



Technical Bulletin (TB) 15.27-1
Engineering Requirements for Complying with
Oakland Municipal Code Chapter 15.27

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Part A. Administrative Provisions

A.1 Applicability

A.1.1. Purpose of this Bulletin. The purpose of this Bulletin is to establish requirements and code official interpretations regarding compliance with Oakland Municipal Code (OMC) Chapter 15.27.

Commentary: OMC Chapter 15.27 was created by Ordinance 13516 with an effective date of January 22, 2019. The Chapter 15.27 provisions are available at https://library.municode.com/ca/oakland/codes/code_of_ordinances?nodeId=TIT15BUCO_CHI5.27MASEEVRECEMUITREBU

This Bulletin does not replace either the Ordinance or OMC Chapter 15.27. It is a supplement to the requirements in the Ordinance and the OMC, produced by the Bureau of Building in accordance with OMC Section 15.27.180, which authorizes the Bureau, as the designee of the City Administrator, to develop “interpretations, clarifications, forms, and commentary to facilitate implementation of the engineering criteria and other requirements [of OMC Chapter 15.27].”

Electronic copies of this bulletin and other program materials are available at the program’s website: www.oaklandca.gov/topics/ssretrofit

A.1.2. Use of this Bulletin. This Bulletin addresses the engineering requirements of OMC Chapter 15.27, as follows:

- Mandatory seismic evaluation of building components other than the structural system of any target story, as required by OMC Sections 15.27.050.C and 15.27.165, shall comply with Part B of this Bulletin.
- Except where compliance by evaluation is demonstrated, mandatory seismic retrofit of the target story or stories, as required by OMC Sections 15.27.050.D and 15.27.170, shall comply with either Part C or Part D of this Bulletin.
- Evaluation of the target story or stories to demonstrate compliance without retrofit, as allowed by OMC Sections 15.27.050.D and 15.27.170, shall comply with Part D of this Bulletin.

Commentary: The term “target story” is defined in OMC Section 15.27.150 and in Parts C and



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D of this Bulletin. Compliance with OMC Chapter 15.27 involves five “steps” represented by the five columns of Table 15.27.070: Compliance Deadlines. The table is reproduced here for reference, with the step numbers and the actual deadlines added. For notification purposes, the Bureau has created two subcategories within Tier 1: Tier 1-NR and Tier 1-LB. Both are subject to the Tier 1 requirements and deadlines given in OMC Chapter 15.27.

With reference to the table, this Bulletin addresses only Steps 3, 4, and 5. Information and instructions for complying with the optional Steps 1 and 2 are given on the program’s website.

Table 15.27.070, modified: Compliance Deadlines

<i>Building Group or Compliance Tier</i>	<i>Compliance Scope Item</i>				
	<i>STEP 1. Document that building is not a subject building (optional) (15.27.050.A)</i>	<i>STEP 2. Document that building is eligible for a later compliance tier (optional) (15.27.050.B)</i>	<i>STEP 3. Perform mandatory evaluation and submit initial affidavit of compliance (15.27.050.C and F)</i>	<i>STEP 4. Obtain retrofit permit or submit target story evaluation report (15.27.050.D.1 or D.2)</i>	<i>STEP 5. Perform retrofit work and obtain approval on final inspection; submit final affidavit of compliance (15.27.050.D.3 and E)</i>
<i>Non-subject buildings</i>	<i>2/21/2020</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>
<i>Tier 1-NR or Tier 1-LB</i>	<i>NA</i>	<i>2/21/2020</i>	<i>2/21/2021</i>	<i>2/21/2022</i>	<i>2/21/2023</i>
<i>Tier 2</i>	<i>NA</i>	<i>2/21/2020</i>	<i>2/21/2022</i>	<i>2/21/2023</i>	<i>2/21/2024</i>
<i>Tier 3</i>	<i>NA</i>	<i>2/21/2020</i>	<i>2/21/2023</i>	<i>2/21/2024</i>	<i>2/21/2025</i>

A.1.3. Other regulations. Unless otherwise specified, work considered by this Bulletin is subject to all City of Oakland regulations and procedures applicable to building alteration projects.

Commentary: The main purpose of this Bulletin is to reference, modify, and interpret ASCE 41 and CEBC Chapter A4, as shown in Parts B through D. All work done to comply with OMC Chapter 15.27 should otherwise comply with normal regulations and procedures, including those related to design review, permitting, fees, and inspections.

A.2 Documentation

A.2.1. Combined work scopes. Non-mandatory seismic improvements may be shown on the same plans and regulated under the same permits as mandatory seismic retrofit work, subject to the approval of the building official. Mandatory and non-mandatory seismic improvements shall be clearly delineated on the permit application. Non-seismic alteration work may be shown on the same plans as seismic



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improvements but shall be regulated under separate permits.

Commentary: This provision anticipates that owners might choose to make additional seismic improvements based on the seismic evaluation required by Section 15.27.050.C (see also Part B of this Bulletin). Some might choose to make non-seismic alterations associated with adding an Additional Unit, as allowed by Section 3 of the Ordinance, which adds Section 17.102.250 to the Oakland Planning Code.

A.2.2. Permit Application Worksheet.

A.2.2.1. Mandatory seismic retrofit. Where retrofit of the target story is required, the Permit Application Worksheet shall identify the Type of Work as “Retrofit” and shall include, in the Description of Proposed Work, the following: “Mandatory seismic retrofit designed to comply with OMC Chapter 15.27.”

