



# **RISA Webinar**

## **Lateral Loads in RISA**

**Presenter: Deborah Brisbin, P.E.**





RISA-3D 9.1



RISAFloor 5.1  
(Buildings Design)

RISA PROGRAMS

## Types of Lateral Loads

- Wind Loads
- Seismic Loads
- Notional Loads

## Diaphragms

## Load Combinations

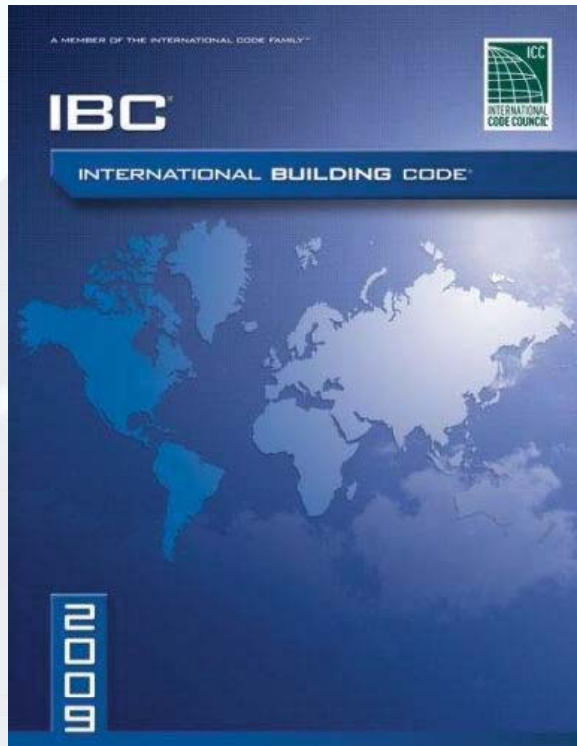


Image Courtesy of International Code Council

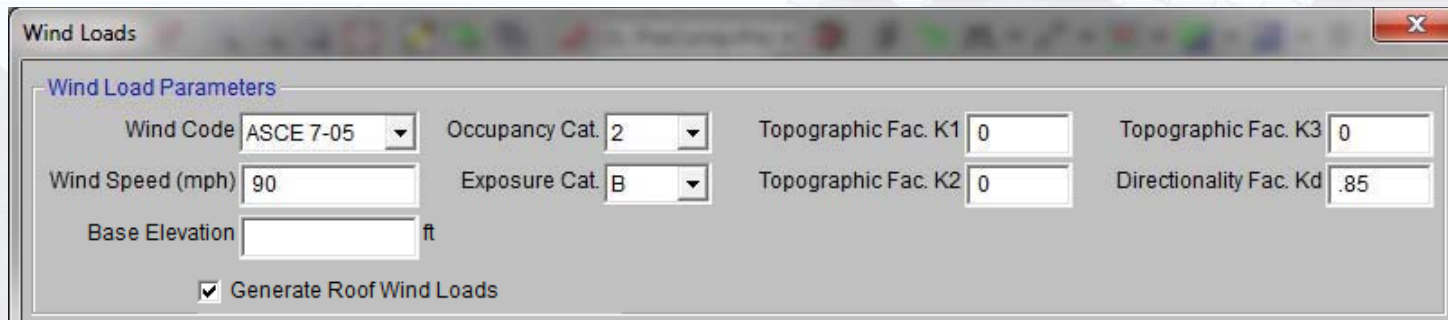


Image Courtesy of ASCE

## REFERENCED CODES



## Automated Wind loading in RISA-3D



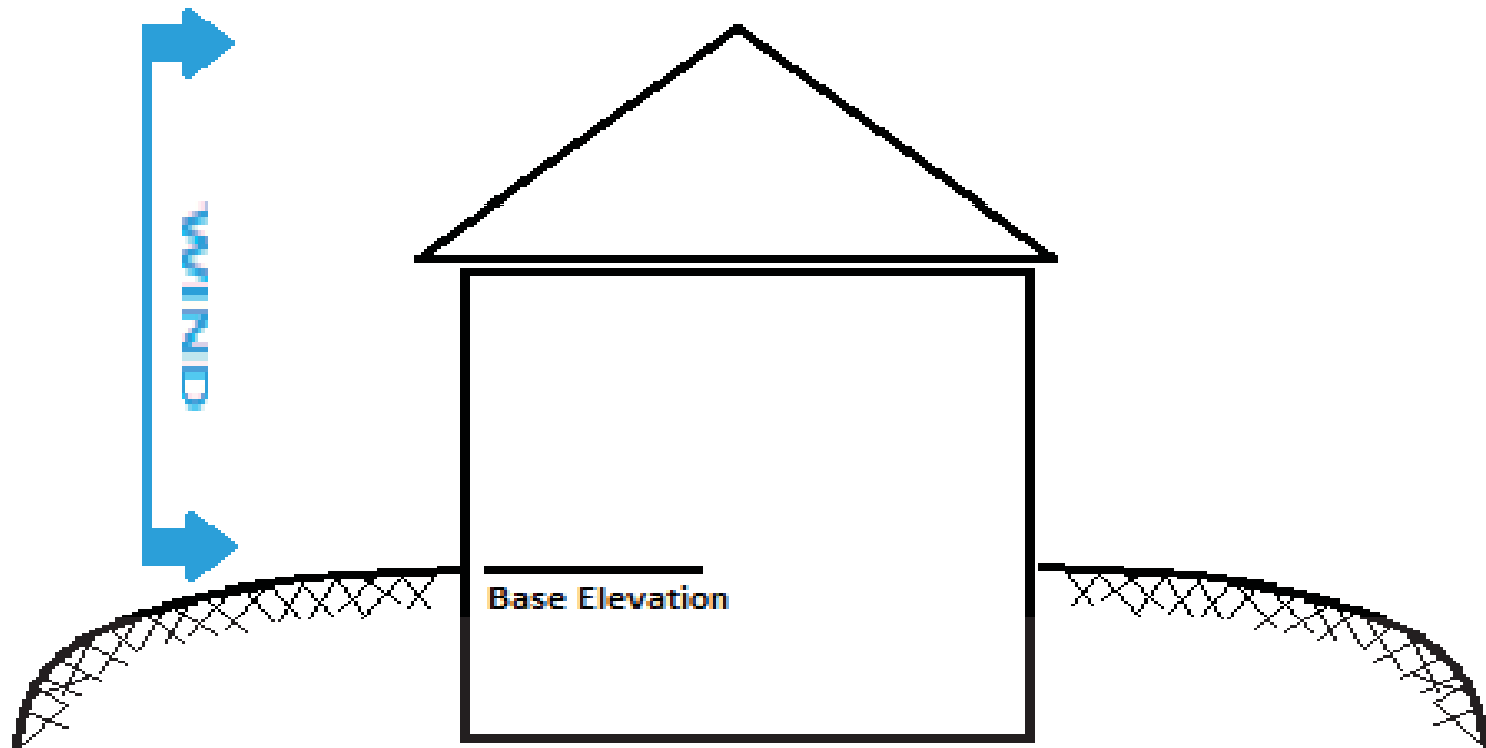
The screenshot shows the 'Wind Loads' dialog box in RISA-3D. It contains the following fields and options:

- Wind Load Parameters** (Section Header)
- Wind Code:** ASCE 7-05 (dropdown)
- Occupancy Cat.:** 2 (dropdown)
- Topographic Fac. K1:** 0 (text box)
- Topographic Fac. K3:** 0 (text box)
- Wind Speed (mph):** 90 (text box)
- Exposure Cat.:** B (dropdown)
- Topographic Fac. K2:** 0 (text box)
- Directionality Fac. Kd:** .85 (text box)
- Base Elevation:** (text box) ft
- ☒ **Generate Roof Wind Loads**

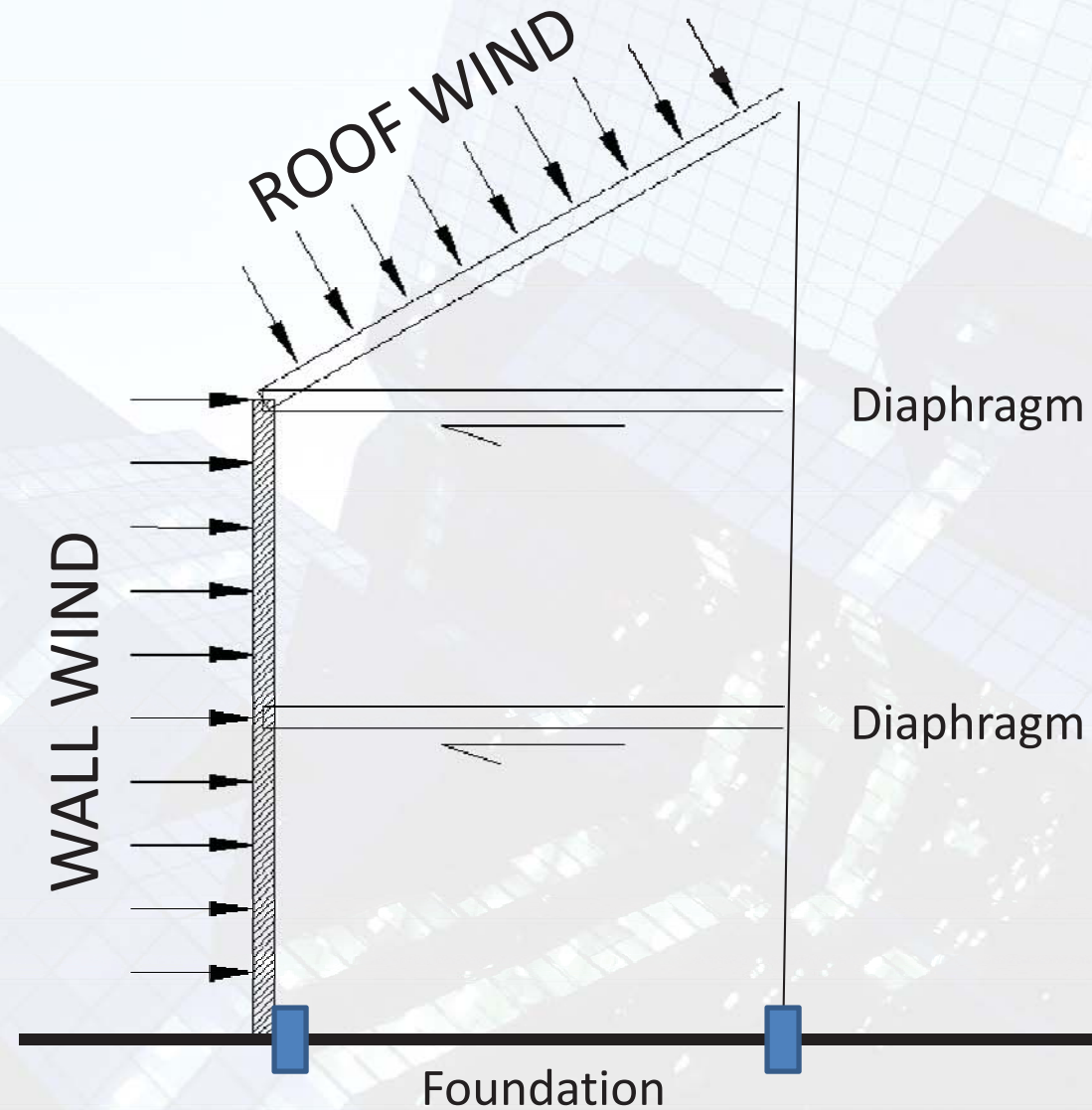
- ASCE7 6.5.12.2.1 Main Wind-Force Resisting Systems (MWFRS)  
Rigid Enclosed Buildings of All Heights

Wind Loads

Base Elevation



Wind Loads



**WIND LOAD PATH ILLUSTRATED**

## Roof Wind Loads

per ASCE7 Figure 6-6

Load Categories created:

WLX, WLZ

WLX+R, WLX-R

WLZ+R, WLZ-R

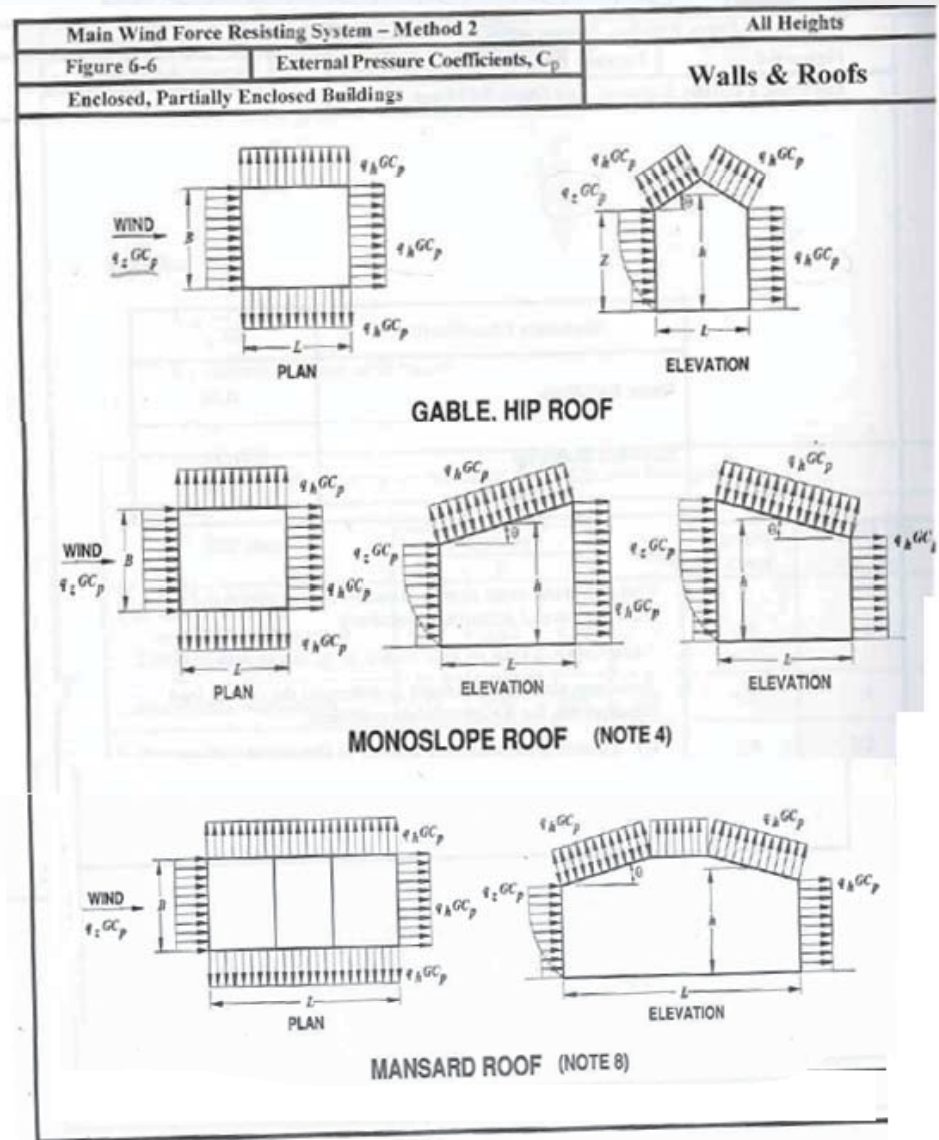


Image Courtesy of ASCE

## Wind Loads





# Seismic Weight in RISAFloor

Global Parameters

Description | Solution | Codes | Composite | Wind | Seismic | Concrete

RISA-3D Seismic Load Options

Seismic Code: **ASCE 7-05**

Ct (X): .02      Ct (Z): .02

T (X):      sec      T (Z):      sec

R (X): 3      R (Z): 3

$\Omega$  (X): 1       $\Omega$  (Z): 1

$\rho$  (X): 1       $\rho$  (Z): 1

Ct Exp. (X): .75      Ct Exp. (Z): .75

S<sub>D1</sub>: .16 g      S<sub>DS</sub>: .27 g

Occupancy Cat: I or II      S<sub>1</sub>: .1 g

TL: 5 sec

Base Elevation:      ft      ☒ Add Base Weight

☒ Show Seismic Dialog when Loads Change

**Diaphragm Mass Self Weight Options**

☒ Include Gravity Items      ☒ Include Deck      ☒ Include Lateral Items

Save as Defaults

OK      Cancel      Apply      Help

Automatically calculates Self Weight:  
Gravity Items, Decks, Lateral Items

Dyn Mass = Superimposed Dead Loads

Uniform Area Loads

Standard | Other

	Label	Addit...	PreDL[ksf]	PostDL[...]	LL[ksf]	LL Type	VL[ksf]	Dyn Load[ksf]
1	Office	<input type="checkbox"/>		.01	.05	LL-Reduce	.011	.01
2	Storage	<input type="checkbox"/>		.01	.125	LLS-Non	.011	.05
3	Public	<input type="checkbox"/>		.01	.1	LL-Non	.004	.01
4	Add Piping	<input checked="" type="checkbox"/>		.02		LL-Non	.011	.02
5	Roof	<input type="checkbox"/>		.01	.02	RLL-Non	.011	.01

## Seismic Loads

## Seismic Weight in RISA-3D

Seismic Loads

Seismic Load Parameters

Seismic Code	ASCE 7-05	Ct (Z)	.02	T (Z)		sec	R (Z)	3	
Base Elevation		ft	Ct (X)	.02	T (X)		sec	R (X)	3
Occupancy Cat	I or II		TL	5		sec	<input checked="" type="checkbox"/> Add Base Weight	Ct Exp. (Z)	.75
S_D1	.16	g	S_DS	.27		g	S_1	.1	g
								Ct Exp. (X)	.75

