

STRUCTURAL ENGINEERING AND INSPECTIONS, INC. S E I

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FOR PUBLIC RELEASE

Position Statement

Elevating Older Slab-on-Grade and Masonry Structures for Flood Compliance



Regarding: Structural concerns, FEMA guidance, Florida Existing Building Code classification, ASCE 24 flood-resistant design, and current Florida wind-load evaluation for older slab-on-grade and masonry buildings proposed to be lifted or elevated.

1. Statement of Position

Structural Engineering and Inspections, Inc. (SEI) issues this public position statement to address the practice of lifting or elevating older slab-on-grade and masonry buildings, including buildings proposed to be raised for flood-compliance purposes. SEI does not support treating this work as a routine lifting operation that may rely on the original slab, foundation, masonry walls, anchorage, or original-code wind design without a new, project-specific structural engineering evaluation.



FEMA guidance identifies significant difficulties and damage risks with slab-on-grade and masonry elevation work. SEI acknowledges these difficulties and damage risks and considers them to be material structural concerns. SEI is also aware that other structural engineers who have reviewed and considered this topic have raised similar concerns regarding structural feasibility, load-path reliability, construction-stage risk, and the cost of attempting to elevate older slab-on-grade or masonry structures without a comprehensive engineering design. [\[FEMA P-312, Ch. 5\]](#) [\[FEMA P-347\]](#)

SEI's position is that a whole-building lift of an older slab-on-grade or masonry structure should be considered a major structural intervention. Before any such work is permitted or performed, the proposed temporary lifting condition and the final elevated condition should be evaluated by a Florida-licensed professional engineer. That evaluation should address flood-resistant design under ASCE 24 as adopted by the Florida Building Code, gravity-load support, foundation capacity, masonry wall performance, diaphragm and connection behavior, construction-stage bracing, and the complete lateral-force-resisting system under the current Florida Building Code wind requirements applicable at the time of permitting. [\[FBC-B Sec. 1612.4 / ASCE 24\]](#) [\[FBC-B Sec. 1609.1.1\]](#) The evaluation should also identify and address proposed slab sawcuts, cores, trenches, utility penetrations, plumbing relocations, exterior stairs, landings, porches, ramps, and any related footprint, setback, easement, or access-code constraints before feasibility is assumed.

2. FEMA Guidance and SEI Concerns With Slab-on-Grade and Masonry Elevation

FEMA recognizes elevation as a flood-mitigation technique, but FEMA's published guidance distinguishes ordinary elevation of suitable foundation types from the more difficult and damage-prone problem of lifting slab-on-grade and masonry buildings. FEMA guidance notes that slab-on-grade buildings may have a slab that forms both the floor and all or a major part of the foundation, making the elevation approach fundamentally different from lifting a structure over a crawlspace or open foundation. [\[FEMA P-312, Ch. 5\]](#)

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FEMA also cautions that masonry buildings are harder to lift because of their design, construction, and weight. FEMA's case-study guidance further warns that the jacking process is difficult to control in practice and that uneven lift at even one jack can crack the slab and walls. These issues are especially relevant to older masonry or slab-on-grade buildings where existing cracking, unknown reinforcement, brittle wall behavior, or incomplete load-path connections may already be present before elevation work begins. [\[FEMA P-312, Ch. 5\]](#) [\[FEMA P-347\]](#)

FEMA further recognizes that, in some circumstances, physically raising a slab-on-grade building may not be feasible or cost-effective, and FEMA discusses alternatives such as the one that engineers at SEI have successfully designed which is abandoning the lower level and constructing an elevated living space above the existing slab. This does not mean that no slab-on-grade building can ever be elevated. **However, engineering analysis should be the default starting point, rather than a presumption of feasibility.** [\[FEMA Second-Story Conversion Fact Sheet\]](#)

For structures that are substantially damaged or substantially improved in a flood hazard area, FEMA guidance also explains that compliance obligations can become broader than the immediate repair or lift itself. Foundations, slabs, bearing walls, structural components, utilities, and code-required work can become part of the compliance and cost analysis. FEMA hazard-mitigation guidance also ties structure-elevation design to applicable local codes and ASCE 24 flood-resistant design requirements. [\[FEMA P-758\]](#) [\[FEMA P-213\]](#) [\[FEMA HMA FFRMS Policy\]](#)

3. Structural Problems Associated With Slab-on-Grade Construction

A slab-on-grade is typically a ground-supported element. Its original performance often depends on continuous support from compacted soil or prepared base material below the slab. When a building is lifted with the slab attached, that original support assumption changes. The slab may be asked to bridge between jacks, temporary beams, cribbing, new piers, grade beams, elevated walls, or other discrete supports. A slab that was adequate when fully supported by the ground may not be adequate as a suspended or partially suspended structural element.

