IR EB-5

DSA

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

Disciplines: Structural

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Division of the State Architect (DSA) documents referenced within this publication are available on the DSA Forms or DSA Publications webpages.

PURPOSE

This Interpretation of Regulations (IR) clarifies how DSA determines when a rehabilitation, as defined in California Administrative Code (CAC) Section 4-314, is required to an existing certified school building in accordance with CAC Sections 4-306 and 4-309(c), Item 2 or 3. CAC Section 4-309(c), addresses cases when the scope of a reconstruction, alteration, or addition results in changes to the existing building that impact the performance of the lateral-force-resisting system (Item 2) or its Risk Category classification (Item 3). The degree of impact is measured against thresholds defined by the regulation. This clarification is intended to promote consistent implementation and enforcement of these thresholds requiring rehabilitation, often referred to as “rehabilitation triggers”.

SCOPE

This IR is applicable to projects with scope including reconstruction, alteration, addition, or any combination thereof to one or more existing certified school buildings.

This IR is not applicable to reconstruction projects for the repair of fire damage in accordance with the Exception listed in CAC Section 4-309(a). This IR does not address the local strengthening requirements of CAC Section 4-309(a) for reconstruction, alteration, and addition projects when a rehabilitation is not required. These requirements are addressed in *IR EB-1: Existing Building Regulations Overview*.

Rehabilitation required by Item 1 of CAC Section 4-309(c) is not covered in this IR but is addressed in *IR EB-4: Rehabilitation Required by Cost*. Similarly, this IR does not address voluntary upgrades to the lateral-force-resisting system of an existing building as defined in CAC Section 4-309(d) and covered in *IR EB-6: Voluntary Seismic Upgrade*.

BACKGROUND

The CAC contains numerous provisions addressing new construction work in existing certified school buildings, which is generally categorized as reconstruction, alteration, or addition. When certain characteristics of such projects exceed the thresholds defined in CAC Section 4-309(c), a rehabilitation of the existing building is required.

CAC Section 4-306 defines the requirements of rehabilitation projects of existing certified school buildings. CAC Section 4-307 defines the requirements of rehabilitation projects for the purpose of converting nonconforming buildings to use as school buildings; the thresholds discussed in this IR are not applicable to the conversion of nonconforming buildings. Refer to *IR EB-2: Conversion of Nonconforming Building* for additional information.

The rehabilitation requirements of CAC Section 4-309(c), Items 2 and 3 intend to ensure that when significant changes impact the lateral-force-resisting system or raise the Risk Category classification, the building is evaluated holistically and brought into conformance with the safety standards of the current regulations.

1. GENERAL REQUIREMENTS

1.1 System Level Assessment

The thresholds established by CAC Section 4-309(c), Item 2 measure the degree of impact proposed changes have to an existing building's overall structure and lateral-force-resisting systems. These global measures identify changes to the existing building that require a rehabilitation. A rehabilitation is defined in CAC Section 4-314 and generally consists of an evaluation and resulting construction work to "bring the building, or portion thereof, into conformance with the safety standards of the currently effective regulations". Similar to the threshold measures, a rehabilitation applies globally to the entire building. Refer to *IR EB-3: Evaluation and Design Criteria Report* for additional details of a rehabilitation scope.

1.1.1 When the scope of the proposed reconstruction, alteration, or addition project does not require a rehabilitation by CAC Section 4-309(c), local evaluation and strengthening may still be required. Refer to CAC Section 4-309(a) for evaluation and strengthening requirements applicable to local elements impacted by the proposed changes. Determination that the thresholds of CAC Section 4-309(c), Item 2 are not exceeded does not preclude the requirements pertinent to local strengthening. See IR EB-1 for additional information.

1.1.2 Although the thresholds established by CAC Section 4-309(c), Item 2 pertain to the existing building's lateral-force-resisting system (i.e., the system resisting seismic and wind loads), when a limit is exceeded the required rehabilitation is not limited to the lateral-force-resisting system. The rehabilitation applies to all building systems governed by all Parts of Title 24, California Code of Regulations (CCR) as listed in the definition of rehabilitation in CAC Section 4-314. Furthermore, the following aspects of a required rehabilitation should be understood:

1.1.2.1 The scope of a rehabilitation is not limited to the loading condition associated with the exceeded threshold. For example, when a rehabilitation is required due to exceedance of a wind force threshold, the rehabilitated lateral force resisting system must comply with current code requirements for wind and seismic loads.

1.1.2.2 The scope of a rehabilitation is not limited to the principal axis associated with the exceeded threshold. As noted in the following sections, some threshold criteria are considered separately in each of the principal orthogonal axes of the building in plan. In these cases, when the criteria is exceeded in one but not both principal axes, the rehabilitation applies to the entire building, including the systems on both axes.

1.1.3 In accordance with CAC Section 4-306, a rehabilitation project requires the advance preparation, submission, and DSA approval of an Evaluation and Design Criteria Report (EDCR). Refer to IR EB-3 for additional information.

1.1.4 Existing buildings on many school campuses have historically been constructed with interconnecting exterior covered walkways. Such existing covered walkways commonly consist of light frame construction with or without columns and often do not include building separation details as required by current seismic code provisions. Existing covered walkways of this nature shall not be used to combine otherwise separate buildings for the purpose of assessing the scope thresholds established by CAC Section 4-309(c), Item 2. When there is doubt concerning the distinction of separate buildings, the district or design team should meet with the DSA regional office with jurisdiction over the project to obtain concurrence.

1.2 Cumulative Changes

Changes to the existing building assessed by the thresholds defined in CAC Section 4-309(c), Items 2A and 2B are "cumulative since the original construction".

1.2.1 Except as permitted by Section 1.2.4 below, the baseline to which all changes are compared shall be the existing building as first designed and delineated on the original construction drawings. This is not necessarily the current state of the building, as changes made during the life of the building are not included in the baseline except as permitted by Section 3.1.1.2 below.

1.2.2 Changes to the existing building after its original design and construction shall be cataloged as accumulated changes. This includes changes made as part of past DSA-certified reconstruction, alteration, or addition projects. Determination of whether a rehabilitation is required, therefore, necessitates that the responsible design professional collect data from all past projects for inclusion in the various threshold comparisons.

1.2.3 In some cases, the original construction drawings for an existing building may be lost, incomplete, or otherwise illegible to such an extent that uncertainty of the original construction renders the comparisons required by the regulation difficult to perform. In such cases, the district and their design team shall make an assessment based on field investigation and meet with the DSA regional office with jurisdiction over the project to obtain concurrence on the critical assumptions concerning prior construction.