Commentary: Structural retrofit of the target story, where required, is the only mandatory seismic retrofit contemplated by OMC Chapter 15.27.

A.2.2.2. Non-mandatory seismic retrofit. Where seismic retrofit in addition to the mandatory seismic retrofit is proposed, the Permit Application Worksheet shall identify the Type of Work as “Retrofit” and shall include, in the Description of Proposed Work, the following: “Non-mandatory seismic retrofit.”

Commentary: Non-mandatory seismic retrofit is any seismic improvement to the structure or to nonstructural components that is not required for compliance with OMC Chapter 15.27. In general, any seismic improvement that is not part of the target story retrofit is non-mandatory. Providing more capacity within the target story retrofit than is strictly required by the design criteria is considered part of the mandatory seismic retrofit.

A.2.3. Plans. Submitted plans shall include all information and details needed to properly construct all of the intended work. Any non-mandatory seismic retrofit work and any non-seismic alteration shall be clearly identified and distinguished from the mandatory seismic retrofit work. In addition, submitted plans shall include:

1. As part of the Project Title, the words “OMC Chapter 15.27 seismic retrofit.”
2. In the Background Information section, the following: “Mandatory seismic retrofit designed to comply with OMC Chapter 15.27.”
3. Existing conditions requiring verification during construction, clearly identified, and coordinated with the structural calculations.
4. Information required by the reference code or standard used, as modified in Part C or Part D of this Bulletin.

Commentary: Non-seismic alteration is any optional work that is neither mandatory seismic



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retrofit nor non-mandatory seismic retrofit. Work done to create one or more Additional Units, as allowed by Section 17.102.250 of the Oakland Planning Code, is an example of non-seismic alteration. Replacement of architectural elements, equipment, and other non-structural components that had to be removed to implement the mandatory or non-mandatory seismic retrofit is considered part of that seismic work and is not considered non-seismic alteration.

A.2.4. Structural calculations. Submitted calculations shall include all information needed to support and validate the submitted plans and to demonstrate compliance with this Bulletin. The calculations shall include:

1. A statement that the calculations are intended to comply with OMC Chapter 15.27.
2. For any non-mandatory seismic retrofit work or non-seismic alteration, a statement and description of the proposed engineering criteria.
3. A listing of existing conditions assumed for purposes of condition assessment and structural design, each of which shall also be identified on the plans as requiring verification during construction.
4. All building investigation, soils, geotechnical, condition assessment, or other supporting reports, as well as a summary of such reports indicating how the findings or conclusions are reflected in the structural calculations.
5. Identification of structural properties and capacities assumed for all existing materials and elements, including any capacity reductions for damage, deterioration, or defect.
6. Identification of structural properties and capacities assumed for all new materials and elements, including product literature for proprietary devices or systems.
7. If requested by the building official, verification calculations for any engineering software used.
8. Other information as required by the building official.

A.3 Quality assurance

A.3.1 Structural observation. Structural observation, in accordance with Section 1704.6 of the *California Building Code*, is required, regardless of seismic design category, height, or other conditions. Structural observation shall include visual observation of work for conformance to the approved construction documents and confirmation of existing conditions assumed during design.

A.3.2 Contractor responsibility. Contractor responsibility shall be in accordance with Section 1704.4 of the *California Building Code*.

A.3.3 Testing and inspection. Structural testing and inspection for new construction materials, submittals, reports, and certificates of compliance, shall be in accordance with Sections 1704 and 1705 of



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the *California Building Code*. Work done to comply with OMC Chapter 15.27 shall not be eligible for Exceptions 1, 2, or 3 to *California Building Code* Section 1704.2 or for the Exception to *California Building Code* Section 1705.12.2.



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Part B. Engineering Criteria for Mandatory Seismic Evaluation and Schematic Retrofit Report

Commentary: With reference to the Compliance Deadlines table above, Part B addresses “Step 3: Perform mandatory evaluation and submit initial affidavit of compliance.” OMC Section 15.27.050.C calls for an evaluation and a schematic retrofit report, with criteria given in OMC Section 15.27.165. The purpose of the evaluation and schematic retrofit report is to provide the owner with information about seismic risks other than the vulnerable target story, especially risks that are expected to be relatively easy to mitigate while the target story is retrofitted. If deficiencies identified by this evaluation are proposed to be retrofitted, that work is considered non-mandatory seismic retrofit.

B.1 Reference standard. The mandatory seismic evaluation shall use the 2017 edition of *Seismic Evaluation and Retrofit of Existing Buildings* [ASCE/SEI 41-17], referenced here as ASCE 41.

Commentary: Use of ASCE 41 is specified by OMC Section 15.27.165.

B.2 Scope of evaluation. The mandatory seismic evaluation shall include all procedures prescribed by ASCE 41 for a Tier 1 Screening with a performance objective of Nonstructural Life Safety with the BSE-1E hazard. Using ASCE 41 Table 17-38, the scope of the evaluation shall consider at least the following potential deficiencies located anywhere in the building:

- Hazardous Materials: Shutoff Valves, Flexible Couplings
- Partitions: Unreinforced Masonry (including boiler room partitions)
- Masonry Veneer: Ties, Shelf Angles, Weakened Planes, Unreinforced Masonry Backup, Anchorage, Weep Holes
- Parapets, etc.: URM Parapets or Cornices, Canopies, Concrete Parapets, Appendages
- Masonry Chimneys: URM Chimneys, Anchorage
- Mechanical and Electrical Equipment: Fall-Prone Equipment (including gas-fueled water heater tanks).

