Soft, Weak, or Open-Front (SWOF) Wall Line Retrofit Ordinance Overview by SEAOSC

August 22nd, 2018

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Agenda

- SWOF Buildings
- Retrofit Examples
- Tenant Impacts, Information about Cost, and More

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Soft/Weak Story Buildings

Damage is concentrated at soft/weak story

http://www.latimes.com/local/lanow/la-me-earthquake-database-los-angeles-20170920-htmlstory.html

Soft/Weak Story Buildings

https://robin2d.com/page/2/
https://vecto.rs/design/vector-of-an-imposing-cartoon-american-football-player-ready-to-charge-forward-by-toonaday-44992

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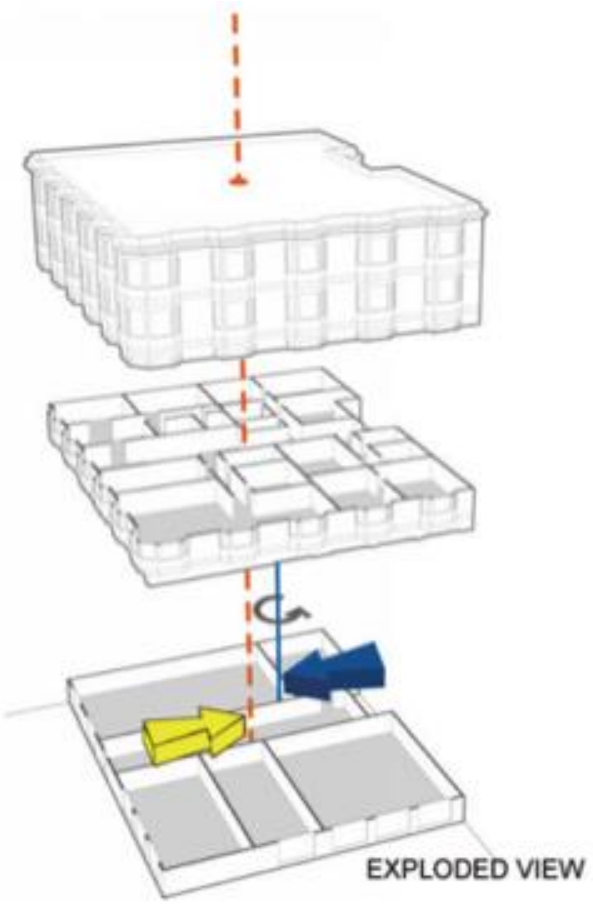
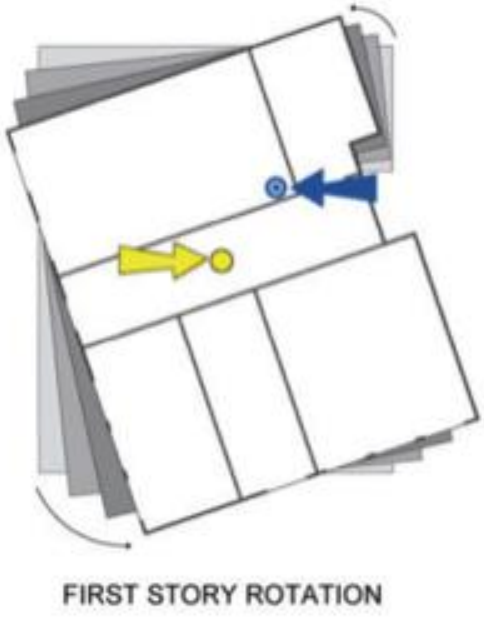
Soft, Weak, or Open Perimeter Walls





