Building Code Chapter 16 shall support the top of the parapet. Parapet corrective work must be performed in conjunction with the installation of tension roof anchors.

The minimum height of a parapet above any wall anchor shall be 12 inches (0.305 m).

EXCEPTION: **If a reinforced concrete beam is provided at the top of the wall, the minimum height above the wall anchor may be 6 inches (170.44 mm).**

413B.7 Veneer.

413B.7.1 Anchorages. Veneer shall be anchored with approved anchor ties, conforming to the required design capacity specified in this code and placed at a maximum spacing of 24 inches (610 mm) with a maximum supported area of 4 square feet (0.372 m2).

EXCEPTION: **Existing anchor ties for attaching brick veneer to brick backing may be acceptable, provided the ties are in good condition and are corrugated galvanized iron strips not less than 1 inch (25.4 mm) in width, 8 inches (203.2 mm) in length and 1/16 inch (1.59 mm) in thickness or equal.**

413B.7.2 Verification. The location and condition of existing veneer anchor ties shall be verified as follows:

1. **An approved testing laboratory shall verify the location and spacing of the ties and shall submit a report to the Chief Harbor Engineer for approval as part of the structural analysis.**
2. **The veneer in a selected area shall be removed to expose a representative sample of ties (not less than four) for inspection by the Chief Harbor Engineer.**

413B.8 Nonstructural Masonry Walls. Unreinforced masonry walls which carry no design vertical or lateral loads and are not required by the design to be part of the lateral force resisting system shall be adequately anchored to new or existing supporting elements. The anchors and elements shall be designed for the out-of-plane forces specified in Port of San Francisco Building Code Chapter 16. The height or length to thickness ratio between such supporting elements for such walls shall not exceed 13.

413B.9 Truss and Beam Supports. Where trusses and beams, other than rafters or joists, are supported on masonry, independent secondary columns shall be installed to support vertical loads of the roof or floor members.

413B.10 Adjacent Buildings. Where elements of adjacent buildings do not have a separation of at least 5 inches (127 mm), the allowable height-to-thickness ratios for "all other buildings" per Table 4B-B shall be used in the direction of consideration.

SECTION 414B — IN-PLACE MASONRY SHEAR TESTS

414B.1 Scope. This section applies when this chapter requires in-place testing of the quality of masonry mortar.

414B.2 Preparation of Sample. The bed joints of the outer wythe of the masonry shall be tested in shear by laterally displacing a single brick relative to the adjacent bricks in the same wythe. The head joint opposite the loaded end of the test brick shall be carefully excavated and cleared. The brick adjacent to the loaded end of the test brick shall be carefully removed by sawing or drilling and excavating to provide space for a hydraulic ram and steel loading blocks.

414B.3 Application of Load and Determination of Results. Steel blocks, the size of the end of the brick, shall be used on each end of the ram to distribute the load to the brick. The blocks shall not contact the mortar joints. The load shall be applied horizontally, in the plane of the wythe, until either a crack can be seen or slip occurs. The strength of the mortar shall be calculated by dividing the load at the first cracking or movement of the test brick by the nominal gross area of the sum of the two bed joints.

SECTION 415B — TEST OF ANCHORS IN UNREINFORCED MASONRY WALLS

415B.1 Scope. Shear and tension anchors embedded in existing masonry construction shall be tested in accordance with this section when and as required by this chapter.

415B.2 Direct Tension Testing of Existing Anchors and New Bolts. The test apparatus shall be supported on the masonry wall. The distance between the anchor and the test apparatus support shall not be less than one-half the wall thickness for existing anchors and 75 percent of the embedment for new embedded bolts. Existing wall anchors shall be given a preload of 300 pounds (136.4 kg) prior to establishing a datum for recording elongation. The tension test load reported shall be recorded at 1/8 inch (3.18 mm) relative movement of the existing anchor and the adjacent masonry surface. New embedded tension bolts shall be subject to a direct tension load of not less than 2.5 times the design load but not less than 1,500 pounds (682 kg) for five minutes (10 percent deviation).

415B.3 Torque Testing of New Bolts. Bolts which are embedded in unreinforced masonry walls shall be tested using a torque calibrated wrench to the following minimum torques:

1/2-inch-diameter bolts - 40 foot-pounds.	
(12.7 mm)	**(5.54 M-Kg)**
5/8-inch-diameter bolts - 50 foot-pounds.	
(16 mm)	**(6.93 M-Kg)**
3/4-inch-diameter bolts - 60 foot-pounds.	