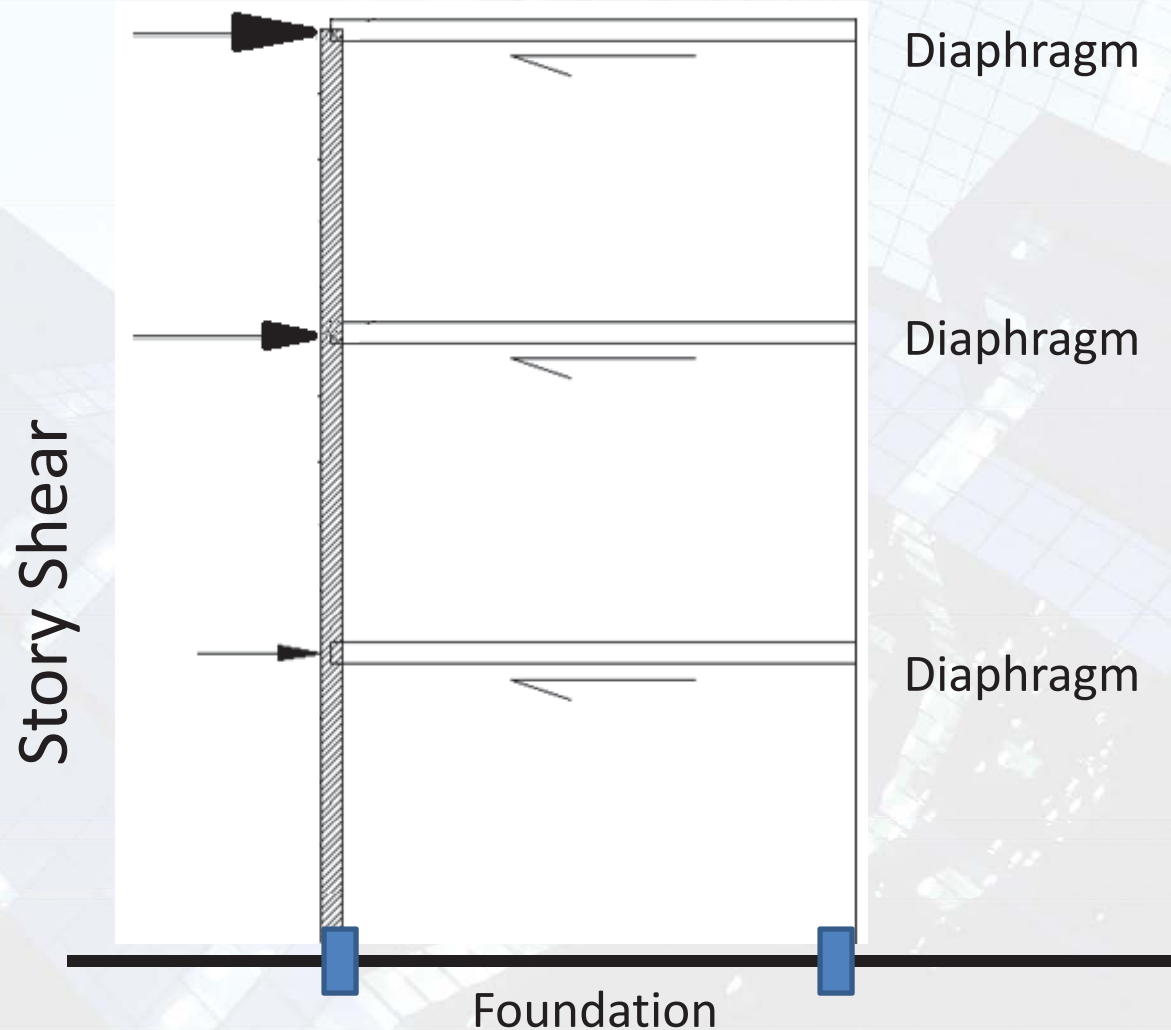
Seismic Load Results

Seismic Weight LC: 1: Dead Load

Calc Loads

Select the LC from the drop-down list

## Seismic Loads



SEISMIC LOAD PATH ILLUSTRATED

## Notional Loads

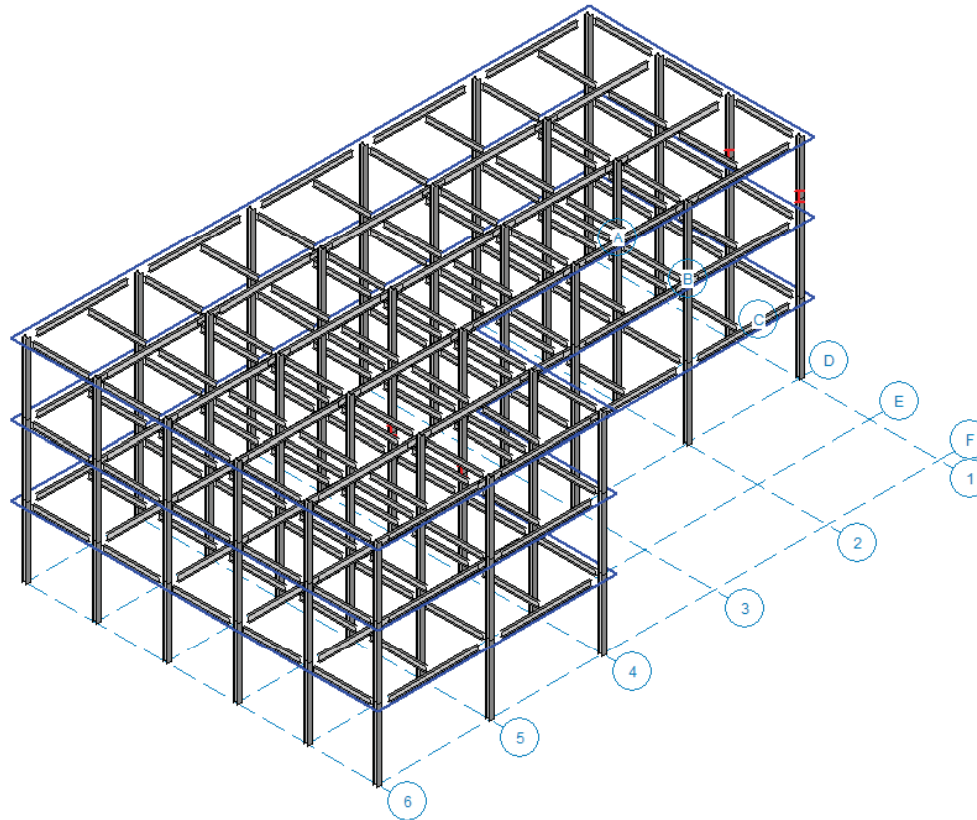
**Definition:** Lateral loads that are applied at each framing level... to account for the effects of geometric imperfections, inelasticity or both.