Commentary: In accordance with OMC Section 15.27.165, “The Bureau of Building is authorized to determine the required scope of the building evaluation.” This section of the Bulletin gives the Bureau’s required minimum scope. The scope was determined by considering potential falling hazards, egress hazards, and fire hazards that are likely to be cost-effectively identified and mitigated during the course of the target story retrofit.

Compliance with this section is independent from, and does not relieve the owner of responsibility for, compliance with any other housing or building regulation, including review of decks and balconies.

A template with the listed items from ASCE 41 Table 17-38 is available on the program website.



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B.3 Schematic retrofit report. For each evaluation scope item classified as Noncompliant or Unknown, a schematic retrofit report shall briefly describe a mitigation measure that, if implemented, would allow the scope item to be reclassified as Compliant or Not Applicable.

Commentary: OMC Section 15.27.050.C calls for a “schematic retrofit report” to accompany the evaluation. Design calculations, drawings, and cost estimates are not required but may be provided by agreement between the Owner and the design professional.

B.4 Affidavit of compliance. The Owner shall timely submit to the Bureau of Building an affidavit of compliance with the minimum requirements described in this Part.

Commentary: In accordance with OMC Section 15.27.050.F, compliance with the Step 3 requirements is demonstrated by submitting a signed affidavit. A blank affidavit form is available on the program website.

The engineer responsible for the evaluation and schematic retrofit report need not sign the affidavit but may prepare the affidavit for the Owner’s signature and may submit it on the Owner’s behalf. The evaluation and schematic retrofit report itself need not be submitted and will not be reviewed or approved by the Bureau. While the affidavit is required to show compliance with OMC Chapter 15.27, there is no requirement in Chapter 15.27 for the Owner to address any potential deficiencies identified by the evaluation.

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Part C. Engineering Criteria for Target Story Retrofit Using CEBC Chapter A4

C.1 Reference code. Appendix Chapter A4 of the current edition of the *California Existing Building Code* (Chapter A4), as adopted and amended by OMC Title 15 and as further modified and interpreted by Section C.2 of this Bulletin, shall be permitted as the criteria for mandatory seismic retrofit to comply with OMC Chapter 15.27. Any code references within Chapter A4 shall be construed to refer to the corresponding provisions of the *California Building Code* (CBC), the *California Existing Building Code* (CEBC), and their reference standards, as adopted and amended by the City of Oakland.

Commentary: OMC Section 15.27.170 allows either CEBC Chapter A4 or ASCE 41 to be used as the retrofit design criteria. Therefore, Part C allows but does not require Chapter A4. (Part D covers the use of ASCE 41.) Some buildings subject to OMC Chapter 15.27 will be able to comply by evaluation, with no retrofit needed, but only ASCE 41 (as interpreted in Part D) is allowed as the basis for compliance by evaluation, since Chapter A4 is not written as an evaluation methodology.

The current CEBC is the 2016 edition. When the 2019 CEBC becomes effective, it will be applicable instead. The 2019 Chapter A4 will be based on the 2018 International Existing Building Code (IEBC) and is essentially identical to the 2015 IEBC (and 2016 CEBC) versions. Both editions as published by ICC are available in read-only mode at <https://codes.iccsafe.org/public/collections/I-Codes>. Until the 2019 CEBC becomes effective, the 2018 IEBC Chapter A4 may be used instead of the 2016 CEBC Chapter A4, with building official approval.

OMC Section 15.27.170 also allows the California Historical Building Code as retrofit criteria for eligible historic buildings. Demonstration of eligibility and modifications to Chapter A4 based on the CHBC should be proposed and will be approved on a case-by-case basis.

The commentary below also refers in places to FEMA P-807 (May 2012), titled Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings With Weak First Stories, available at: https://www.fema.gov/media-library-data/20130726-1916-25045-2624/femap_807.pdf

C.2 Modification and interpretation of CEBC Chapter A4

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

A401.2 Scope. *Omit this section.*

Commentary: In the context of OMC Chapter 15.27, the applicability of Chapter A4 is established by the Ordinance and by the definition of Subject Buildings in OMC Section 15.27.030.



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A402 Definitions. *Add, omit, or revise as follows:*

GROUND FLOOR. *Omit this definition.*

Commentary: This term is omitted because it is unnecessary and could be confused with the new term Target Story. In Chapter A4, the term is used in only two places: the exception to A403.2, which is omitted (see below), and A404.1, where the plain English meaning is sufficient.

STORY STRENGTH. *Omit this definition.*

Commentary: This definition is omitted because it is unnecessary and to avoid conflict with “expected story strength” as used in Section A403.3.1. It is used only once in Chapter A4, in the definition of “weak wall line,” but that definition is itself unnecessary because of the new definition of Target Story.

TARGET STORY. Either (1) a basement story or underfloor area that extends above grade at any point or (2) any story above grade, where the wall configuration of such basement, underfloor area, or story is substantially more vulnerable to earthquake damage than the wall configuration of the story above, except that a story is not a target story if it is the topmost story or if the difference in vulnerability is primarily due to the story above being a penthouse or an attic with a pitched roof.

Commentary: This definition, given in OMC Section 15.27.150, is added as a preferred way to refer to the structural deficiency of interest in Chapter A4 and the subject of mandatory seismic retrofit.