(19 mm)	(8.31 M-Kg)

415B.4 Prequalification Test for Bolts and Other Types of Anchors. This section is applicable when it is desired to use tension or shear values for anchors greater than those permitted by Table 4B-E. The direct tension test procedure set forth in Section 415B.2 for existing anchors may be used to determine the allowable tension values for new embedded or through bolts except that no preload is required. Bolts shall be installed in the same manner and using the same materials as will be used in the actual construction. A minimum of 5 tests for each bolt size and type shall be performed for each class of masonry in which they are proposed to be used. The allowable tension value for such anchors shall be 40 percent of the average value of the tests for each size and type of bolt and class of masonry.

Shear bolts may be similarly prequalified. The test procedure shall comply with ASTM E 488-90 or such other procedure as is approved by the Chief Harbor Engineer.

The allowable values determined in this manner may exceed those set forth in Table 4B-E.

415B.5 Reports. Results of all tests shall be reported. The report shall include the test results as related to anchor size and type, orientation of loading, details of the anchor installation and embedment, wall thickness and joist orientation.

SECTION 416B — POINTING OF UNREINFORCED MASONRY WALLS

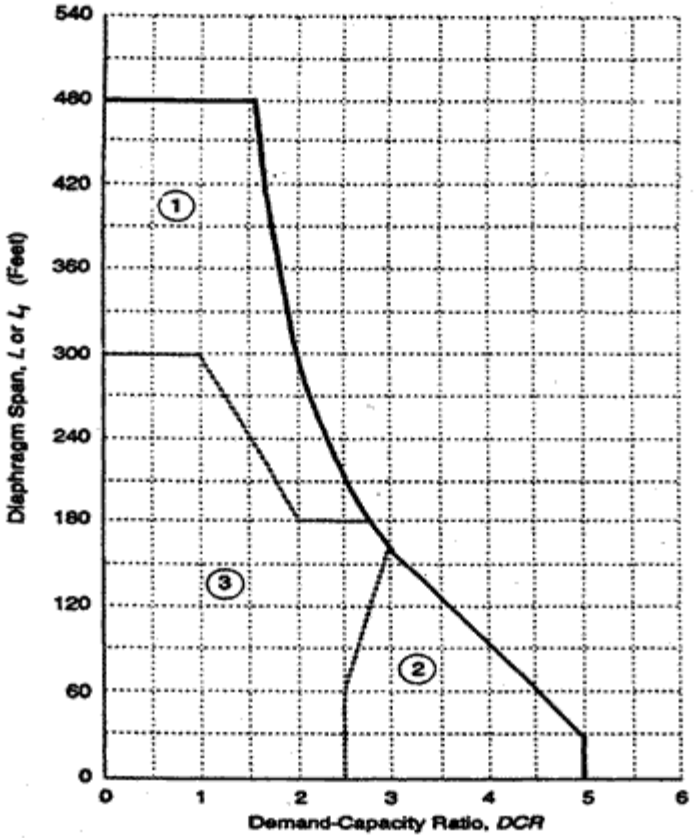
416B.1 Scope. Pointing of deteriorated mortar joints when required by this chapter shall be in accordance with this section.

416B.2 Joint Preparation. The old or deteriorated mortar should be cut out, by means of a toothing chisel or non-impact power tool, to a uniform depth of ¾ inch (19.1 mm) until sound mortar is reached. Care shall be taken not to damage the brick edges. After cutting is completed, all loose material shall be removed with a brush, air or water stream.

416B.3 Mortar Preparation. The mortar mix shall be Type N or S proportions as required by the construction specifications. The pointing mortar shall be pre-hydrated by first thoroughly mixing all ingredients dry, and then mixing again, adding only enough water to produce a damp unworkable mix which will retain its shape when pressed into a ball. The mortar shall be kept in a damp condition for 1½ hours; then sufficient water shall be added to bring it to a proper consistency that is somewhat drier than conventional masonry mortar.

416B.4 Packing. The joint into which the mortar is to be packed shall be damp but without freestanding water. The mortar shall be tightly packed into the joint in layers not exceeding ¼ inch (6.35 mm) in depth until it is filled; then it shall be tooled to a smooth surface to match the original profile.