1.2.4 After a rehabilitation project has been constructed and certified by DSA, the rehabilitated building is considered to be in conformance with the structural safety standards of the edition of Title 24, CCR under which the rehabilitation was approved. Certification of the rehabilitation project resets the baseline building configuration for future regulatory threshold comparisons. Future reconstruction, alteration, or addition projects need not include changes made before the rehabilitation in assessing the thresholds defined by CAC Section 4-309(c), Item 2. Neither local strengthening required by CAC Section 4-309(a) nor voluntary strengthening in accordance with CAC Section 4-309(d) resets the baseline for the comparison of future projects as a rehabilitation does.

1.3 Combined Effect

Where the proposed reconstruction, alteration, or addition project both increases demand to and reduces capacity of an existing building's lateral-force-resisting system, the impact of the change values determined in CAC Section 4-309(c), Items 2A and 2B shall be combined.

1.3.1 For example, the alteration of a single-story building may propose changes that result in an increase of the seismic roof weight by eight percent in combination with changes that reduce the capacity of the original shear walls by seven percent. While neither change taken independently exceeds 10 percent, the combined effect of these changes results in a 16 percent (1.08 / 0.93 = 1.16) increase in the demand-to-capacity ratio of the story. Because the combined effect exceeds the 10 percent threshold, a rehabilitation is required. Refer to Example A4 in Appendix A below for an additional example of this case.

1.3.2 When considering combined effects, a reduction in seismic weight or wind tributary area at any story is not permitted to offset a reduction in the lateral-force-resisting system for the purposes of evaluating the thresholds requiring rehabilitation. Refer to Example A5 in Appendix A below for an example of this case.

1.4 Application Submission

In accordance with form *DSA 3: Project Submittal Checklist*, Part 4, Section B, the submission of the reconstruction, alteration, and/or addition project shall include comparisons of each threshold required by the regulation and applicable to the project. The design professional shall prepare and present each comparison, which includes submitting all supporting information and documents upon which the comparisons are based.

2. INCREASE IN LATERAL FORCE

CAC Section 4-309(c), Item 2A addresses conditions whereby the reconstruction, alteration, or addition scope of work causes an increase in the overall seismic or wind force demand on the building's lateral-force-resisting system at any given story level. Revisions to the regulations since the time of the existing building's design and construction are likely to have changed the code-prescribed seismic and wind forces. However, this provision is constructed to identify changes in the lateral force demand resulting from the proposed scope of work, not changes to the building code or its adopted standards. For example, a decrease or increase in the code-prescribed seismic or wind parameters is not considered in the evaluation of these thresholds.

2.1 Seismic Weight

An increase in the effective seismic weight in any story by more than 10 percent requires a rehabilitation of the existing building.

2.1.1 As described in Section 1.2 above, changes to the seismic weight shall be taken as cumulative since the original construction.

2.1.1.1 Any existing seismic weight added during the life of the building shall be included as a portion of the cumulative increase in weight and shall not be included in the baseline seismic weight.

2.1.1.2 Similarly, the story weight comparison is permitted to consider reductions in the original seismic weight over the life of the building, including the proposed project, to offset past and proposed increases.

2.1.2 The following examples illustrate the determination of net cumulative change in seismic weight:

2.1.2.1 When a proposed alteration project scope includes the replacement of existing rooftop mechanical units that were included on the original construction drawings, the change in seismic weight of this work may be taken as the difference in unit weights.

2.1.2.2 When a proposed alteration project scope includes the replacement of existing rooftop mechanical units that were added during a previous modernization project (and did not exist in the original construction), the full weight of the new units shall be counted as increased seismic weight.

2.2 Wind Force

An increase in the wind load surface area for any story by more than 10 percent requires a rehabilitation of the existing building.

2.2.1 As described in Section 1.2 above, changes to the wind load surface area shall be taken as cumulative since the original construction.

2.2.1.1 Any existing surface area collecting wind loads that was added during the life of the building shall be included as a portion of the cumulative increase in surface area and shall not be included in the baseline surface area.

2.2.1.2 Similarly, the wind load surface area comparison is permitted to consider reductions in the original surface area over the life of the building, including the proposed project, to offset past and proposed increases.

2.2.2 The wind load surface area comparison shall be considered separately in each of the principal orthogonal axes of the building in plan. If any surface area collecting wind load is not parallel to the principal axes, the contribution of the nonparallel area to the story surface area in each direction shall be taken as its trigonometric projection onto each respective principal axis.

2.2.3 Either of the following methods are permitted to evaluate the change in surface area exposed to wind:

2.2.3.1 The profile of the original baseline building is projected onto a vertical plane in each orthogonal direction. The projected area is distributed to each story (i.e., floor or roof level) by creating dividing lines corresponding to the framing system of the exterior walls. For typical floor-to-floor or floor-to-roof framed walls, the dividing lines occur at the midpoint between floor/roof levels; however, spandrel framed systems vary. The process is repeated for the existing building with cumulative changes from reconstruction, alteration, and addition projects, including those proposed by the current project. The resulting surface areas at each story level are compared and evaluated according to the threshold.

2.2.3.2 The wind load demands prescribed for the main wind force resisting system by the current California Building Code (CBC) are determined for the original baseline building in each orthogonal direction. The overall wind load is distributed to each story (i.e., floor or roof level) in accordance with the CBC. The process is repeated for the existing building with cumulative changes from reconstruction, alteration, and addition projects, including those currently proposed. The resulting story-level wind forces are compared and evaluated according to the threshold.

3. LATERAL-FORCE-RESISTING SYSTEM REDUCTION

CAC Section 4-309(c), Item 2B addresses conditions whereby the reconstruction, alteration, or addition scope of work causes a reduction in the overall strength or stiffness of the building's lateral-force-resisting system at any given story level.

3.1 Strength Reduction

A reduction in the strength of the existing lateral-force-resisting system at any story by more than 10 percent requires a rehabilitation of the existing building. For the purposes of evaluating the strength reduction, any new strengthening proposed as part of the project shall not be considered. Refer to Appendix A below for example cases.

3.1.1 As described in Section 1.2 above, reduction to the story strengths of the lateral-force-resisting system shall be taken as cumulative since the original construction.

3.1.1.1 Any past reductions in the strength of the lateral-force-resisting system during the life of the building shall be included as a portion of the cumulative reduction in story strength and shall not be included in the baseline story strength.