- *The definition simplifies and clarifies the Chapter A4 terminology. Chapter A4 and this Bulletin call for consideration of whole stories, but Chapter A4 only defines its critical deficiencies in terms of wall lines and does not clearly recognize complexities posed by sloped sites (e.g. the target story might not be the ground story, and a building might have more than one target story). That said, any story that contains a soft wall line, a weak wall line, or an open-front wall line as defined in Chapter A4 would normally be considered a target story.*
- *Because the definition is not quantitative, it usefully relies on the judgment of engineers or other qualified design professionals; Step 1, described in the Compliance Deadlines table above, offers each owner noticed by the City an opportunity to demonstrate that the building in question has no target stories or wood frame target stories.*
- *By including underfloor areas, the definition avoids confusion about crawl spaces and the building code definition of “story,” especially on sloped sites.*
- *The definition facilitates coordination with similar programs in Berkeley and San Francisco and with the voluntary SHOP program already in effect in Oakland.*

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WOOD FRAME TARGET STORY. A target story in which a significant portion of lateral or torsional story strength or story stiffness is provided by wood frame walls.

Commentary: Together with the definition of target story, this definition, also given in OMC Section 15.27.150, identifies the deficiency of interest in Chapter A4 and the subject of mandatory seismic retrofit. As with the definition of target story, the definition of wood frame target story relies intentionally on the judgment of design professionals.

A403.1 General. Omit the exception and revise the first sentence as follows: All modifications required by the provisions in this chapter shall be designed in accordance with the *California Building Code* provisions for new construction, except as modified or otherwise allowed by this chapter and by TB 15.27-1.

Commentary: The exception is omitted because the additional phrase “or otherwise allowed” makes it moot.

A403.2 Scope of analysis. References to “soft, weak, or open-front wall line” shall be taken to mean “wood frame target story.” Omit the exception.

Commentary: By substituting the definition of wood frame target story, this modification clarifies the scope of work. (It also makes the two sentences about podium structures and hillside conditions largely moot.) The exception is omitted because it improperly focuses on individual wall lines; any reduced retrofit scope should be justified by full-story calculations. Also, many cases that would be covered by the exception are also covered by the prescriptive solution of Section A404.

A403.3 Design base shear and design parameters. Correct Δ_0 to Ω_0 in multiple places. Add Exceptions 4 and 5 and subsections A403.3.1 and A403.3.2:

Commentary: Where applicable, the allowance for a capped base shear coefficient in ASCE 7 Section 12.8.1.3 may be applied so that the value of $0.75S_{DS}$, including the 75 percent factor allowed by Chapter A4 Section A403.3, need not be taken greater than 1.00.

Exception 4: For retrofit systems involving different seismic force-resisting systems in the same direction within the same story, resisting elements are permitted to be designed using the least value of R for the different structural systems found in each independent line of resistance if the following conditions are met: (1) The building is assigned to Risk Category I or II (2) The building height is no more than four stories above grade plane, and (3) the seismic force-resisting systems of the retrofitted building comprise only wood structural panel shear walls, steel moment-resisting frames, steel cantilever columns, and steel braced frames. Values for C_d and Ω_0 shall be consistent with the R value used.

Exception 5: With reference to ASCE 7 Table 12.2-1, ordinary, intermediate, and special steel systems and all light-frame systems shall be permitted without limitation where those systems are used only for retrofit of target stories.

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Commentary: More than one of the exceptions to Section 403.3 can apply in a single building. Added Exception 4 implements the SEAONC recommendation to allow retrofit schemes that involve different structural systems on different lines. Without this exception, a retrofit using an intermediate or ordinary steel frame along one line and wood structural panels elsewhere would be forced to over-design the wood elements. Exception 5 recognizes that height limits applicable when certain structural systems are used for a whole building should not apply when the same system is used only within a single story. In this regard, Exception 5 is like Exceptions 1 through 3, in that it decouples the design of the new retrofit system from non-conforming conditions in the existing structure.

A403.3.1 Expected story strength. Despite any other requirement of Section A403.3 or A403.4, the total expected strength of retrofit elements added to any target story need not exceed 1.7 times the expected strength of the story immediately above in a two-story building, or 1.3 times the expected strength of the story immediately above in a three-story or taller building, as long as the retrofit elements are located symmetrically about the center of mass of the story above or so as to minimize torsion in the target story. Calculation of expected story strength and identification of irregularities in Section A403.3 shall be based on the expected strength of all wall lines, even if sheathed with nonconforming materials. The strength of a wall line above the target story may be reduced to account for inadequate load path or overturning resistance.

Commentary: This added provision implements the allowance in OMC Section 15.27.170 that “the strength of a retrofitted Target Story need not exceed that required to develop the strength of stories above.” It is based on a SEAONC recommendation to cap the required strength, consistent with FEMA P-807. The expected strength of the story above may be calculated using the FEMA P-807 criteria. If the strength is reduced to account for an inadequate load path, as allowed, the load path should be documented by field observation and condition assessment; otherwise, the strength calculation should assume an adequate load path to avoid underestimating the upper story strength.

A403.3.2. Seismicity parameters, Site Class, and geologic hazards. Any building located in an area labeled “NEHRP E” on the latest USGS map of “Soil Type and Shaking Hazard in the San Francisco Bay Area” shall be assigned to Site Class E unless site-specific investigation in accordance with ASCE 7 Chapter 20 indicates otherwise. For any site designated as Site Class E, the value of F_a shall be taken as 1.3. Site-specific procedures are not required for compliance with OMC Chapter 15.27. Compliance with OMC Chapter 15.27 does not require mitigation of existing geologic site hazards such as liquefiable soil, fault rupture, or landslide.