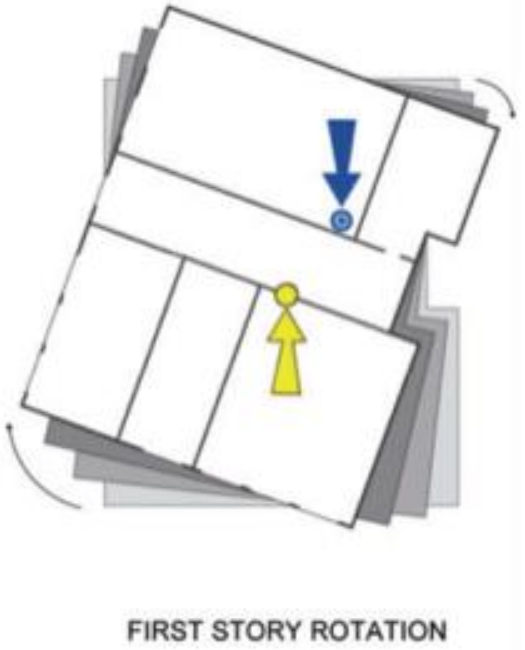


Diagram from FEMA P807- Seismic Evaluation and Retrofit of Buildings with Weak First Stories

SWOF Wall Line Identification

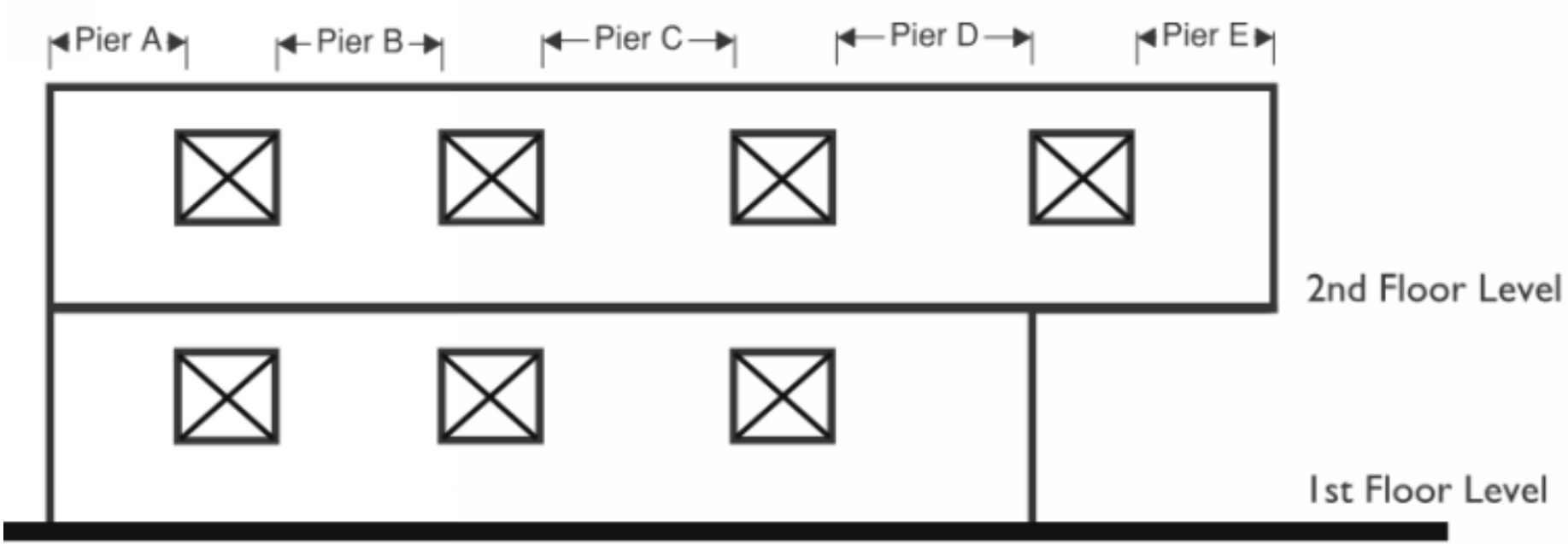


Figure 1.3-1 Definition of P1 and P2 Wall Piers

Performance in Previous Earthquakes

1989 Loma Prieta

6 collapsed buildings were four story corner apartments with first story parking

1994 Northridge

200 soft or weak story buildings suffered damage or collapsed

September 19, 2017 Puebla Earthquake

September 19, 2017 Puebla Earthquake

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SWOF Retrofit Examples

Retrofit In Construction

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Another Example

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Another Example

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Steel MF Column & Existing Gravity Column