- AISC Appendix 7- Direct Analysis Method
- ASCE7-2010 Required for all structures (ASCE7 1.4.3)

Notional Loads



Let's look at an example of Wind, Earthquake, Notional Loads:



Automated Loads

## Earthquake & Wind Loads without Diaphragms

- Calculate the loads outside of RISA
- Apply the wind loads

Point Loads

Distributed Line loads

Area Loads

Lateral Loads

## Area Loading for Wind Walls

Distribution:

- One Way (Ribbed Siding)
- Two Way (Isotropic Siding)
- Open Structure (No Siding)

Direction:

- Always Perpendicular to the member local axis (“Perp”)

**Lateral Loads**



## RISA-3D & RISAFloor automates Lateral Loads

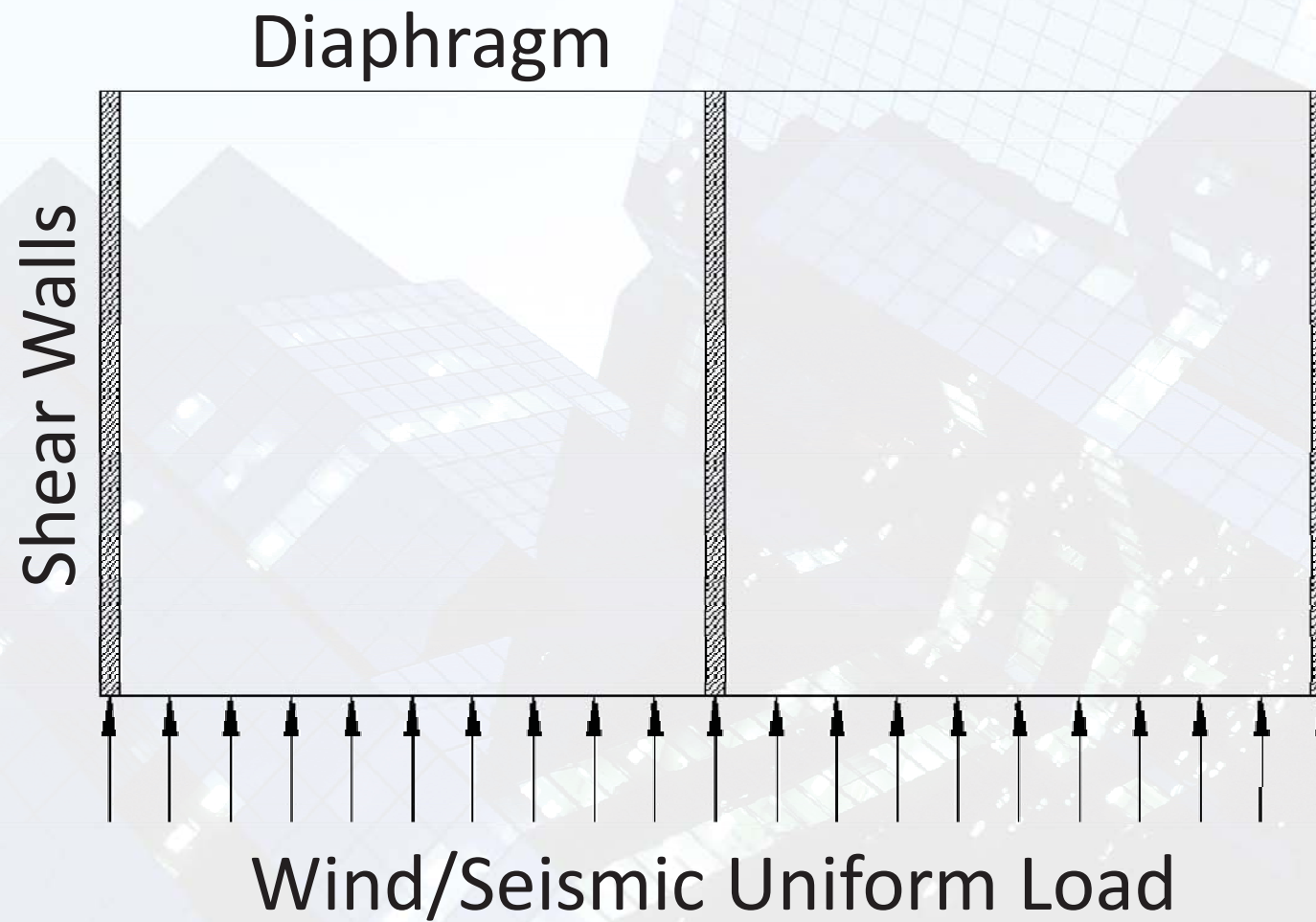
➤ Requires a Diaphragm

### Flexible or Rigid Diaphragm?

What is the stiffness of your diaphragm?