Commentary: Other than this provision regarding Site Class E, Site Class shall be determined following the normal procedures for new construction, including the use of Site Class D as a default. The USGS map of Bay Area site classes is at <https://earthquake.usgs.gov/hazards/urban/sfbay/soiltype/map/>.



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Seismic hazard parameters as needed may be obtained from the SEAOC/OSHPD Seismic Design Maps, using “2015 IBC” as the Reference, at <https://seismicmaps.org/> or from the ATC Hazards by Location tool at <https://hazards.atcouncil.org/>.

Neither the SEAOC/OSHPD nor the ATC application, however, implements the additional requirement to take F_a as 1.3 in Site Class E; design professionals will need to make that adjustment separately. This requirement implements a SEAONC recommendation related to observed performance and recorded ground motions in the Loma Prieta earthquake.

The site-specific ground motion procedures normally required by ASCE 7 Section 11.4.8 are waived for these retrofit projects. Many buildings eligible for CEBC Chapter A4 would be exempt from site response analysis in any case by the exception to ASCE 7 Section 20.3.1. Similarly, mandatory seismic retrofit to comply with OMC Chapter 15.27 is deemed exempt from requirements of the Alquist-Priolo Earthquake Fault Zoning Act because the cost of the mandatory work is not expected to exceed 50 percent of the value of the structure (California Public Resources Code Section 2621.7).

A403.7 Collector elements. *Revise this section to read, “Collector elements shall be provided to transfer the seismic forces between the elements within the scope of Section A403.2.”*

Commentary: *This provision is revised to eliminate potential confusion over the words “other portions of the building,” which could be misread to mean even parts of the building outside the scope identified in Section A403.2.*

A403.8 Horizontal diaphragms. *Replace the entire section as follows:*

A403.8. Floor diaphragms. Floor diaphragms within the scope of Section A403.2 shall be shown to have adequate strength at the following locations:

1. For straight lumber sheathed diaphragms without integral hardwood flooring: Throughout the diaphragm. At the discretion of the building official, this requirement may be waived where the condition occurs only in relatively small portions of each dwelling unit.
2. For all other diaphragms: At locations where forces are transferred between the diaphragm and each new or strengthened vertical element of the seismic force-resisting system. Collector elements shall be provided where needed to distribute the transferred force over a greater length of diaphragm.

Exception: Where the existing vertical elements of the seismic force-resisting system are shown to comply with OMC Chapter 15.27 by evaluation, diaphragms need not be evaluated.

Commentary: *This replacement implements an interpretation considered appropriate for the limited objective of Chapter A4. The exception allows compliance by evaluation (Part D of this Bulletin) to focus on the vertical SFRS elements – the walls and frames – without considering a diaphragm deficiency by itself to justify an intrusive retrofit.*

Straight lumber sheathed diaphragms without integral hardwood flooring are weaker and more flexible than other diaphragm systems. Though there are no known collapses due to this

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condition, expected poor performance could compromise the building's ability to meet even the limited objective of Chapter A4. Integral hardwood flooring – but not newer “floating” wood flooring – provides significant added strength and stiffness. Even in buildings with original hardwood flooring, some remodeled, carpeted, or tiled areas might have had the original wood flooring removed. Areas of the diaphragm that form a roof for the target story (such as the portion of a garage that extends beyond the wall line above, or at a lightwell or building setback) are also unlikely to have hardwood flooring to supplement the straight sheathing. These areas should be identified as part of the condition assessment and evaluated. Small isolated areas without hardwood flooring are not expected to affect overall building performance, so the provision grants a waiver for these cases. As a rule of thumb, an area up to 150 square feet per unit might represent such an acceptable condition.

For other less vulnerable diaphragm types, the provision requires a local check for each new or strengthened SFRS element but does not require an overall analysis of the full diaphragm. The unit shear demand at each vertical element is calculated as the force in the element divided by the total length of the element and its collectors. The shear demand is then compared to the unit shear capacity of the diaphragm. Where demand is greater than capacity, either the diaphragm must be strengthened or the collector lengthened. An existing diaphragm can be strengthened by adding a wood structural panel soffit to the bottom of the floor joists in the critical area. Diaphragm capacity need not be checked at existing vertical elements that are not strengthened because (except for straight lumber sheathed diaphragms) it is assumed that the unit capacities of the existing vertical elements and the diaphragm are comparable.

A403.9 Wood-framed shear walls. *Add the following sentence at the end of the provision:* Where new sheathing is applied to existing studs to create new wood-framed shear walls, the new wall elements shall be considered bearing wall systems for purposes of determining seismic design parameters.

Commentary: Since existing studs are presumed to carry existing gravity loads, the walls they frame must be considered bearing walls, as opposed to “building frame” systems. This affects the selection of seismic design coefficients R , C_d , and Ω_0 .

A403.9.1 Gypsum or cement plaster products. *Replace the entire provision as follows:* Gypsum or cement plaster products shall not be used to provide the strength required by Section A403.3 or the stiffness required by Section A403.4.