FIGURE 4B-1 — ACCEPTABLE DIAPHRAGM SPAN



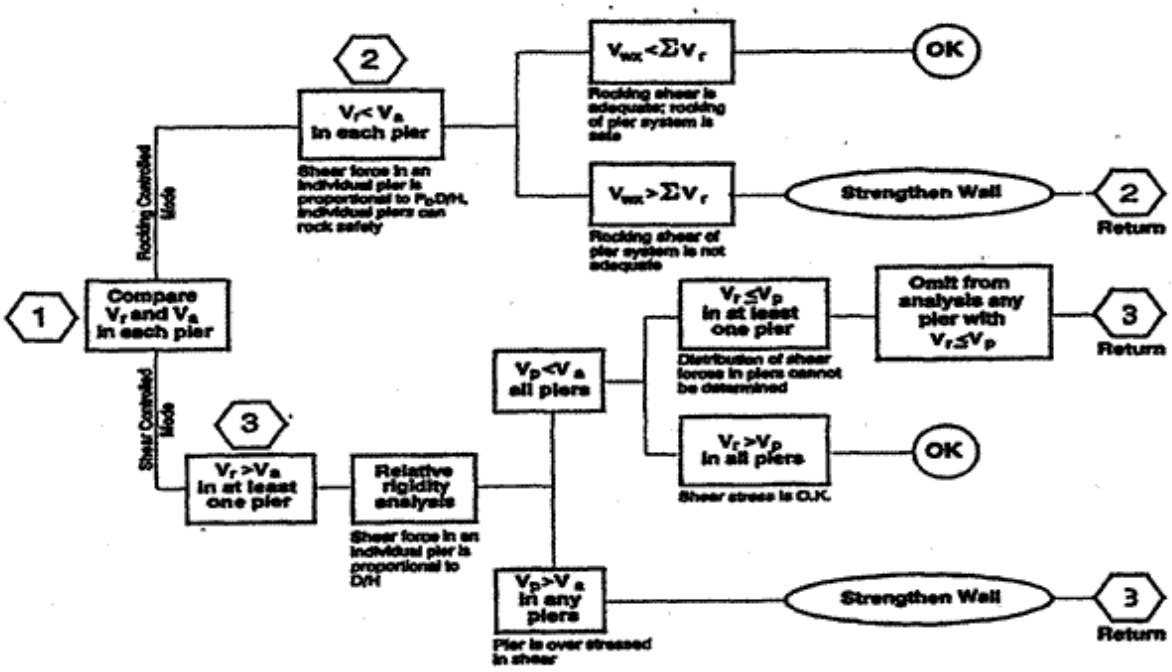
① **Region of demand-capacity ratios where crosswalls may be used to increase *h/t* ratios.**

② **Region of demand-capacity ratios where *h/t* ratios of "with crosswalls" may be used.**

③ **Region of demand-capacity ratios where *h/t* ratios of "all other buildings" shall be used.**

NOTE: To convert feet to meters, multiply by 0.3048.

FIGURE 4B-2 — ANALYSIS OF UNREINFORCED MASONRY WALL IN-PLANE SHEAR FORCES



V_r = **Rocking shear capacity of pier.**

V_{wx} = **Total Shear Force resisted by the wall.**

Σv_r = **Rocking shear capacity of all piers in the wall.**

V_p = **Shear force assigned to a pier on the basis of a relative shear rigidity analysis.**

V_a = **Allowable shear strength of a pier.**

TABLE 4B-A -- ELEMENTS REGULATED BY THIS CHAPTER

ELEMENTS	SECTION	PROCEDURE			
		BOLTS-PLUS	SPECIAL	GENERAL	301.2[2]
Masonry Shear Strength	406B.3.3	X	X	X	X
Diaphragms	410B.1			X	
	411B.4		X		
	301.2			X	
Diaphragm Shear Transfer	410B.1	X[1]			
	411B.5	X[1]	X		
	413B.2	X	X	X	
Chords	411B.4			X	
Diaphragm Capacity Ratios	SFBC 1604		X		
Collectors	413B.3			X	
	411B.4		X		
	301.2				X[4]
Analysis of Vertical Elements	412B		X	X	
Crosswalls	411B.3		X		
Shear Walls	410B.3		X		
	411B.6		X		
	301.2				X[3, 4]
Out of Plane Wall Anchorage	413B.1	X	X	X	
	301.2			X	
Ties & Continuity	413B.4		X	X	
	301.2			X	X
Wall Bracing	413B.5	X	X	X	X[5]
Parapets	413B.6	X	X	X	X

Veneer	**413B.7**	**X**	**X**	**X**	**X**
Nonstructural Masonry Walls	**413B.8**		**X**	**X**	**X**
Truss & Beam Supports	**413B.9**		**X**	**X**	**X**
Adjacent Buildings	**413B.10**		**X**	**X**	**X**
Subdiaphragms	**301.2**				**X**
	SFBC 1604.8.2				
	ASCE 7-10 Section 12.11.2[4]				

1 Diaphragm shear transfer forces shall be calculated using the General Procedures unless the building qualifies for the use of the Special Procedure.