The presence of wire mesh, light reinforcement, or fibers should not be treated as proof that an older slab-on-grade can carry structural service loads in the elevated condition. FEMA notes that wire



mesh in a residential slab is intended to help prevent shrinkage cracking during original construction and is not intended to provide structural strength. In SEI's opinion, that same concern extends to reinforcement or fiber systems intended primarily for temperature-movement control, crack-width control, and other serviceability functions. Serviceability reinforcement is not the same as a designed structural system with verified flexural capacity, shear capacity, development length, support conditions, and load path. [\[FEMA P-312, Ch. 5\]](#)

Determining the location and effectiveness of steel reinforcement in older slabs is a frequent challenge. During concrete placement, welded wire mesh is easily displaced—often stepped on and pushed toward the bottom of the slab rather than remaining at its intended depth. If the steel sits outside its required design depth, it provides little to no reliable capacity to handle bending forces during or after the lifting process. This risk multiplies when there are no as-built drawings, inspection records, core data, or reinforcement surveys to verify the actual conditions.

Some slabs may contain only fiber reinforcement. Depending on fiber type, dosage, distribution, and concrete condition, fibers may help control early-age or shrinkage cracking, but they should not automatically be assumed to create a suspended structural slab capable of supporting building loads after elevation. Existing visible cracking, curling, slab-edge damage,

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moisture distress, corrosion at embedded metals, or micro-cracking from age and service history can further reduce reliability. These conditions may not be fully visible until the structure is stressed by jacking or by the new elevated support condition.

Changes in slab elevation and cold joints are additional complicating factors. Common examples include the step from an attached garage slab to the main house slab, step-down rooms, additions, patios or enclosed former exterior slabs, separate slab placements, and construction joints between different pours. These conditions can mean that the slab is not a uniform structural plate: slab thickness, base preparation, reinforcement type, reinforcement location, dowels or tie bars, and continuity across the joint may vary substantially. Cold joints and elevation offsets can act as planes of weakness or discontinuities, may not reliably transmit bending, shear, diaphragm, uplift, or in-plane forces, and can concentrate stresses during jacking.

Elevation changes can also interfere with temporary lifting operations. Jacking beams, cribbing, and temporary supports may not engage stepped slab areas uniformly. A garage-to-house step, depressed room, raised curb, thickened edge, or cold joint can create differential movement, torsion, local punching, hinge behavior, cracking at the step, or separation along the joint. These conditions should be treated as structural risk factors, not minor architectural details.

Two-way punching shear and the development of positive and negative moment within a slab that was originally ground-supported are of particular concern. An elevated or partially elevated slab may be forced to resist concentrated reactions and span between supports in a manner for which it was never designed. This issue becomes more severe when walls, masonry loads, garage steps, slab offsets, or cold joints introduce concentrated loads and discontinuities.

Accordingly, SEI's position is that the existing slab should not be treated as a competent structural floor or foundation component for a lifted building unless the engineer of record verifies its thickness, reinforcement type, reinforcement location, concrete condition, visible cracking, likely micro-cracking, edge support, elevation changes, cold joints, construction joints, garage-to-house slab steps, dowel or tie-bar continuity, wall connection, load path, and ability to resist the temporary and permanent loads imposed by the elevation project.

The engineer should also evaluate proposed or existing slab sawcuts, cores, trenches, plumbing penetrations, utility penetrations, patch repairs, and reinforcement continuity around each modified area.

Modifying the slab for plumbing installation, plumbing relocation, or other utility work is another significant complicating factor. Saw-cutting, coring, trenching, chipping, or otherwise removing concrete can reduce the slab section, sever or expose welded wire mesh, reinforcing bars, dowels, tie bars, anchors, or fibers, and create stress concentrations that can initiate or enlarge cracking. Where the slab is proposed to remain attached to the building during lifting, or to participate in the final elevated support or load path, these penetrations and cuts should not be treated as incidental construction activity.