Commentary: Since Chapter A4 is based on code provisions for new construction, code provisions and standards that allow like materials do not apply, and non-conforming materials are not allowed to be counted toward the minimum required strength. They must be considered, however, if the cap in Section 403.3.1 is applied, which is why the provision is modified.

Add Section A403.10 and subsections A403.10.1 and A403.10.2:

A403.10 Steel retrofit systems. Steel retrofit systems shall have strength and stiffness sufficient to resist the seismic loads and shall conform to the requirements of this section.



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A403.10.1 Special moment frames. Steel special moment frames shall comply with all applicable provisions of AISC 341, including but not limited to connection design and lateral bracing of beams. It is permitted to employ approved commercially available proprietary frame systems to achieve the special moment frame classification.

Exception: The “strong-column/weak-beam” provision of AISC 341-10, Section E3.4a is waived, provided that the columns carry no gravity load.

A403.10.2 Intermediate or ordinary moment frames. Steel intermediate or ordinary moment frames shall comply with all applicable provisions of AISC 341.

Commentary: See Section A403.3 Exception 5 as added by this Bulletin for a waiver on height limits otherwise applicable to these systems.

A403.10.3 Cantilevered column systems. Steel special or ordinary cantilevered column systems shall comply with all applicable provisions of AISC 341.

A403.10.4 Inverted moment frame systems. Cantilevered column systems shall be permitted to be designed as inverted special, intermediate, or ordinary moment frames, with corresponding moment frame seismic design coefficients, where the system satisfies the following conditions:

1. The columns carry no gravity load.
2. The columns are configured in pairs (or larger groups) connected by a continuous reinforced concrete foundation or grade beam.
3. The foundation or grade beam shall be designed to resist the expected plastic moment at the base of each column, computed as $R_y F_y Z$ in accordance with AISC 341.
4. The flexibility of the foundation or grade beam, considering cracked section properties of the reinforced concrete, shall be included in computing the deformation of the steel frame system.
5. The columns shall be considered as twice their actual height when checking lateral torsional buckling.

Commentary: This provision implements a SEAONC recommendation developed to accommodate a modification of traditional cantilevered column systems. Cantilevered column systems for new construction are normally assigned seismic design coefficients that severely limit their use. When used for retrofit of wood frame structures, however, the columns are less vulnerable to buckling failure because they carry no gravity load. SEAONC has therefore recommended that these cantilever column systems, configured as upside-down moment frame bents (with concrete cross beams), should be allowed to be designed as moment frame systems.

A404.1 Limitation. In the first sentence, omit the words “and only where deemed appropriate by the code official.”

Commentary: These prescriptive measures are deemed appropriate for compliance with OMC Chapter 15.27.

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A405.3 Existing materials. *No modification, but see commentary.*

Commentary: While an overall condition assessment is often beneficial, this provision is applicable primarily to the existing structural elements that will be relied on to provide the required strength and stiffness. If the cap allowed in Section 403.3.1 is used, this will include all existing elements contributing to the expected story strength in each target story and the story above, as well as diaphragms and foundations. If the cap is not used, the condition assessment may be limited to just the structural scope identified in Section A403.2. ASCE 41-17 provisions and commentary for condition assessment may be useful as a guide to the work. The investigation should be based on a combination of non-destructive testing or inspection, destructive testing or inspection, and reference to record documents. Where record documents are used to reduce the scope of testing or other on-site work, appropriate field verification is normally required. The building official is authorized to require additional investigation as needed to fulfill the purpose of the condition assessment. Findings of the condition assessment should be included with the structural calculations per Section A.2.4 of this Bulletin.

With the approval of the building official, field verification of assumed conditions may be performed during construction; in these cases adjustments to previously approved structural calculations and plans might be needed, which is why Section A.2.3 of this Bulletin calls for field verification items to be shown on the plans.

A405.3.6 Existing masonry partitions. *Add this subsection:* Masonry partitions or fire separation walls within a target story shall be investigated to determine their capacity to resist story shears and deformations, whether intended as seismic force-resisting elements or not. The investigation shall consider their material strength and condition, grouting and reinforcing, connections and continuity to stories above and foundation below, and related detailing and load path as they relate to likely performance in in-plane shear, out-of-plane shear, overturning moment, and uplift. Based on the investigation, the design professional shall document and substantiate a design approach and acceptability criteria.

Commentary: Some Oakland buildings are known to have concrete masonry fire separation partitions that might act as de facto seismic force-resisting elements, even if not designed to carry lateral forces and not detailed for ductile response. Since the construction of these partitions is not well documented, it is the responsibility of the design professional to understand their likely performance and to account for it in the retrofit design. In some cases, the walls might be usable as SFRS elements (as is, or as strengthened). In other cases, it might be preferable to isolate them from the seismic response by breaking the lateral load path, as long as necessary fire safety and support for gravity loads is maintained.

A405.3.7 Existing unreinforced brick footings. *Add this subsection:* The capacity of an existing brick footing to resist shear or pullout of an existing or new anchor shall be established by testing or by reference to approved tests of similar conditions.



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Commentary: Older buildings might have unreinforced brick footings. In general, these are unlikely to be adequate for new or strengthened shear walls, but the added provision allows a method to substantiate their capacity.

A406.1 General. *Omit this subsection.*

Commentary: Section A.2.3 of this Bulletin replaces Chapter A4 Section A406.1.