3.1.1.2 In accordance with CAC Section 4-309(c), Item 2B, any past increases in the strength of the lateral-force-resisting system made through projects approved and certified by DSA are permitted to be included as part of the baseline story strengths. Past strengthening shall not be used to offset past or proposed (i.e., cumulative) story strength reductions. Refer to Example A3 in Appendix A below.

3.1.2 The story strength comparison shall not consider the net change in story strength proposed in the scope of the reconstruction, alteration, or addition project. While voluntary strengthening of the lateral-force-resisting system in accordance with CAC Section 4-309(d) is permitted, any strengthening included in the proposed project shall be neglected in the story strength comparison. Refer to Examples A2 and A3 in Appendix A below.

3.1.3 The story strength shall be determined from the primary components of the lateral-force-resisting system whose original design intent was the resistance of lateral wind and seismic forces. Existing secondary components (e.g., columns of the gravity-load-resisting system, partial height masonry or concrete infill walls, etc.) may have inherent lateral stiffness and, in a rehabilitation, will be required to demonstrate adequate deformation compatibility, but these shall be neglected for the purpose of the story strength comparison.

3.1.4 The story strength comparison shall be considered separately in each of the principal orthogonal axes of the building in plan. If the existing lateral-force-resisting system includes any line of lateral resistance that is not parallel to the principal axes, the strength of the nonparallel line contributory to the story strength in each direction shall be taken as the trigonometric projection of the in-plane strength onto each respective principal axis.

3.1.5 Story strength shall be based on the sum of all the lines of resistance in the direction of a given principal axis regardless of the relative stiffness of the diaphragm for the purpose of the story strength comparison.

3.2 Stiffness Reduction

A reduction in the stiffness of the lateral-force-resisting system at any story by more than 10 percent requires a rehabilitation of the existing building. For the purposes of evaluating the stiffness reduction, any new strengthening as part of the proposed project shall not be included.

3.2.1 The story stiffness comparison shall be based on the same lateral-force-resisting system configurations used for the story strength comparison as defined in Sections 3.1.1 through 3.1.4 above.

3.2.2 Where the diaphragm of the story under consideration is classified as rigid or semi-rigid in accordance with American Society of Civil Engineers (ASCE) Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7), Section 12.3 and a torsional irregularity per ASCE 7 Table 12.3-1 does not exist, the story stiffness comparison shall be based on the drift at the diaphragm’s center of mass.

3.2.3 Where the diaphragm of the story under consideration is classified as rigid or semi-rigid in accordance with ASCE 7 Section 12.3 and a torsional irregularity per ASCE 7 Table 12.3-1 does exist, the story stiffness comparison shall be based on the drift at the edge of the diaphragm where the most severe stiffness reduction occurs.

3.2.4 Where the diaphragm of the story under consideration is classified as flexible in accordance with ASCE 7 Section 12.3, the story stiffness comparison is permitted to be based on a simple sum of the stiffnesses of the vertical lateral force resisting elements at each story in each of the principal axes. Section 3.1.5 above applies to this comparison.

3.3 Shear Wall Systems

The following provisions apply to lateral-force-resisting systems consisting of shear walls.

3.3.1 When determining the story shear of the lateral-force-resisting system (and any corresponding reductions), shear walls shall be determined to be either shear-controlled or flexural-controlled. Flexural-controlled shear walls will not develop their full shear strength before yielding, and therefore only the shear force corresponding to flexural yielding is contributory to the story shear strength. It is permitted to treat all light-frame sheathed shear walls as shear-controlled.

3.3.2 When a new opening is introduced into an existing shear wall at a location that renders a remaining portion of the wall noncompliant with the aspect ratio requirement of the current regulations, the portion of wall made noncompliant by the proposed work ceases to contribute to the strength and stiffness of the story. Both the new opening and the noncompliant length of wall shall be considered reductions in the story strength and stiffness. Refer to Example A4 in Appendix A below. This consideration is specific to code prescribed aspect ratio requirements and, in light-frame sheathed shear walls, does not preclude achieving compliance through the addition of new holddown hardware or straps in conjunction with the new wall opening.

3.3.3 When light-frame wood shear walls require local repair of damage caused by water or moisture, refer to the Exception in IR EB-1 Section 5.4.

3.4 Braced Frame Systems

The following provisions apply to lateral-force-resisting systems consisting of braced frames.

3.4.1 The story strength of the lateral-force-resisting system (and any corresponding reductions) for a braced frame system is permitted to be determined by a plastic mechanism analysis. The plastic mechanism analysis shall be based on expected brace strengths in tension and compression.

3.4.2 When a single brace is removed as part of the reconstruction, alteration, or addition project the story strength shall be considered in the direction that results in the most severe reduction of strength. For existing buildings with conventional concentrically braced frames in balanced configurations (i.e., equal number of braces in tension and compression), this will mean considering the removed brace as acting in tension.

3.5 Moment Frame Systems

The following provisions apply to lateral-force-resisting systems consisting of moment frames.

3.5.1 The story strength of the lateral-force-resisting system (and any corresponding reductions) for a moment frame system is permitted to be determined by a plastic mechanism analysis. The portal method may be used to determine story strengths associated with the plastic mechanism. Other analysis methods may be utilized, provided they are applied consistently to both the existing and proposed structure configurations.

3.5.2 Where a strong-column/weak-beam relationship is verified, the plastic mechanism analysis shall assume the plastic hinge formation at each end of each moment frame beam.

3.5.3 Where the existing construction does not provide a strong-column/weak-beam relationship the plastic mechanism analysis must determine the sequence of yielding to establish the story strength.

4. STRUCTURAL IRREGULARITY

CAC Section 4-309(c), Item 2C addresses conditions whereby the reconstruction, alteration, or addition scope of work results in a structural irregularity that is prohibited by the CBC regulations for new building design. Some structural irregularities are prohibited based on Seismic Design Category by ASCE 7 Section 12.3.3, as modified by CBC Section 1617A.1.10.

4.1 Proposed Changes

4.1.1 The assessment for prohibited structural irregularities is based on an analysis of the structure including the proposed reconstruction, alteration, or addition project. Proposed voluntary strengthening of the lateral-force-resisting system as part of the project, including those designed to remediate prohibited irregularities, are permitted to be included in this analysis.

4.1.2 When a prohibited irregularity occurs in an existing building in the absence of (i.e., prior to) the proposed reconstruction, alteration, or addition, the structure shall be evaluated to determine if the proposed work worsens the existing irregularity. If the proposed work makes an existing prohibited irregularity more severe, a rehabilitation is required.

