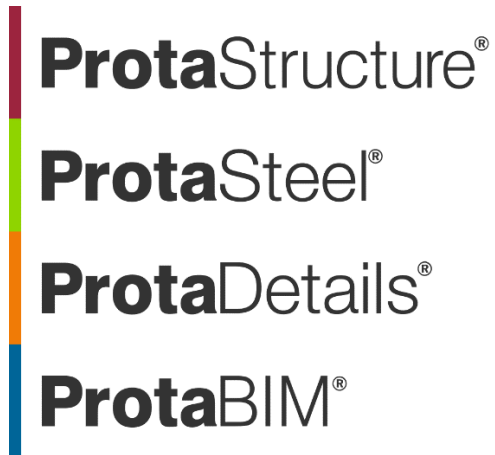




# ProtaStructure Design Guide

## Seismic Joint Design (EC8)

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## Introduction

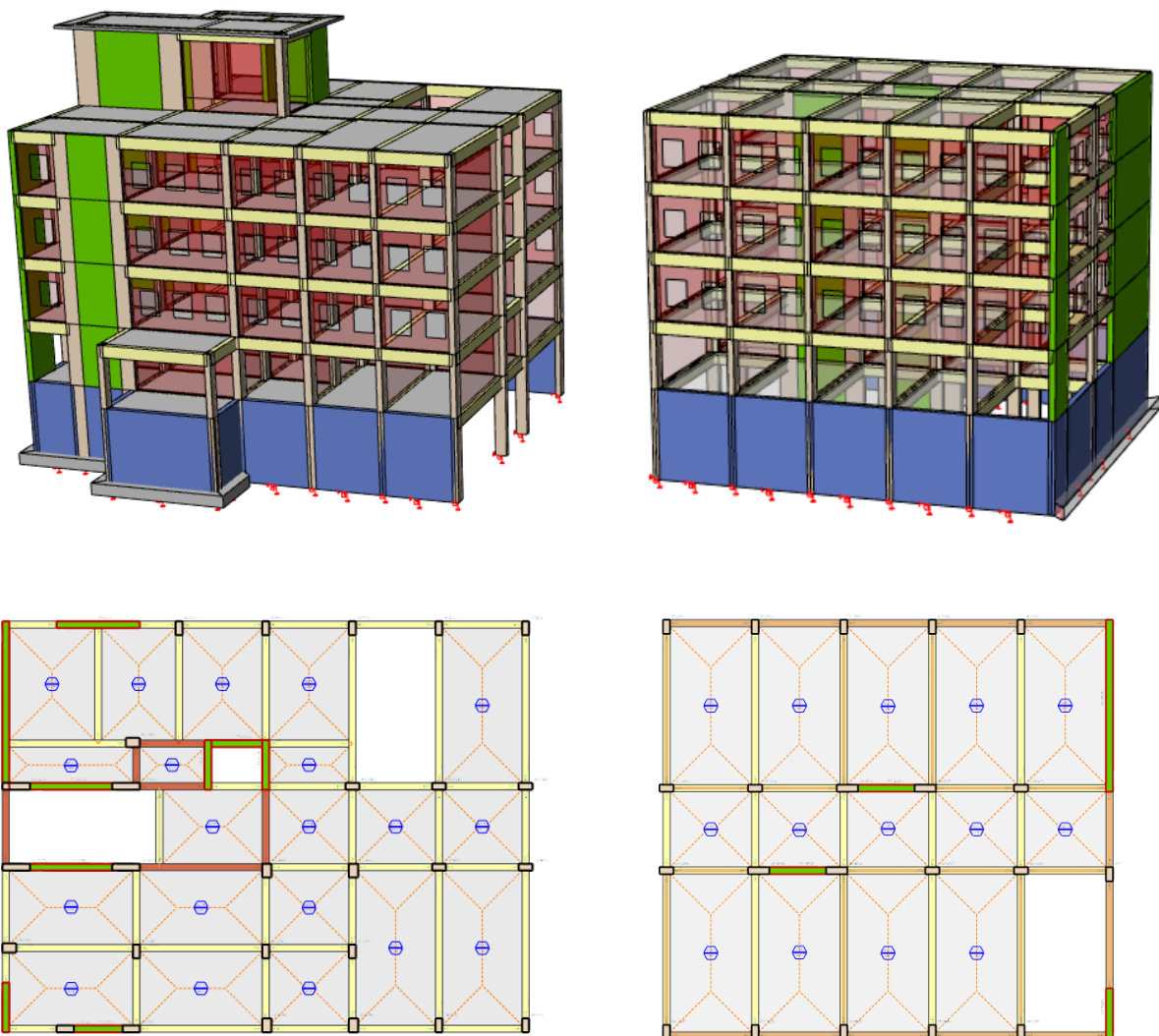
ProtaStructure determines the seismic joint condition according to **EC8 Chapter 4.4.2.7**. In this document, calculation details about seismic joint condition are explained.