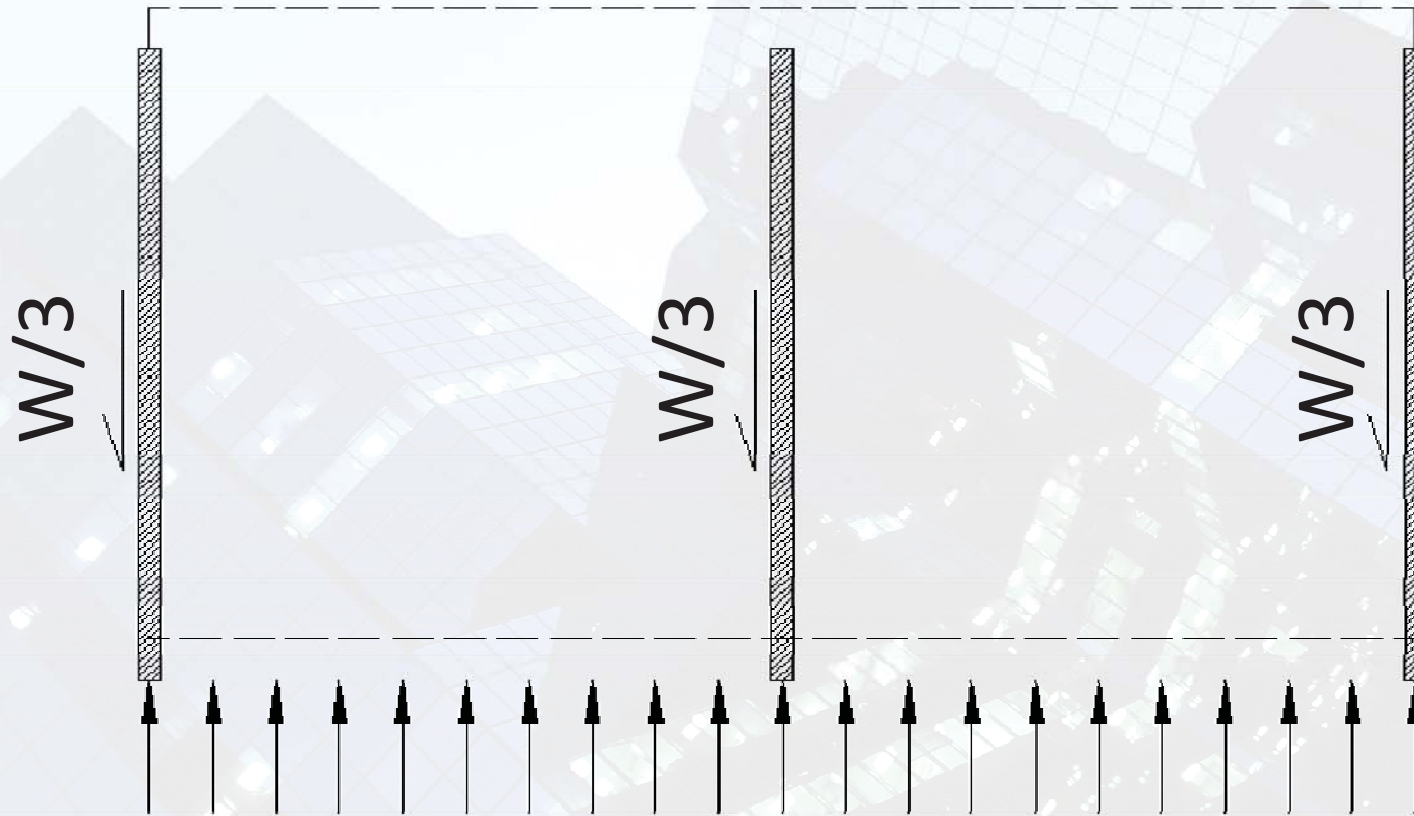
How does it distribute the loads?