2 Retrofit procedure per PSFEBC Section 301.2.

3 Wood shear walls allowed only for one- or two-story building per Port of San Francisco Building Code Section 2305.1.

4 Only in-plane shear check required. (Rocking not allowed.)

5 Use (h/t) for "All other walls" from Table 4B-B.

TABLE 4B-B — ALLOWABLE VALUE OF HEIGHT-TO-THICKNESS RATIO OF UNREINFORCED MASONRY WALLS

WALL TYPES	BUILDINGS WITH CROSSWALLS[1]	ALL OTHER BUILDINGS
Walls of one-story buildings	16[2,3]	13
First story wall of multistory buildings	16	15
Walls in top story of multistory buildings	14[2,3]	9
All other walls	16	13

1 Applies to the Special Procedure of Section 411B and the Bolts-plus Procedure of the last paragraph of Exception 1 to Section 409B.2 only. See Section 411B.7 for other restrictions.

2 This value of height-to-thickness ratio may be used only where mortar shear tests establish a tested mortar shear strength, v_t, of not less than 100 psi (689.48 kPa). This value may also be used where the tested mortar strength is not less than 60 psi (413.69 kPa) and a visual examination of the collar joint indicates not less than 50 percent mortar coverage.

3 Where a visual examination of the collar joint indicates not less than 50 percent mortar coverage, and the tested mortar shear strength, v_t is greater than 30 psi (206.84 kPa) but less than 60 psi (413.69 kPa), the allowable height-to-thickness ratio may be determined by linear interpolation between the larger and smaller ratios in direct proportion to the tested mortar strength.

TABLE 4B-C — HORIZONTAL FORCE FACTOR, C_p[1]

CONFIGURATION OF MATERIALS	C_p
Roofs with straight or diagonal sheathing and roofing applied directly to the heathing, or floors with straight tongue-and-groove sheathing	0.50
Diaphragms with double or multiple layers of boards with edges offset, and blocked plywood systems	0.75
[1] Applicable to the Special Procedure of Section 411B only.	

TABLE 4B-D — ALLOWABLE VALUES FOR EXISTING MATERIALS

EXISTING MATERIALS OR CONFIGURATION OF MATERIALS[1]	*ALLOWABLE VALUES*
1. HORIZONTAL DIAPHRAGMS[2]	(x 14.5939 for N/m)
a. Roofs with straight sheathing and roofing applied directly to the sheathing	100 pounds per foot seismic shear
b. Roofs with diagonal sheathing and roofing applied directly to the sheathing	250 pounds per foot seismic shear
c. Floors with straight tongue-and-groove sheathing	100 pounds per foot seismic shear
d. Floors with straight sheathing and finished wood flooring with board edges offset or perpendicular	500 pounds per foot seismic shear
e. Floors with diagonal sheathing and finished wood flooring	600 pounds per foot seismic shear
2. CROSSWALLS[2,3]	(x 14.5939 for N/m)
a. Plaster on wood or metal lath	per side: 200 pounds per foot seismic shear
b. Plaster on gypsum lath	175 pounds per foot seismic shear
c. Gypsum wallboard, unblocked edges	75 pounds per foot seismic shear
d. Gypsum wallboard, blocked edges	125 pounds per foot seismic shear
3. EXISTING FOOTINGS, WOOD FRAMING, STRUCTURAL STEEL AND REINFORCE STEEL	(x 6.895 for kPa)
a. Plain concrete footings	f'_c = 1,500 psi unless otherwise shown by tests[4]
b. Douglas fir wood	Allowable stress same as D.F. No. 1[4]
c. Reinforcing steel	f_t = 18,000 psi maximum[4]
d. Structural steel	f_t = 20,000 psi maximum[4]

1 Material must be sound and in good condition.

2 A one-third increase in allowable stress is not allowed

3 Shear values of these materials may be combined, except the total combined value shall not exceed 300 pounds per foot (2068.43 kPa).