4.2 Extreme Soft Story Irregularity (Vertical Type 1b)

An extreme soft story irregularity could result from proposed work that changes the stiffness of the lateral-force-resisting system. The prohibited irregularity status could be influenced by a decrease in lateral stiffness at the story under consideration or an increase in lateral stiffness at the story (or stories) above.

4.2.1 When the lateral story stiffness is altered, it shall be evaluated to determine if an extreme soft story irregularity is created or made worse.

4.2.2 The extreme soft story irregularity shall be considered separately in each of the orthogonal principal axes of the building in plan.

4.3 Weak Story Irregularities (Vertical Type 4a or 4b)

A weak story irregularity could result from proposed work that changes the strength of the lateral-force-resisting system. The prohibited irregularity status could be influenced by a decrease in lateral strength at the story under consideration or an increase in lateral strength at the story (or stories) above.

4.3.1 When the lateral story strength is altered, it shall be evaluated to determine if a weak story irregularity is created or made worse.

4.3.2 The weak story irregularity shall be considered separately in each of the orthogonal principal axes of the building in plan.

5. CHANGE IN RISK CATEGORY

CAC Section 4-309(c), Item 3 addresses conditions whereby the reconstruction, alteration, or addition scope of work results in the structure being classified in a higher Risk Category as defined by CBC Table 1604A.5.

5.1 Risk Category of Existing Building

The Risk Category of Table 1604A.5 was first defined in the 2013 edition of the CBC in coordination with the 2010 edition of the adopted standard, ASCE 7. The 2007 and 2010 editions of the CBC in coordination with the 2005 edition of ASCE 7 defined Occupancy Categories in Table 1604A.5 using the same designators and definitions as later used for Risk Categories. The 2001 and 1998 editions of the CBC defined Occupancy Categories by name in Table 16A-K.

For the purpose of this regulation and determining whether Item 3 requires a rehabilitation, the baseline Risk Category of the existing building shall be determined as described in this section. When the Risk Category classification is dependent on occupant load, the original occupant load may be determined in accordance with the code in effect at the time of construction.

5.1.1 For buildings designed and constructed prior to the 1998 CBC, the Risk Category shall be taken as that determined from the requirements of the current CBC based on the occupancy and use of the original design.

5.1.2 For buildings designed and constructed under the 1998 or 2001 editions of the CBC, the Risk Category may be determined in accordance with Section 5.1.1 above. Alternatively, the Risk Category is permitted to be determined from the Occupancy Category defined by the design code and listed on the DSA-approved construction drawings as follows:

5.1.2.1 Essential facilities are considered Risk Category IV.

5.1.2.2 Hazardous facilities are considered Risk Category IV.

5.1.2.3 Special occupancy structures are considered Risk Category III.

5.1.2.4 Standard occupancy structures are considered Risk Category II.

5.1.2.5 Miscellaneous occupancy structures are considered Risk Category I.

5.1.3 For buildings designed and constructed under the 2007 or 2010 editions of the CBC, the Risk Category shall be taken as the Occupancy Category defined by the design code and listed on the DSA-approved construction drawings.

5.1.4 For buildings designed and constructed under the 2013 CBC or later, the Risk Category shall be as defined by the design code and listed on the DSA-approved construction drawings.

5.2 Examples of Risk Category Reclassification

Multiple scenarios exist in which a change in occupancy may result in the reclassification of a structure to a higher Risk Category, including but not limited to those described in this section.

5.2.1 When a reconstruction or alteration project changes the use of an existing building to an occupancy with a more concentrated occupant load factor, the resulting increased occupant load may result in a higher Risk Category classification. Occupant load factors are defined in CBC Table 1004.5. For example, an existing building designed with 10,000 net square feet of shop space may have originally been designated a Risk Category II structure based on an occupant load of 200 (10,000 net square feet / 50 net square feet per occupant). When repurposed to use as regular classrooms, however, the occupant load will increase to 500 (10,000 net square feet / 20 net square feet per occupant), exceed 250, and result in a Risk Category III classification.

5.2.2 When an addition increases the square footage of a building, the resulting increased occupant load may result in a higher Risk Category classification. This condition can occur in a structurally detached addition as well as a structurally attached addition.

5.2.2.1 For some occupancies, CBC Table 1604A.5 designates Risk Category based on the occupant load. Occupant load is determined by the number of persons whose path of egress passes through the building. Therefore, a structurally detached addition can increase the occupant load of the existing building if the path of egress for the occupants of the new addition passes through the existing building.

5.2.2.1.1 Detached Addition Example 1: An existing building with a Group E occupancy may originally be classified as Risk Category II based on its original occupant load of 200. A proposed structurally detached addition accommodating 100 occupants whose only path of egress is through the existing building will increase the occupant load of the existing building from 200 to 300. In accordance with CBC Table 1604A.5, the existing building is reclassified from Risk Category II to III as a result of the addition, so a rehabilitation is required.

5.2.2.1.2 Detached Addition Example 2: An existing building with a Group E occupancy may originally be classified as Risk Category III based on its original occupant load of 300. A proposed structurally detached addition (also with a Group E occupancy) accommodating 400 occupants whose only path of egress is through the existing building will increase the occupant load of the existing building from 300 to 700. In this case the Risk Category of the existing building is unchanged (i.e., remains III), so a rehabilitation is not required by CAC Section 4-309(c), Item 3.

5.2.2.2 CBC Section 1604A.5.1 addresses the case of an existing building that provides “required access to, required egress from or shares life safety systems, designated seismic systems, emergency power systems, or emergency and egress lighting systems with another portion having a higher risk category”. If any of these conditions are applicable, the structurally detached addition will cause the Risk Category of the existing building to increase. Similarly, CBC Section 1604A.5.1 links any structurally separated portion of a building that “provides required electrical, communications, mechanical, plumbing or conveying support to another portion assigned to Risk Category IV”.

5.2.2.2.1 Detached Addition Example 3: A structurally detached addition is proposed to an existing building originally classified as Risk Category II. Considered independently, the addition is classified as Risk Category III. While a movement compensating joint is provided in the pipes crossing the seismic separation joint between the two structures, the existing building and structurally detached addition will share a fire sprinkler system. In accordance with CBC Section 1604A.5.1, the existing building is reclassified from Risk Category II to III as a result of the shared life safety system, so a rehabilitation is required.

5.2.2.2.2 Detached Addition Example 4: A structurally detached addition is proposed to an existing building originally classified as Risk Category III. Because the new addition will house the campus police station, it is classified as Risk Category IV. The new addition will rely upon the existing building for electrical and telecommunication service. In accordance with CBC Section 1604A.5.1, the existing building is reclassified from Risk Category III to IV as a result of the addition's reliance on these services, so a rehabilitation is required.