Lateral Loads

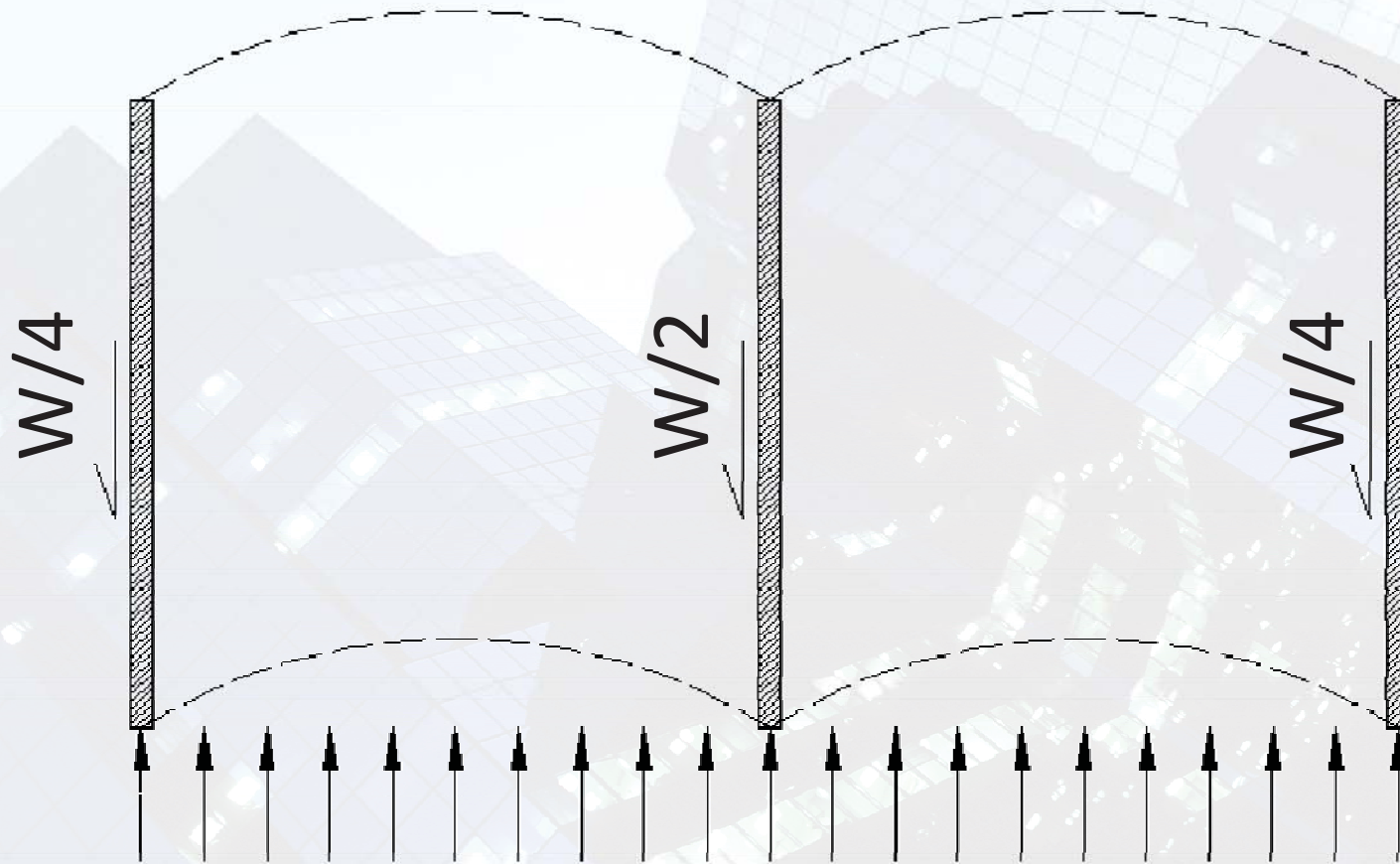


DIAPHRAGM EXAMPLE

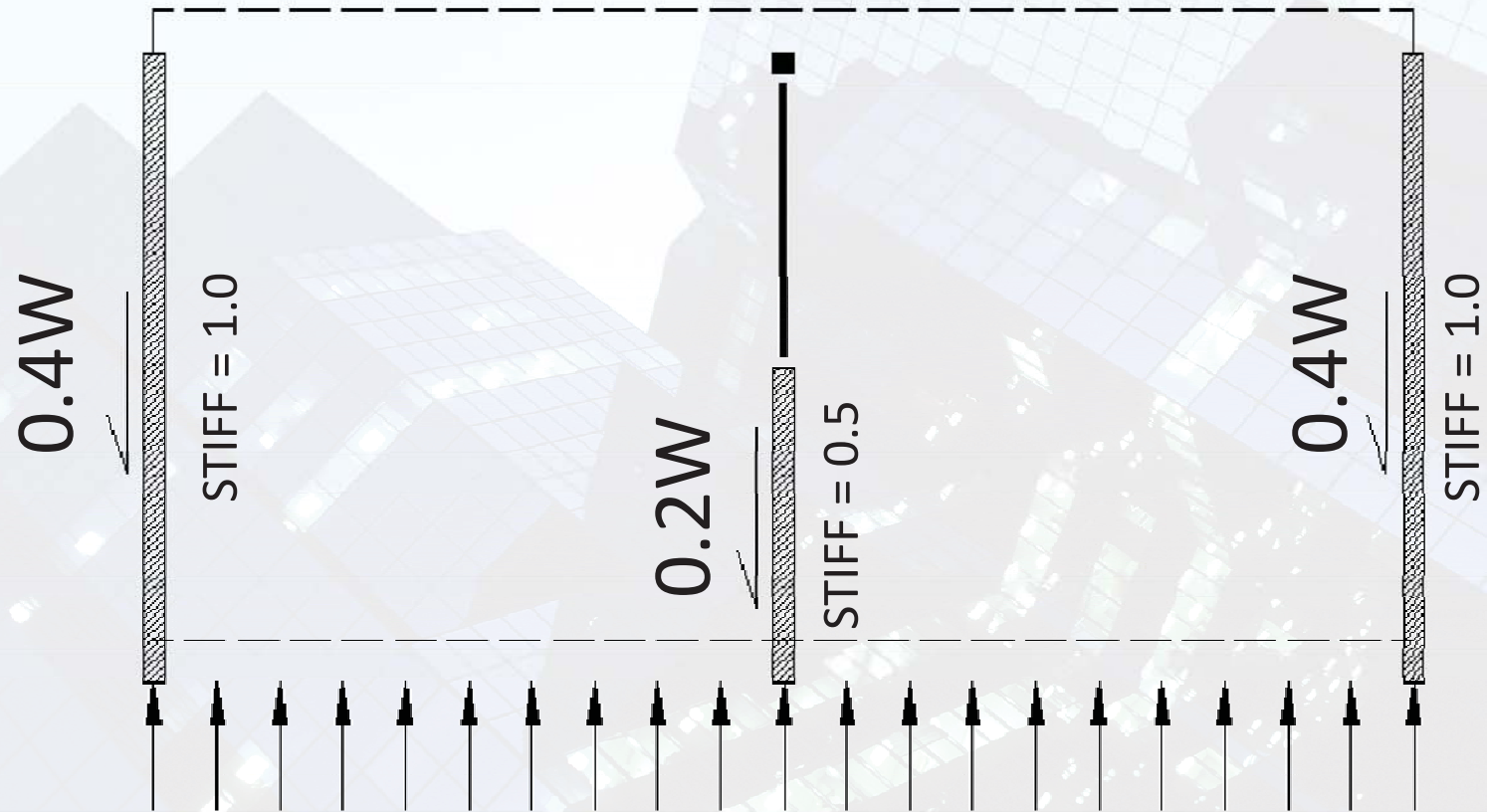




**RIGID DIAPHRAGM**

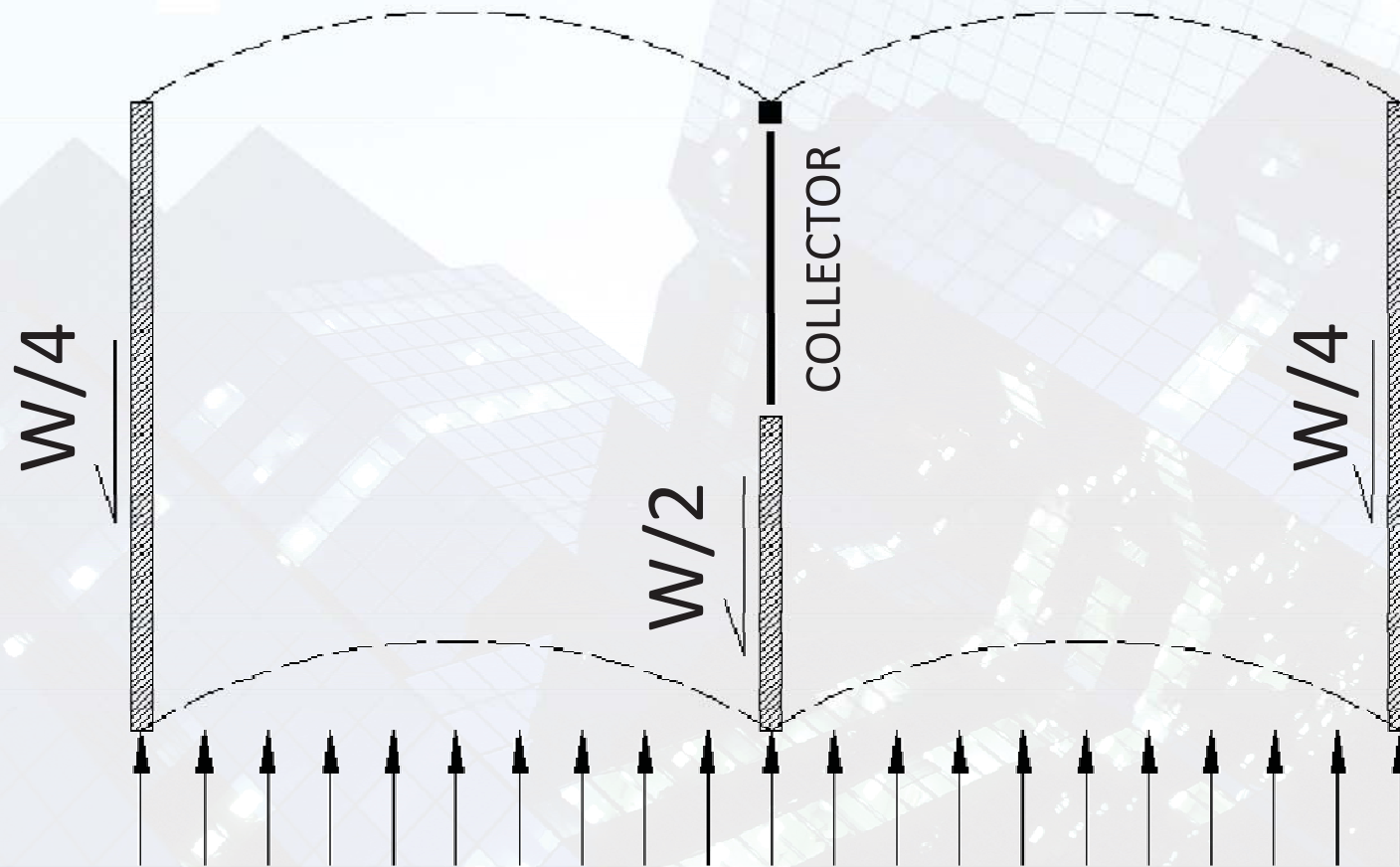


FLEXIBLE DIAPHRAGM



**RIGID DIAPHRAGM**





FLEXIBLE DIAPHRAGM

## Seismic Load Combinations

Load Combination Generator - Seismic

Gravity | Wind | Seismic

LC Region: United States

LC Code: 2009 IBC Strength

Seismic Load Options

- ☐ Reversible ☐ None
- ☐ Include  $\rho$  ☐ 2D Only
- ☐ Include  $E_v$  (vertical) ☐ X and Z
- ☐ Include Non Ortho (100%+30%) ☒ X and Z w/Ecc
- ☐ Add Notional Loads to Seismic Load Combinations?

Overstrength LC Options

- ☐ Reversible ☒ None
- ☐ Include  $E_v$  (vertical) ☐ 2D Only
- ☐ Include Non Ortho (100%+30%) ☐ X and Z
- ☐ Include Non Ortho (100%+30%) ☒ X and Z w/Ecc

RLL Options: None

Save as Defaults

Generate Close Help

### Options:

- Reversible
- Redundancy Factor,  $\rho$
- $E_v = 0.2 S_{DS} * DL$
- Include Non Orthogonal
- Overstrength Options



## Wind Load Combinations

Load Combination Generator - Wind