Plumbing-related slab modifications are especially concerning in older buildings because the actual slab thickness, reinforcement type and location, thickened edges, grade beams, prior repairs, vapor barrier, termite treatment, and embedded utilities may be unknown. A core, trench, or sawcut near a wall line, cold joint, elevation step, garage-to-house transition, slab offset, thickened edge, or temporary lifting point can significantly reduce local bending, shear, punching, anchorage, diaphragm, or load-transfer capacity. Such work should be located, detailed, repaired, and, where necessary, reinforced as part of the engineer-of-record's design rather than left to field coordination after the lift concept has been approved.



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4. Masonry Walls, Flood-Resistant Design, and Lateral-Force-Resisting System Concerns

Older masonry buildings may include unreinforced or lightly reinforced masonry walls, brittle mortar, limited diaphragm anchorage, inadequate out-of-plane wall ties, discontinuous bond beams, weak roof-to-wall connections, weak floor-to-wall connections, or veneers that were not intended to move with the structure during jacking. These conditions can create cracking or instability during lifting and can also affect the final elevated building after new flood openings, stairs, access changes, foundation modifications, or enclosure limitations are introduced.

A successful elevation project must provide a complete vertical and lateral load path from roof and wall elements through diaphragms, walls, floors, connectors, foundations, and ground support. In flood hazard areas, the elevated foundation, enclosure configuration, lowest-floor elevation, flood openings, flood-damage-resistant materials, and anchorage should be evaluated under ASCE 24 as adopted by the Florida Building Code. [\[FBC-B Sec. 1612.4 / ASCE 24\]](#) [\[FEMA ASCE 24-14 Highlights\]](#)

Florida-specific guidance on attached garage and enclosure floors/slabs and flood openings further illustrates why slab elevation changes cannot be ignored. A step from a garage slab to the main house slab may have both structural implications and floodplain-management implications, including lowest-floor determinations, use limitations for enclosed areas below the design flood elevation, and the need for proper flood openings. [\[FDEM Slabs/Floors/Openings Guidance\]](#) [\[FDEM Flood-Resistant Provisions\]](#)

In a wind-prone state such as Florida, this is not a secondary issue. Raising a building can increase exposure, change the overturning and shear demands on foundation elements, alter wall-bracing conditions, change the tributary areas carried by connections, and expose pre-existing weaknesses in the roof-to-wall-to-foundation load path. FEMA's Hurricane Ian recovery guidance also supports a multi-hazard approach to flood mitigation in Florida rather than considering flood elevation in isolation. [\[FEMA Hurricane Ian Recovery Advisory 1\]](#)

The final elevated structure should therefore be evaluated as an altered structural system, not as the same building now located at a higher elevation.

Access to an elevated structure also introduces structural and site-planning issues that should be evaluated at the outset. Exterior stairs, landings, porches, decks, ramps, and similar access components are not merely architectural conveniences; they add foundations, posts or columns, beams, connectors, guards, handrails, bracing, attachment points, gravity loads, live loads, wind uplift and lateral loads, potential flood loads, and additional construction-stage risk. These elements must be designed and connected so they do not create unanticipated load paths, damage the elevated building, or compromise flood-resistant design requirements.

The required access improvements may also increase the building footprint or the area of structural improvements on the site. On many older or constrained lots, exterior stairs, landings, porches, ramps, or access platforms may fall within required front, side, or rear setback areas, drainage or utility easements, visibility triangles, coastal or floodplain limitations, or other local land-development restrictions. A lift that appears structurally possible may therefore become impractical if the required exterior access cannot be permitted without a variance, redesign, relocation, or additional site work.

5. Florida Existing Building Code Classification and Current Wind-Load Evaluation

SEI's position is that a whole-building lift of the type addressed in this statement should ordinarily be evaluated as a Level 3 alteration under the Florida Building Code, Existing Building when the work area exceeds 50 percent of the building area, subject to the authority having jurisdiction's determination of work area and applicable code classification. Such a lift is not a localized repair. It typically affects the building footprint, foundation, support condition, utilities, access, anchorage, bracing, and the gravity and lateral load path for most or all of the structure. [\[2023 FBC-EB, Ch. 6\]](#)

The same work may also qualify as a substantial structural alteration where the altered gravity load-carrying structural elements, within the code-defined 5-year period, support more than 30 percent of the total floor and roof area of the building or structure. For a whole-structure elevation project, the altered foundation, slab/floor support, walls, piers, posts, columns, grade beams, sill connections, anchorage, and other support components would ordinarily be expected to support substantially more than that threshold. Final code classification should be confirmed by the local authority having jurisdiction and the Florida-licensed design professional for the project. [\[2023 FBC-EB, Ch. 2\]](#)