5.2.3 When an existing building is designated as an essential facility where such designation did not previously exist, the building becomes subject to the higher Risk Category IV classification. This could occur, for example, when a community college district repurposes a classroom building for use by the campus police department.

REFERENCES:

2025 California Code of Regulations (CCR) Title 24

Part 1: California Administrative Code (CAC), Sections 4-306, 4-307, 4-309, 4-314.

Part 2: California Building Code (CBC), Tables 1004.6, 1604A.5 and Section 1604A.5.1 1617A.1.10

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

APPENDIX A: EXAMPLE BUILDING CASES

<u>Basis of Evaluation</u>

1) Original and all prior alteration projects were approved and certified by DSA.
2) Single story building with a flexible roof diaphragm. Seismic mass not changed.
3) All shear walls are shear-controlled.
4) Shear capacity of shear walls in pounds per linear foot (plf) is as follows:
   - Type A: 500 plf
   - Type B: 750 plf
5) Stiffness check not performed here.

<u>Calculation</u>

North-south direction:

Baseline = 500plf[12'(4)+24'(2)] = 48,000#

Reduction = 500plf(4'+4') = 4,000#

Ratio = 4,000/48,000 = 0.083 = 8.3% < 10%

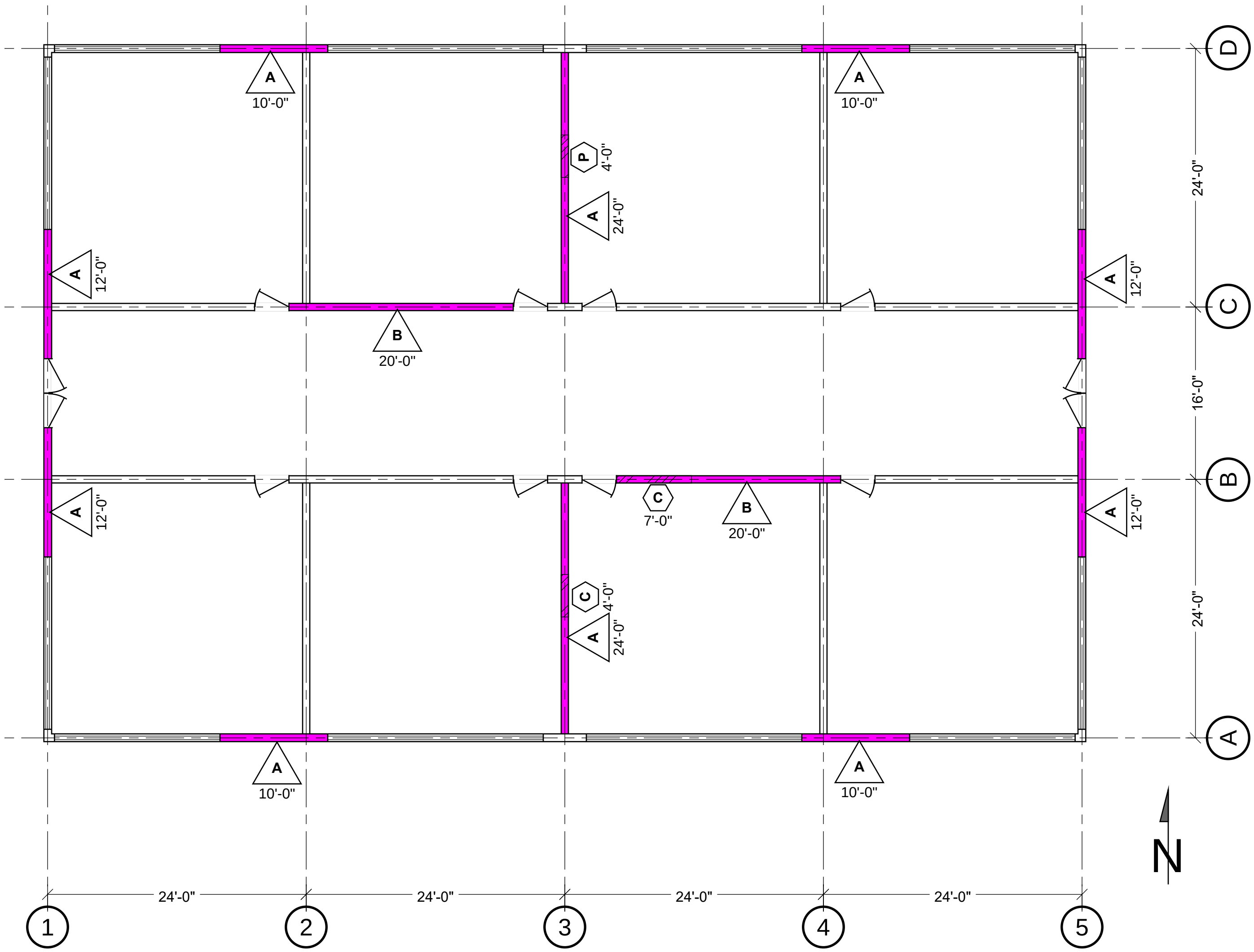
East-west direction:

Baseline = 500plf(10')(4)+750plf(20')(2) = 50,000#

Reduction = 750plf(7') = 5,250#

Ratio = 5,250/50,000 = 0.105 = 10.5% > 10%

<u>Rehabilitation IS Required</u>



<u>Legend</u>

Existing shear wall from original construction (A, 12'-0")

Existing shear wall added in previous strengthening (A, 12'-0")

Demolished shear wall (C, 6'-0")
C = current project
P = previous project

New shear wall proposed as part of the current project (A, 12'-0")

Example A1: Shear Wall Removal

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

<u>Basis of Evaluation</u>

1) Original and all prior alteration projects were approved and certified by DSA.
2) Single story building with a flexible roof diaphragm. Seismic mass not changed.
3) All shear walls are shear-controlled.
4) Shear capacity of shear walls in pounds per linear foot (plf) is as follows:
   - Type A: 500 plf
   - Type B: 750 plf
   - Type C: 1,000 plf
5) Stiffness check not performed here.