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Steel MF Column & Existing Gravity Column

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Steel MF Behind Existing Columns

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Plywood Shear Wall Strengthening

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Finished Foundations

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Completed Retrofit

Courtesy of John Labib & Associates

SWOF Retrofit Examples

Completed Retrofit

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Tenant Impact

- Construction typically occurs from 8am-5pm during weekdays
- Rarely do tenants lose access to their units
- Likely will temporarily lose access to parking during construction hours
- Rarely does a building permanently lose a parking space
- Construction takes approximately 1 month
- Some noise during construction only

Finding an Engineer

WHAT IS STRUCTURAL ENGINEERING?

Structural Engineering is a specialty within Civil Engineering which deals with the design, construction and maintenance of our surrounding infrastructure, such as buildings, bridges and tunnels. Contrary to popular belief, a structural engineer is not an architect. Rather, a structural engineer takes the vision of the architect, building owner, or project leader and creates a structural system, or "skeleton" to physically support the intended loads. The end goal of the structural design is to resist loads such as gravity, seismic, and wind loads.

WHAT DOES A STRUCTURAL ENGINEER DO?

A Structural Engineer designs the physical elements that allow a building to exist, provide shelter, and safely resist forces. These elements are designed to meet the requirements of the governing building codes. The day-to-day tasks of a structural engineer entail creating construction documents, performing calculations and evaluations, as well as coordinating with a general contractor before and while in construction phase.

WHY DO I NEED A STRUCTURAL ENGINEER?

A structural engineer possesses the specialized education and experience needed to design and evaluate a structure that is safe for its intended use. The design of every structure is particular to the environment it is in, and a properly licensed engineer is equipped to analyze structures founded in different soil conditions, as well as subject to various gravity, seismic, and wind loads. A structural engineer is also a technical resource who can discuss with you the various options for retrofitting your building and advantages and disadvantages of each.

An engineer's stamp and signature is required on contract documents, permitted by the authority having jurisdiction, for the following applications:

- New Building Construction
- Existing Building Renovation
- Existing Building Seismic Retrofit

WHAT IS A LICENSED ENGINEER?

Within structural engineering, there are two levels of licensing provided by the Board for Professional Engineers, Land Surveyors, and Geologists (BPELSG) in the state of California. The first level of licensing is the Civil Engineer license, which requires 6 years of qualifying work experience or education and the passing of an examination. The second level of licensing is the Structural Engineer license which is obtained after the Civil Engineer license. This requires an additional 3 years of qualifying work experience under the supervision of a licensed Structural Engineer and the passing of an additional examination.