4 Stresses given may be increased for combinations of loads as specified in this code

TABLE 4B-E — ALLOWABLE VALUES OF NEW MATERIALS USED IN CONJUNCTION WITH EXISTING CONSTRUCTION

NEW MATERIALS OR CONFIGURATIONS OF MATERIALS	*ALLOWABLE VALUES*[1]
1. HORIZONTAL DIAPHRAGMS[10]	(x 14.5939 for N/m)
a. Plywood sheathing nailed directly over existing straight sheathing with ends of plywood sheets bearing on joists or rafters and edges of plywood located on center of individual sheathing boards	225 pounds per foot seismic shear
b. Plywood sheathing nailed directly over existing diagonal sheathing with ends of plywood sheets bearing on joists or rafters	375 pounds per foot seismic shear

c. Plywood sheathing nailed directly over existing straight or diagonal sheathing with ends of plywood sheets bearing on joists or rafters with edges of plywood located over new blocking and nailed to provide a minimum nail penetration into framing and blocking of 1 5/8 inches (41.28 mm)	75 percent of the values specified in Port of San Francisco Building Code Table 2306.2.1(1)
2. SHEAR WALLS: (GENERAL PROCEDURE)	
Plywood sheathing applied directly over wood studs. No value shall be given to plywood applied over existing plaster or wood sheathing.	100 percent of the value specified in Port of San Francisco Building Code Table 2306.2.1(2) for shear walls
3. CROSSWALLS: (SPECIAL PROCEDURE)	
a. Plywood sheathing applied directly over wood studs. No value shall be given to plywood applied over existing plaster or wood sheathing	133 percent of the value specified in Port of San Francisco Building Code Table 2306.2.1(2) for shear walls
b. Drywall or plaster applied directly over wood studs	100 percent of the values in Port of San Francisco Building Code Table 2306.3(3)
c. Drywall or plaster applied to sheathing over existing wood studs	The values in Port of San Francisco Building Code Table 2306.3(3) reduced as noted in Footnote a of that table[2]
4. TENSION BOLTS	(x 4.448 for N)
a. Bolts extending entirely through unreinforced masonry walls secured with bearing plates on far side of a 3 wythe minimum wall with at least 30 square inches (19,355 mm2) of area[3,4,11]	1,800 pounds per bolt8 900 pounds per bolt for 2 wythe walls[8]
b. Bolts extending to the exterior face of the wall with a 2½-inch (63.5 mm) round plate under the head and drilled at an angle of 22½ degrees to the horizontal, installed as specified for shear bolts[3,4,5]	1,200 pounds per bolt
5. SHEAR BOLTS	
Bolts embedded a minimum of 8 inches into unreinforced masonry walls and centered in a 2½-inch diameter hole filled with dry-pack or non- shrink grout. Through bolts with first 8 inches as noted above and embedded bolts as noted in item 4b. [4,5,9]	½ inch dia. = 350 pounds[7,8] 5/8 inch dia. = 500 pounds[7,8] ¾ inch dia. = 750 pounds[7,8]
6. INFILLED WALLS	
Reinforced masonry infilled openings in existing unreinforced masonry walls. Provide keys or dowels to match reinforcing.	Same values as for unreinforced masonry walls
7. REINFORCED MASONRY	
Masonry piers and walls reinforced per Port of San Francisco Building Code Chapter 21	Same values as specified in Port of San Francisco Building Code Section 2107[6]
8. REINFORCED CONCRETE	
Concrete footings, walls and piers reinforced as specified in Port of San Francisco Building Code Chapter 19 and designed for tributary loads	Same values as specified in Port of San Francisco Building Code Chapter 19[6]

1 A one-third increase in allowable stress is not allowed, except as noted.

2 In addition to existing sheathing value.

3 Bolts to be ½ inch (1.27 mm) minimum in diameter.

4	**Drilling for bolts and dowels shall be done with an electric rotary drill. Impact tools shall not be used for drilling holes or tightening anchors and shear bolt nuts.**
5	**Embedded bolts to be tested as specified in Section 407B ~~1607C~~.**
6	**Stress given may be increased for combinations of load as specified in this code.**
7	**A one-third increase in allowable stress is allowed for short-term loading.**
8	**Other bolt sizes, values and installation methods may be used, provided a testing program is conducted in accordance with Section 415B ~~1615C~~. Bolt spacing shall not exceed 6 feet (1.83 m) on center and shall not be less than 12 inches (0.305 m) on center.**
9	**Tension and shear from seismic loads need not be assumed to act simultaneously.**
10	**Values and limitations are for nailed plywood. Higher values may be used for other approved fastening systems such as staples when approved by the Chief Harbor Engineer.**
11	**Plate size may be reduced to not less than 9 square inches (5805 mm^2), provided the bearing stress on the masonry at design load does not exceed 60 pounds per square inch, psi (414 kPa).**