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Where a Level 3 alteration involves a substantial structural alteration, the Florida Existing Building Code requires structural evaluation and analysis demonstrating that the lateral load-resisting system of the altered building or structure complies with the Florida Building Code, Building for wind loading. Current wind design should therefore be addressed for the altered/elevated condition rather than relying only on the wind-load requirements that existed when the original structure was constructed. [\[2023 FBC-EB, Ch. 9\]](#) [\[FBC-B Sec. 1609.1.1\]](#)

This position is consistent with the current-code framework in Florida. The Florida Building Code, Building determines wind loads in accordance with ASCE 7, and the 8th Edition (2023) Florida Building Code has been updated to correlate with ASCE 7-22 wind provisions. Flood-load design for the elevated condition should be evaluated under ASCE 24 as adopted by the Florida Building Code, in combination with the applicable ASCE 7 wind-load requirements. The code edition and supplements in effect at the time of permitting should be confirmed for each project. [\[Florida Building Code Online\]](#) [\[FBC ASCE 7-22 Wind Loads Fact Sheet\]](#) [\[FBC-B Sec. 1612.4 / ASCE 24\]](#)

6. Remedy for Improper Design or Improper Lifting

If an older slab-on-grade or masonry structure is lifted without proper engineering analysis, design, observation, and inspection, the remedy is unlikely to be a simple post-lift repair. In SEI's opinion, improper design or improper lifting would require a proper engineering investigation and analysis of both the temporary lifting condition and the final elevated condition, followed by retrofitting of the structural elements that are found to be inadequate.

Such remediation would likely require evaluation and retrofit of the slab, cold joints, elevation changes, masonry walls, foundations, anchors, diaphragms, roof-to-wall connections, wall-to-floor connections, floor-to-foundation connections, bracing, flood-opening effects, and other lateral-force-resisting elements of the building. Depending on the deficiencies discovered, the retrofit may require new or supplemental grade beams, piers, posts, columns, piles, shear walls, slab strengthening, joint doweling, wall reinforcement, bond beams, collectors, hold-downs, anchors, diaphragm strengthening, masonry repairs, veneer stabilization, or replacement of portions of the original slab/foundation system.

These corrective measures would drastically increase the cost and complexity of the project. Remediating an improperly lifted slab-on-grade or masonry building through retrofitting is often unfeasible or economically unjustifiable. This is due to the extreme costs, constructability hurdles, operational disruptions, and inherent uncertainties of the process. Consequently, more reasonable approaches include implementing an alternative flood-mitigation strategy, pursuing complete demolition and reconstruction, or ensuring proper project design from the outset.

For that reason, SEI does not consider post-lift remediation to be an acceptable substitute for proper pre-lift engineering. Owners, contractors, and public officials should require a complete structural design and code-compliance analysis before the lift is attempted.

7. Recommended Minimum Engineering and Permit Expectations

For older slab-on-grade and masonry buildings proposed to be lifted or elevated, SEI recommends that permit documents and construction controls include, at a minimum:

- a Florida-licensed professional engineer's analysis of the existing structure, temporary lifting condition, and final elevated condition;
- verification of slab thickness, reinforcement type, reinforcement location, concrete condition, visible cracking, likely micro-cracking, edge support, slab elevation changes, cold joints, construction joints, garage-to-house steps, dowels or tie bars, and connections to walls or foundation elements;
- documentation and engineering review of all proposed and existing slab cutting, coring, trenching, plumbing relocation, utility penetrations, patching, and reinforcement discontinuities, including repair or strengthening details where those modifications affect slab capacity, load transfer, or the lateral-force-resisting system;
- evaluation of masonry wall stability, out-of-plane wall anchorage, veneer behavior, bond beams, vertical reinforcement, openings, and wall-to-diaphragm connections;
- ASCE 24 flood-resistant design analysis for foundations, lowest-floor elevations, enclosure limitations, flood openings, flood-damage-resistant materials, scour/erosion conditions, utilities, anchorage, and load combinations, as adopted by the applicable Florida code edition;