A406.2 Existing construction. *Add the following sentence to this subsection: If the cap allowed by Section A403.3.1 is used to limit the scope of retrofit, the foregoing information shall be shown for each target story and at least one story above the uppermost target story. If the cap allowed by Section A403.3.1 is not used, the foregoing information need only be shown for each target story and for the floor immediately above the uppermost target story.*

A407.1 Structural observation, testing and inspection. *Omit this subsection.*

Commentary: Section A.3 of this Bulletin replaces Chapter A4 Section A407.1.

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Part D. Engineering Criteria for Target Story Evaluation or Retrofit Using ASCE 41

D.1 Reference standard. ASCE 41, the 2017 version of *Seismic Evaluation and Retrofit of Existing Buildings*, as modified and interpreted by Section D.2 of this Bulletin, shall be permitted as the criteria for evaluation of existing target stories and for mandatory seismic retrofit where such retrofit is required.

Commentary: OMC Section 15.27.170 allows either ASCE 41 or CEBC Chapter A4 to be used as the retrofit design criteria. Therefore, Part D allows but does not require ASCE 41. (Part C covers the use of Chapter A4 for target story retrofit.) The phrase “where such retrofit is required” refers to the possibility that a subject building might comply by evaluation, with no retrofit needed. ASCE 41 may also be used as the basis for compliance by evaluation.

D.2 Definitions (ASCE 41 Section 1.2.1)

TARGET STORY. Either (1) a basement story or underfloor area that extends above grade at any point or (2) any story above grade, where the wall configuration of such basement, underfloor area, or story is substantially more vulnerable to earthquake damage than the wall configuration of the story above, except that a story is not a target story if it is the topmost story or if the difference in vulnerability is primarily due to the story above being a penthouse or an attic with a pitched roof.

Commentary: This definition, given in OMC Section 15.27.150, is added as a preferred way to refer to the structural deficiency of interest and the subject of mandatory seismic retrofit.

- Because the definition is not quantitative, it usefully relies on the judgment of engineers or other qualified design professionals; Step 1, described in the Compliance Deadlines table above, offers each owner noticed by the City an opportunity to demonstrate that the building in question has no target stories or wood frame target stories.
- By including underfloor areas, the definition avoids confusion about crawl spaces and the building code definition of “story,” especially on sloped sites.
- The definition facilitates coordination with similar programs in Berkeley and San Francisco and with the voluntary SHOP program already in effect in Oakland.

WOOD FRAME TARGET STORY. A target story in which a significant portion of lateral or torsional story strength or story stiffness is provided by wood frame walls.

Commentary: Together with the definition of target story, this definition, also given in OMC Section 15.27.150, identifies the deficiency of interest and the subject of mandatory seismic retrofit. As with the definition of target story, the definition of wood frame target story relies intentionally on the judgment of design professionals.

D.3 Scope of evaluation or retrofit (ASCE 41 Section 1.1)

D.3.1 Elements to be considered. Evaluation or retrofit to comply with OMC Chapter 15.27 need only consider the lateral load path elements from the wood diaphragm immediately above any wood frame

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target story to the foundation soil interface. Stories above the uppermost wood frame target story shall be considered in the analysis but need not be modified. The lateral-load-path analysis for added structural elements shall include evaluation of the allowable soil-bearing and lateral pressures in accordance with the building code.

Commentary: Normally, ASCE 41 is applied to an entire building or structure. OMC Section 15.27.160, however, makes clear that the intent of the chapter is to apply only to the building's wood frame target stories. The wording is consistent with the similar scope of CEBC Chapter A4, Section A403.2.

D.3.2 Required Retrofit Strength. Despite any other requirement of ASCE 41, the total expected strength of retrofit elements added to any target story need not exceed 1.7 times the expected strength of the story immediately above in a two-story building, or 1.3 times the expected strength of the story immediately above in a three-story or taller building, as long as the retrofit elements are located symmetrically about the center of mass of the story above or so as to minimize torsion in the target story. Calculation of expected story strength and identification of irregularities shall be based on the expected strength of all wall lines, even if sheathed with nonconforming materials. The strength of a wall line above the target story may be reduced to account for inadequate load path or overturning resistance.

Commentary: This added provision implements the allowance in OMC Section 15.27.170 that "the strength of a retrofitted Target Story need not exceed that required to develop the strength of stories above." This provision is consistent with this Bulletin's addition of Section A403.3.1 to CEBC Chapter A4 (see Part C). The provision is based on a SEAONC recommendation to cap the required strength, consistent with FEMA P-807. Strictly speaking, the allowance should not be needed if the ASCE 41 rules for selecting analysis procedures and for modeling secondary components are carefully followed. In concept, the strength cap could be applied to all elements (new and existing) in the target story, but it is applied only to retrofit elements to ensure that some ductility, reliability, and torsion control is provided.

The expected strength of the story above may be calculated using the FEMA P-807 criteria. If the strength is reduced to account for an inadequate load path, as allowed, the load path should be documented by field observation and condition assessment; otherwise, the strength calculation should assume an adequate load path to avoid underestimating the upper story strength.

D.4 Modification and interpretation of ASCE 41

D.4.1 Performance Objective (ASCE 41 Sections 1.4.1 and 1.5.2). For either evaluation or retrofit, the performance objective shall be Structural Life Safety in the BSE-1E seismic hazard.

Commentary: This objective is given in OMC Section 15.27.170.B. It need only be applied to the building elements identified in Bulletin Section D.3.1. As such, the mandatory seismic retrofit contemplated by OMC Chapter 15.27 is, in ASCE 41 terms, a partial retrofit in accordance with ASCE 41 Section 2.2.5.