Chapter 4C
PARAPETS AND APPENDAGES – RETROACTIVE PROVISIONS

Add Chapter as follows:

Chapter 4C
PARAPETS AND APPENDAGES – RETROACTIVE PROVISIONS

SECTION 401C — GENERAL

Every parapet or appendage which is supported on or attached to an exterior wall of a building adjacent to a property line, passageway, open courtyard or public way or which occurs in any other location where failure of such parapet or appendage would be hazardous to life or limb in such areas shall, when required by the Chief Harbor Engineer, be subject to inspection by a licensed architect or civil engineer employed by the tenant. The provisions of this section are retroactive and shall apply to and include buildings erected prior to the adoption of this code.

SECTION 402C — CORRECTION OF HAZARDOUS PARAPETS AND APPENDAGES

Whenever the Chief Harbor Engineer determines, by visual inspection or from the report furnished by the architect or civil engineer, that an existing parapet or appendage which is within the scope of this section is not adequate to resist the lateral forces due to earthquake as detailed in Chapter 16 of the Port of San Francisco Building Code which was in effect on July 1, 1969, the Chief Harbor Engineer shall conclude that inadequacies exist and shall, by written notice to the tenant or person or the agent in charge of the building, direct that necessary steps be taken to eliminate the hazard.

Upon receipt of such notice, the tenant or person or agent in control of the building where such hazardous parapet or appendage exists shall:

1. **Within one year from the date of receipt of such notice:**

   (1) **Submit to the Chief Harbor Engineer an acceptable written plan or procedure for the elimination of the hazardous condition by removal or alteration of the hazardous parapet or appendage.**

   (2) **Obtain the necessary alteration permit in accordance with the procedures set forth in Port of San Francisco Building Code Section 106A.**

2. **Within one year after obtaining the alteration permit, complete all work indicated on the approved construction documents. A one-year extension may be granted by the Chief**

Harbor Engineer when mitigating circumstances exist.

SECTION 403C — VARIANCE PROCEDURE

Any person receiving a notice as set out in Section 402C above may appeal for a variance from the notice to the Chief Harbor Engineer in the manner provided by Port of San Francisco Building Code Section 105A.1.

SECTION 404C — UNREINFORCED MASONRY PARAPETS AND APPENDAGES

The removal, stabilization or bracing of unreinforced masonry parapets or appendages, the application for a permit for which was filed after February 15, 1993, shall comply with Section 413B.6. Certain parapets or appendages, previously exempted under this section, shall be removed, or stabilized, or braced when required by Section 413B.6.

Chapter 5 to Chapter 15

These chapters are not adopted in San Francisco.

Chapter 16

REFERENCED STANDARDS

No Port of San Francisco Existing Building Code Amendments

Add the following appendices:

CALIFORNIA EXISTING BUILDING CODE (CEBC) APPENDICES

(CEBC) APPENDIX A CHAPTER A1 SEISMIC STRENGTHENING PROVISIONS FOR UNREINFORCED MASONRY BEARING WALL BUILDINGS

No Port of San Francisco Existing Building Code Amendments

REFERENCED STANDARDS

No Port of San Francisco Existing Building Code Amendments

(CEBC) APPENDIX A CHAPTER A3 PRESCRIPTIVE PROVISIONS FOR SEISMIC STRENGTHENING OF CRIPPLE WALLS AND SILL PLATE ANCHORAGE OF LIGHT, WOOD-FRAME RESIDENTIAL BUILDINGS

No Port of San Francisco Existing Building Code Amendments

(CEBC) APPENDIX A CHAPTER A4 EARTHQUAKE RISK REDUCTION IN WOOD-FRAME RESIDENTIAL BUILDINGS WITH SOFT, WEAK OR OPEN FRONT WALLS

No Port of San Francisco Existing Building Code Amendments

(CEBC) APPENDIX A CHAPTER A6 REFERENCED STANDARDS

No Port of San Francisco Existing Building Code Amendments