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- a current-code wind-load analysis for the altered building's lateral-force-resisting system, including the complete roof-to-wall-to-floor-to-foundation load path;
- design of new or altered foundations, piers, posts, piles, columns, grade beams, bracing, anchors, flood openings, and enclosure elements for the combined flood, gravity, wind, and construction-stage demands;
- design and permitting review for exterior stairs, landings, porches, decks, ramps, guards, handrails, support foundations, attachments to the elevated structure, and related site constraints, including setbacks, easements, lot coverage, floodplain limitations, drainage, and required zoning or AHJ approvals;
- construction-stage bracing, monitoring, and inspection requirements to address jacking, cribbing, temporary support, weather exposure, differential movement, cracking, and construction-stage wind risk; and
- clear identification of whether the proposed work is Level 3 alteration, substantial structural alteration, substantial improvement, substantial damage, or another code classification requiring additional compliance.

8. Consistency and Limitations

This position statement does not state that every slab-on-grade or masonry building is impossible to elevate. FEMA recognizes elevation methods, and some projects may be feasible where the structure, slab, foundation, load path, site, hazards, and code requirements are properly evaluated and designed. The position stated here is that feasibility must be demonstrated by engineering analysis; it should not be presumed from the mere fact that a building exists on a slab or contains nominal reinforcement.

This position is consistent with FEMA flood-elevation guidance and with the Florida Existing Building Code. FEMA/NFIP substantial-damage and substantial-improvement requirements are floodplain-management concepts. Level 3 alteration and substantial structural alteration are separate Florida Existing Building Code concepts. A whole-building slab-on-grade or masonry lift can trigger both types of review, and the flood-compliance analysis does not waive the need for current structural, ASCE 24 flood-resistant design, and wind-load compliance where the Florida code requires it.

The feasibility of an elevation project should therefore include both structural engineering review and site-code review. A project-specific conclusion should consider whether the elevated building, modified slab, required exterior access, new foundations, and resulting footprint can comply with applicable building-code, floodplain-management, zoning, setback, easement, drainage, and land-development requirements.

This statement is intended for general public information and policy guidance. It is not a project-specific engineering design, legal opinion, or substitute for review by the local authority having jurisdiction. Final code determinations, permit requirements, and design responsibilities remain with the applicable building official and the Florida-licensed design professionals of record.

9. Hyperlinked Source List

- [FEMA P-312, Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home from Flooding, 3rd ed. \(June 2014\), Chapter 5: Elevating Your House.](#)
- [FEMA P-347, Above the Flood: Elevating Your Floodprone House \(May 2000\).](#)
- [FEMA, Second-Story Conversion - Elevation Project Design Considerations for Hazard Mitigation Assistance Applicants \(Feb. 14, 2019\).](#)
- [FEMA P-758, Substantial Improvement/Substantial Damage Desk Reference \(May 2010\).](#)
- [FEMA P-213, Answers to Questions About Substantially Improved/Substantially Damaged Buildings \(rev. Aug. 2018\).](#)
- [FEMA, Highlights of ASCE 24-14, Flood Resistant Design and Construction \(Jan. 2015\).](#)
- [FEMA Policy FP-206-21-003-0001, Implementation of the Federal Flood Risk Management Standard for Hazard Mitigation Assistance Programs \(Dec. 2022\).](#)
- [FEMA Hurricane Ian Recovery Advisory 1, Designing for Flood Levels Above the Minimum Required Elevation After Hurricane Ian.](#)
- [Florida Division of Emergency Management, Guidance for Attached Garage and Enclosure Floors/Slabs and Flood Openings \(Dec. 2024\).](#)

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- [Florida Division of Emergency Management, Flood Resistant Provisions in the 8th Edition Florida Building Code \(2023\) \(Dec. 2023\).](#)
- [Florida Building Code Online, official state code portal.](#)
- [2023 Florida Building Code, Existing Building, 8th ed., Chapter 2, Definitions.](#)
- [2023 Florida Building Code, Existing Building, 8th ed., Chapter 6, Classification of Work.](#)
- [2023 Florida Building Code, Existing Building, 8th ed., Chapter 9, Alterations Level 3.](#)
- [2023 Florida Building Code, Building, 8th ed., Section 1609.1.1, Determination of Wind Loads.](#)
- [2023 Florida Building Code, Building, 8th ed., Section 1612.4, Design and Construction in Flood Hazard Areas.](#)
- [Florida Building Commission, Wind Loads - Impacts from ASCE 7-22 Fact Sheet \(June 2024\).](#)

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