OMC Chapter 15.27 does not require any nonstructural retrofit. See Bulletin Part B regarding

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mandatory nonstructural evaluation.

D.4.2 Seismic hazard, seismicity parameters and Site Class (ASCE 41 Section 2.4). Any building located in an area labeled “NEHRP E” on the latest USGS map of “Soil Type and Shaking Hazard in the San Francisco Bay Area” shall be assigned to Site Class E unless site-specific investigation in accordance with ASCE 7 Chapter 20 indicates otherwise. For any site designated as Site Class E, the value of F_a shall be taken as 1.3. Site-specific procedures are not required for compliance with OMC Chapter 15.27.

Commentary: Other than this provision regarding Site Class E, Site Class shall be determined following the normal procedures for new construction, including the use of Site Class D as a default. The USGS map of Bay Area site classes is at <https://earthquake.usgs.gov/hazards/urban/sfbay/soiltype/map/>.

Seismic hazard parameters as needed may be obtained from the SEAOC/OSHPD Seismic Design Maps, using “2015 IBC” as the Reference, at <https://seismicmaps.org/> or from the ATC Hazards by Location tool at <https://hazards.atcouncil.org/>.

Neither the SEAOC/OSHPD nor the ATC application, however, implements the additional requirement to take F_a as 1.3 in Site Class E; design professionals will need to make that adjustment separately. This requirement implements a SEAONC recommendation related to observed performance and recorded ground motions in the Loma Prieta earthquake.

The site-specific ground motion procedures normally required by ASCE 7 Section 11.4.8 are waived for these retrofit projects. Many buildings eligible for CEBC Chapter A4 would be exempt from site response analysis in any case by the exception to ASCE 7 Section 20.3.1. Similarly, mandatory seismic retrofit to comply with OMC Chapter 15.27 is deemed exempt from requirements of the Alquist-Priolo Earthquake Fault Zoning Act because the cost of the mandatory work is not expected to exceed 50 percent of the value of the structure (California Public Resources Code Section 2621.7).

D.4.3 Benchmark Buildings (ASCE 41 Section 3.3). In ASCE 41 Table 3-2, the benchmark code of 1976 UBC for Building Types W1 and W2 does not apply.

Commentary: Per OMC Section 15.27.030, the chapter applies to buildings constructed before 1991 or designed with the 1985 or earlier edition of the Uniform Building Code. Most buildings subject to OMC Chapter 15.27 will be type W1a and will therefore not be eligible for benchmarking with ASCE 41 Table 3-2, but this restriction is made for buildings that might be classified as type W1 or W2.

D.4.4 Performance Level and Seismic Hazard Level (ASCE 41 Sections 4.1.1 and 4.1.2). These sections do not apply.

Commentary: These ASCE 41 sections are moot, since the performance objective is given in Bulletin Section D.4.1. Since the given objective is consistent with the ASCE 41 “BPOE” objective, the Tier 1 and Tier 2 procedures are appropriate for buildings evaluated or retrofitted



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for compliance with OMC Chapter 15.27.

D.4.5 Selection and use of checklists (ASCE 41 Section 4.3). For evaluation of Structural Life Safety, the Tier 1 screening checklists for Collapse Prevention shall be used, except that checklist statements using Quick Check procedures shall be based on values provided for Life Safety performance.

Commentary: In ASCE 41-17, checklists are provided for the Immediate Occupancy and Collapse Prevention structural performance levels, but not explicitly for Life Safety. This provision clarifies how to use the checklists for the OMC Chapter 15.27 objective. It is consistent with footnote d to ASCE 41 Table 2-2.

D.4.6 Structural compliance (ASCE 41 Section 4.3 and Table 17-2). Compliance with OMC Chapter 15.27 using ASCE 41 requires full compliance with all applicable ASCE 41 provisions, unless specifically noted in this Bulletin. A finding of “Compliant” for the Weak Story and/or Soft Story Tier 1 checklist items shall not by itself indicate compliance with OMC Chapter 15.27.

D.4.7 Geologic site hazards (ASCE 41 Section 4.3 and Table 17-2). ASCE 41 Tier 1 checklist items for Liquefaction, Slope Failure, and Surface Fault Rupture do not apply.

Commentary: Compliance with OMC Chapter 15.27 does not require mitigation of existing geologic site hazards.

D.4.8 Modeling Primary and Secondary Components (ASCE 41 Section 7.2.3.3) Only primary components are to be modeled in linear analyses. In particular, for purposes of establishing the distribution of story forces, discontinuous upper story walls and partitions should not be modeled unless their stiffness is reduced to account for lack of overturning resistance or load path to elements below.

Commentary: This provision is consistent with this Bulletin’s addition of Section A403.3.1 to CEBC Chapter A4 (see Part C). See also the commentary to Bulletin Section D.3.2.

D.4.9 Modeling Overturning (ASCE 41 Section 7.2.8). Where dead loads alone are used to resist overturning, existing walls without hold-downs should be considered force-controlled for purposes of checking overturning. Existing walls without hold-downs may be considered deformation-controlled for purposes of checking shear strength, as long as the demands and capacities assigned to them account for the lack of hold-downs. Alternatively, where in accordance with ASCE 41 provisions for designating secondary elements, existing walls without hold-downs may be designated as secondary and removed from the linear model for purposes of distributing design forces to retrofit elements.