Gravity | **Wind** | Seismic

LC Region: United States

LC Code: 2009 IBC Strength

Wind Load Options

☐ Reversible

☐ None

☐ 2D Only

☐ X and Z

☐ X and Z w/Ecc

☒ X and Z w/Ecc, Quart

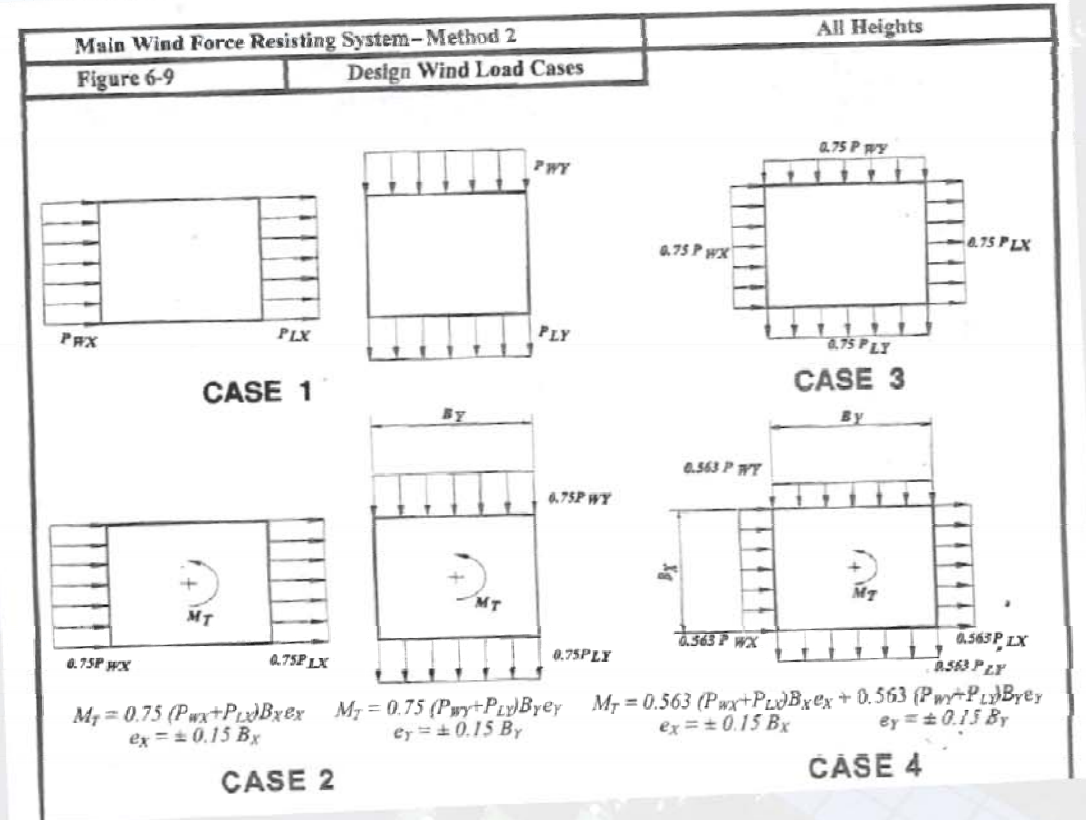
☐ Generate Roof Wind Loads?

☐ Add Notional Loads to Wind Load Combinations?

RLL Options: None

Save as Defaults

Generate Close Help



## Load Combinations

## **Additional Resources**

- RISA-3D Help File and Reference Manual
- [www.risanews.com](http://www.risanews.com)
- [support@risa.com](mailto:support@risa.com)
- User's Guides available at [www.risa.com](http://www.risa.com)

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# Questions?

Please let us know if you have questions.

We will answer as many questions as time permits during the webinar.

Once the webinar is closed, we will post all Q&A's, the powerpoint slides and the models used today to our website:

[www.risa.com](http://www.risa.com)

For further information, contact us at: [info@risa.com](mailto:info@risa.com)

**Thank you for Attending!**