<u>Calculation</u>

North-south direction:

Baseline = 500plf[12'(4)+24'(2)] = 48,000#

Reduction = 500plf(24') = 12,000#

Ratio = 12,000/48,000 = 0.25 = 25% > 10%

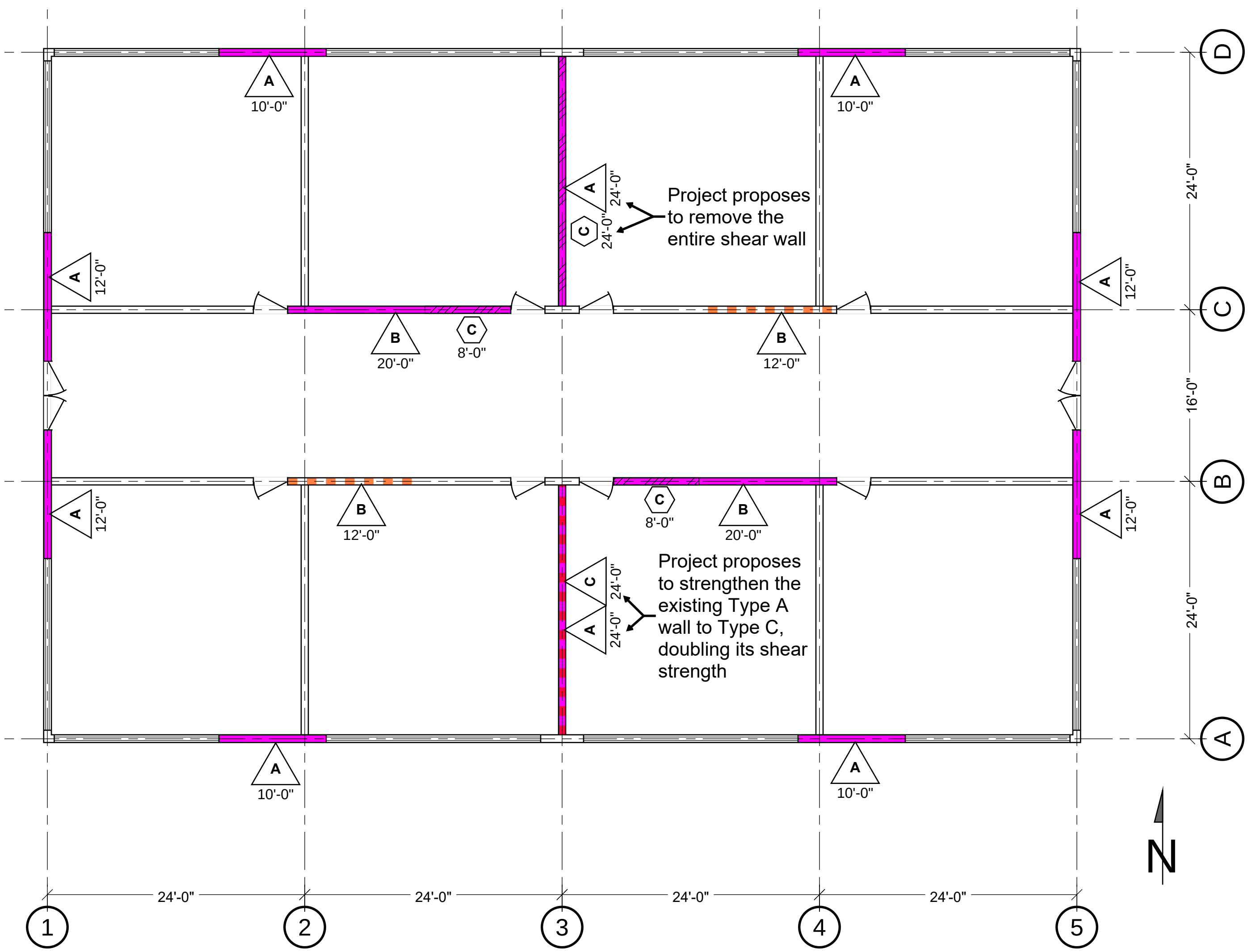
East-west direction:

Baseline = 500plf(10')(4)+750plf(20')(2) = 50,000#

Reduction = 750plf[8'(2)] = 12,000#

Ratio = 12,000/50,000 = 0.24 = 24% > 10%

<u>Rehabilitation IS Required</u>



<u>Legend</u>

A 12'-0" — Existing shear wall from original construction

A 12'-0" — Existing shear wall added in previous strengthening

C 6'-0" — Demolished shear wall
C = current project
P = previous project

A 12'-0" — New shear wall proposed as part of the current project

Example A2: Shear Wall Removal and Proposed New Shear Walls

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

<u>Basis of Evaluation</u>

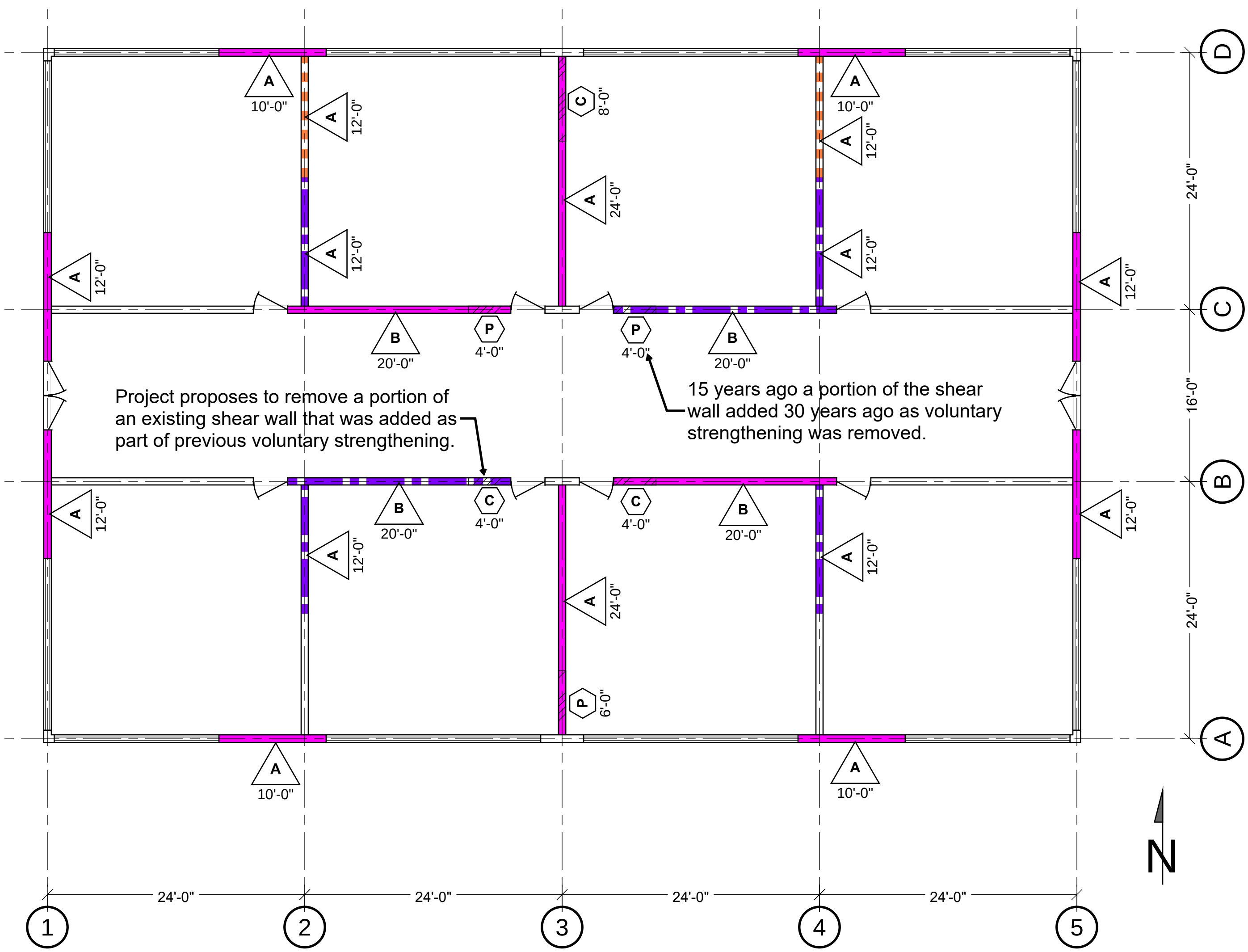
1) Original and all prior alteration projects were approved and certified by DSA.
2) Single story building with a flexible roof diaphragm. Seismic mass not changed.
3) All shear walls are shear-controlled.
4) Shear capacity of shear walls in pounds per linear foot (plf) is as follows:
   - Type A: 500 plf
   - Type B: 750 plf
5) Stiffness check not performed here.