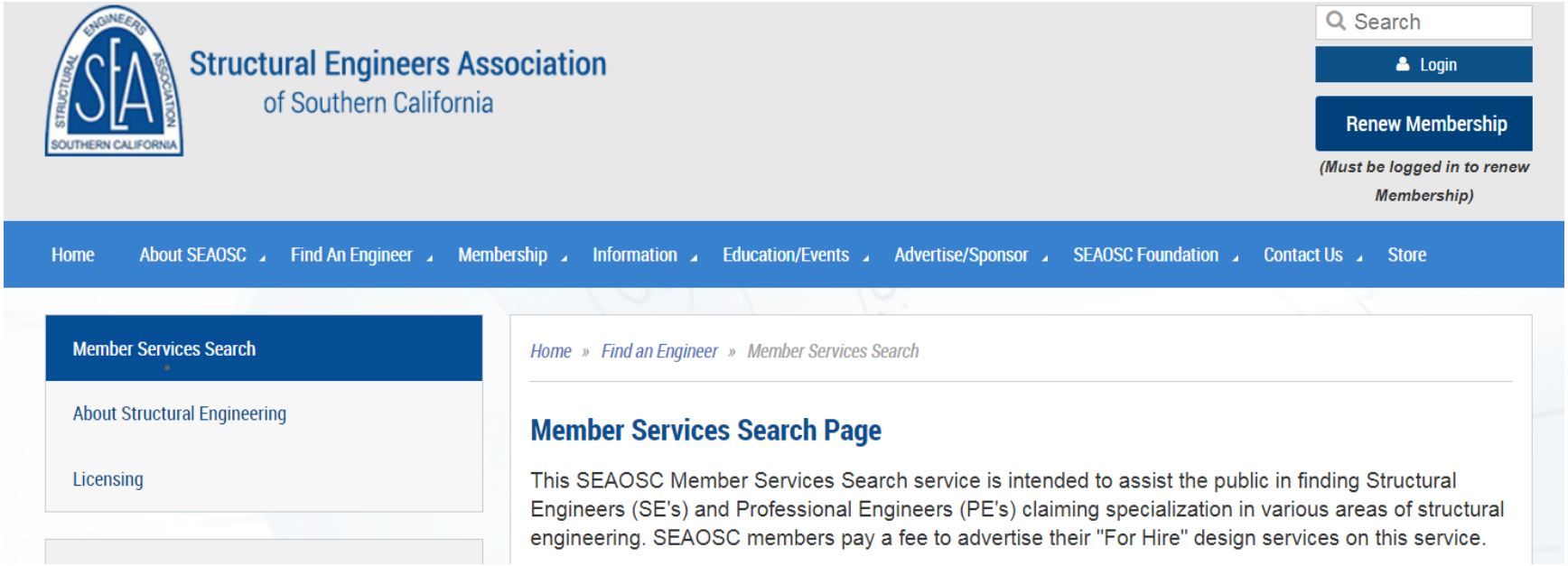
HOW DO I FIND A LICENSED ENGINEER?

- Ask your friends, architects or contractors for recommendations.
- SEAOSC has provided a webpage to help facilitate your search. Visit http://www.seaosc.org/find-an-engineer

SEAOSC Flyer: ***"What You Need to Know about Structural Engineering"***

Finding an Engineer

https://seaosc.org/Find-an-Engineer/



Finding a Contractor

- **Get multiple bids**
  - Get at least 3 written bids
  - Make sure bids are for identical scope of work
  - Be weary of substantially low bids
    - The contractor may have underestimated the scope of work
    - Could be a sign the contractor produces substandard work or cuts corners
- **Review the track record of the contractor, particularly with these kinds of projects**
  - Ask the contractor for references from previous similar projects

Finding a Contractor

- **Verify the contractor is licensed**
  - Ask to see his pocket license and a picture ID
  - Check online:

    https://www2.cslb.ca.gov/OnlineServices/CheckLicenseII/CheckLicense.aspx
  - Call (800) 321-CSLB (2752)
- **Verify the contractor's workers' compensation and commercial general liability insurance coverage**

More Tips:

http://www.cslb.ca.gov/Consumers/Hire_A_Contractor/Finding_The_Right_Contractor.aspx

Design-Bid-Build vs Design Build

Design-Bid-Build

- Traditional approach of the owner hiring consultants to complete the design and create construction drawings followed by hiring a contractor to complete the construction.

Design-Build

- Owner hires a firm to design and construct the building resulting in one contract for the entire process.

Information about Cost

- Design fee is small relative to the construction cost
- Some building characteristics that typically affect cost:
  - Number of Stories
  - Retrofit type (i.e. plywood shear walls vs. steel moment frames)
  - Number of deficient wall lines
  - Total length of deficient wall lines
  - Difficult conditions caused by
    - Obstructions
    - Existing structural framing
    - Drive isles and parking
  - Hillside building
  - Building irregularities
  - Absence of plywood in walls above the deficient wall line
  - Building evaluation shows retrofit is not required

Questions?