<u>Calculation</u>

North-south direction:
- Baseline = 500plf[12'(8)+24'(2)] = 72,000#
- Reduction = 500plf(8'+6') = 7,000#
- Ratio = 7,000/72,000 = 0.097 = 9.7% < 10%

East-west direction:
- Baseline = 500plf(10')(4)+750plf(20')(4) = 80,000#
- Reduction = 750plf[4'(4)] = 12,000#
- Ratio = 12,000/80,000 = 0.15 = 15% > 10%

<u>Rehabilitation IS Required</u>



<u>Legend</u>

A 12'-0" — Existing shear wall from original construction

A 12'-0" — Existing shear wall added in previous strengthening

C 6'-0" — Demolished shear wall
C = current project
P = previous project

A 12'-0" — New shear wall proposed as part of the current project

Example A3: Shear Wall Removal, Previous Strengthening and Proposed New Shear Walls

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

<u>Basis of Evaluation</u>

1) Original and all prior alteration projects were approved and certified by DSA.
2) Single story building with a flexible roof diaphragm.
3) All shear walls are shear-controlled.
4) Shear capacity of shear walls in pounds per linear foot (plf) is as follows:
   - Type A: 500 plf
   - Type B: 750 plf
5) Stiffness check not performed here.
6) Seismic mass increased by 3.8% as a result of a new roofing system.

<u>Calculation</u>

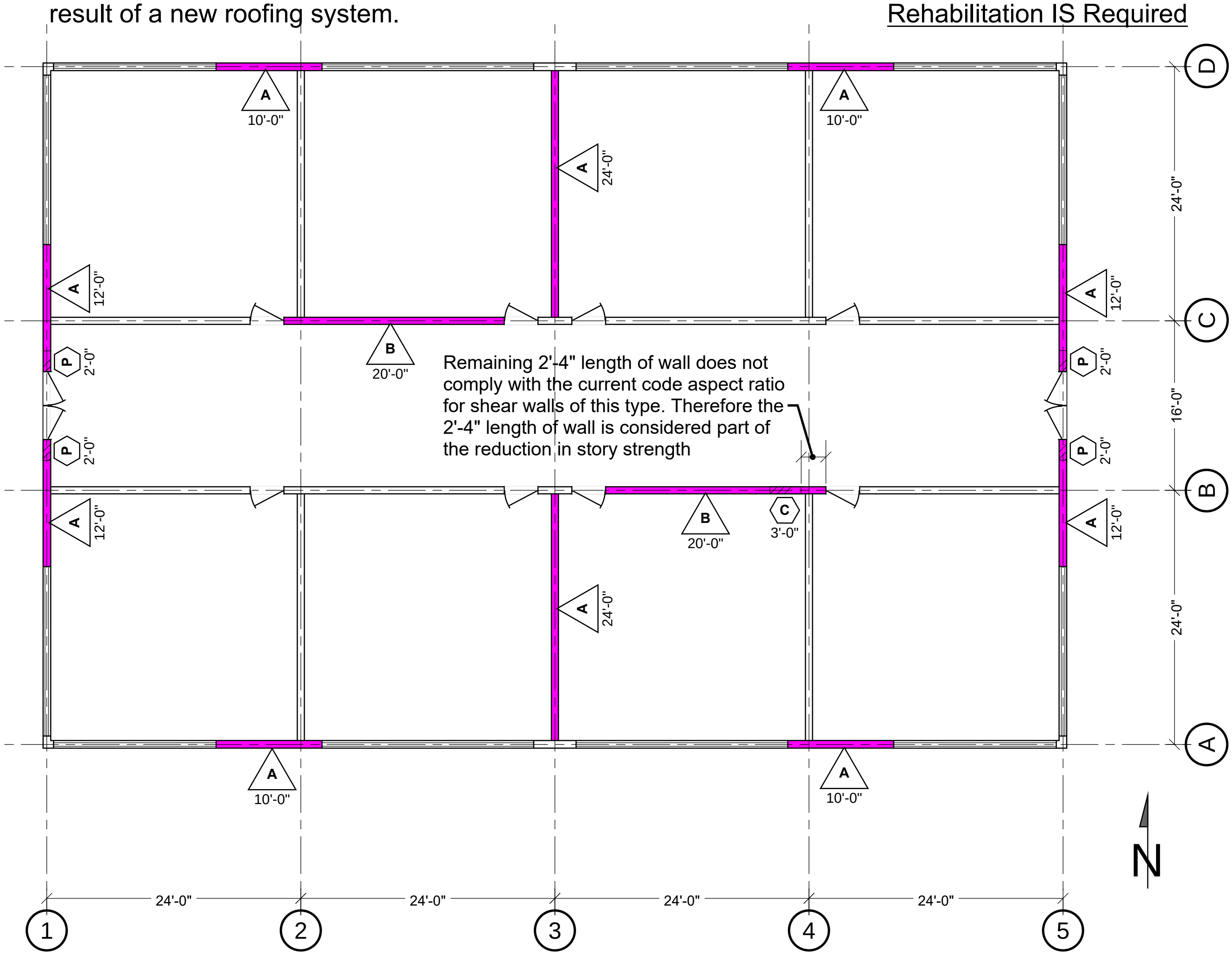
North-south direction:

Baseline = 500plf[12'(4)+24'(2)] = 48,000#
Reduction = 500plf[2'(4)] = 4,000#
Ratio = 4,000/48,000 = 0.083 = 8.3% < 10%
Combined = (1.038 / 0.917) - 1 = 13.2% > 10%

East-west direction:

Baseline = 500plf(10')(4)+750plf(20')(2) = 50,000#
Reduction = 750plf(3'+2.33') = 4,000#
Ratio = 4,000/50,000 = 0.08 = 8% < 10%
Combined = (1.038 / 0.920) - 1 = 12.8% > 10%

<u>Rehabilitation IS Required</u>



<u>Legend</u>

Existing shear wall from original construction (A, 12'-0")

Existing shear wall added in previous strengthening (A, 12'-0")

Demolished shear wall (C, 6'-0")
C = current project
P = previous project

New shear wall proposed as part of the current project (A, 12'-0")

Example A4: Combined Effect

REHABILITATION REQUIRED BY SCOPE: 2025 CAC

Basis of Evaluation

1) Original and all prior alteration projects were approved and certified by DSA.
2) Single story building with a flexible roof diaphragm. Seismic mass not changed.
3) All shear walls are shear-controlled.
4) Shear capacity of shear walls in pounds per linear foot (plf) is as follows:
   - Type A: 500 plf
   - Type B: 750 plf
5) Stiffness check not performed here.

Calculation

North-south direction:

Baseline = 500plf[12'(4)+24'(2)] = 48,000#

Reduction = 500plf(12'+12') = 12,000#

Ratio = 12,000/48,000 = 0.25 = 25% > 10%

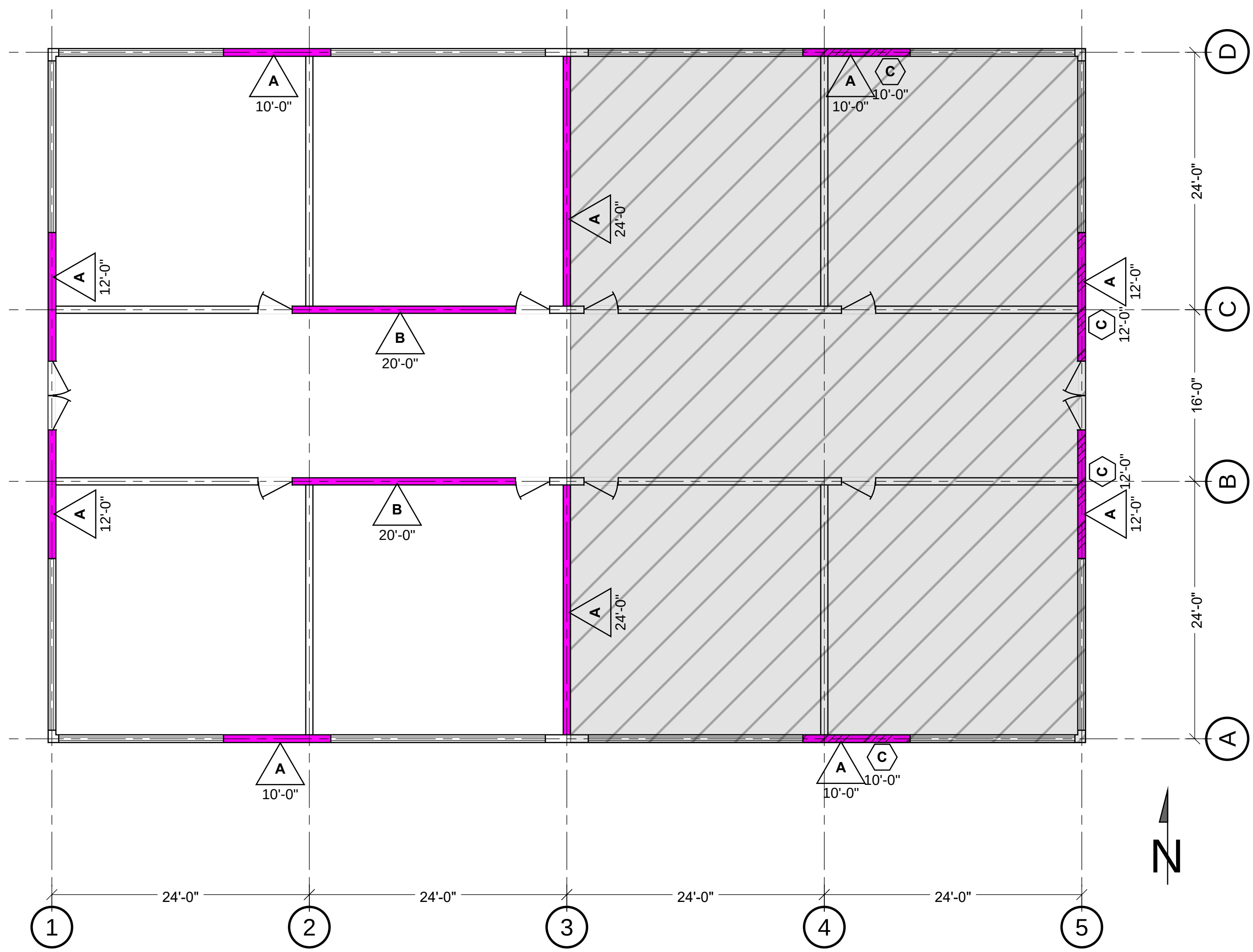
East-west direction:

Baseline = 500plf(10')(4)+750plf(20')(2) = 50,000#

Reduction = 500plf(10')(2) = 10,000#

Ratio = 10,000/50,000 = 0.20 = 20% > 10%

Rehabilitation IS Required



Legend

Existing shear wall from original construction (A, 12'-0")

Existing shear wall added in previous strengthening (A, 12'-0")

Demolished shear wall (C, 6'-0")

New shear wall proposed as part of the current project (A, 12'-0")

Building demolition

Example A5: Partial Building Demolition