## Building Model Details

In the current document, the seismic joint condition of two models that belongs to the same property is investigated.

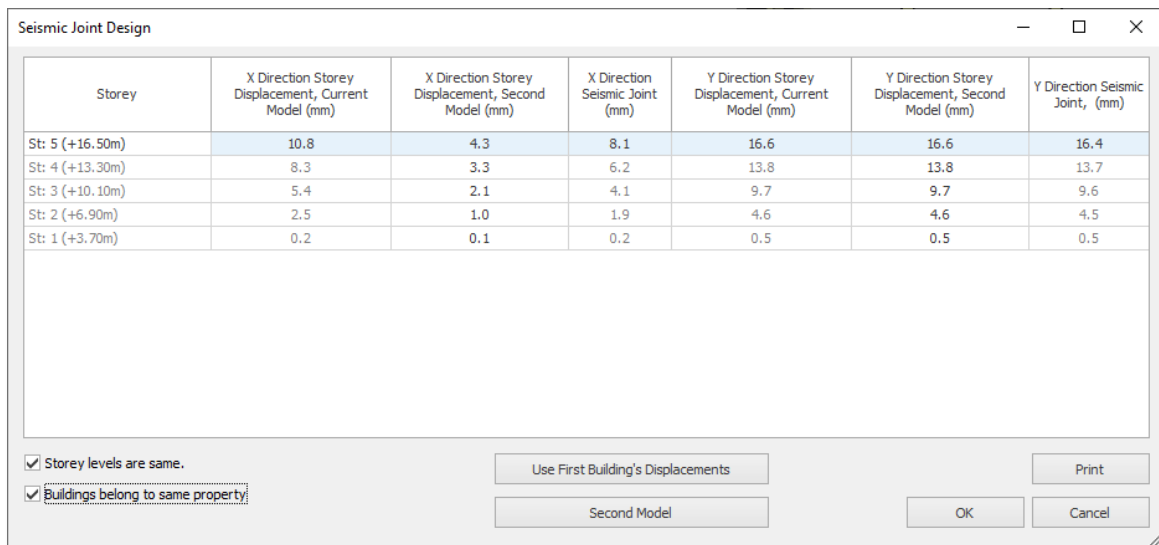
**Block A**, consists of 6 stories including the elevator maintenance floor. **Block B**, consists of 5 stories. Storey levels are the same for these structures.

Seismic joints align between X Direction for both buildings.



3D and Typical Plan View of Building Models (A and B Block Accordingly)

## User Interface



| Storey          | X Direction Storey Displacement, Current Model (mm) | X Direction Storey Displacement, Second Model (mm) | X Direction Seismic Joint (mm) | Y Direction Storey Displacement, Current Model (mm) | Y Direction Storey Displacement, Second Model (mm) | Y Direction Seismic Joint, (mm) |
|-----------------|-----------------------------------------------------|----------------------------------------------------|--------------------------------|-----------------------------------------------------|----------------------------------------------------|---------------------------------|
| St: 5 (+16.50m) | 10.8                                                | 4.3                                                | 8.1                            | 16.6                                                | 16.6                                               | 16.4                            |
| St: 4 (+13.30m) | 8.3                                                 | 3.3                                                | 6.2                            | 13.8                                                | 13.8                                               | 13.7                            |
| St: 3 (+10.10m) | 5.4                                                 | 2.1                                                | 4.1                            | 9.7                                                 | 9.7                                                | 9.6                             |
| St: 2 (+6.90m)  | 2.5                                                 | 1.0                                                | 1.9                            | 4.6                                                 | 4.6                                                | 4.5                             |
| St: 1 (+3.70m)  | 0.2                                                 | 0.1                                                | 0.2                            | 0.5                                                 | 0.5                                                | 0.5                             |

☒ Storey levels are same.  
☒ Buildings belong to same property.

Use First Building's Displacements  
 Second Model

Print  
 OK Cancel

At the “**Seismic Joint Design**” user interface, story displacements for the current model in both directions will be listed automatically. Users may both set the second model story displacements manually or use the “**Second Model**” option to get story displacements from another model. Conditions due to **EC-8 4.4.2.7 (2) and (3)**, can be set from user interface by using “**Storey levels are same.**” and “**Buildings belong to same property.**” options.

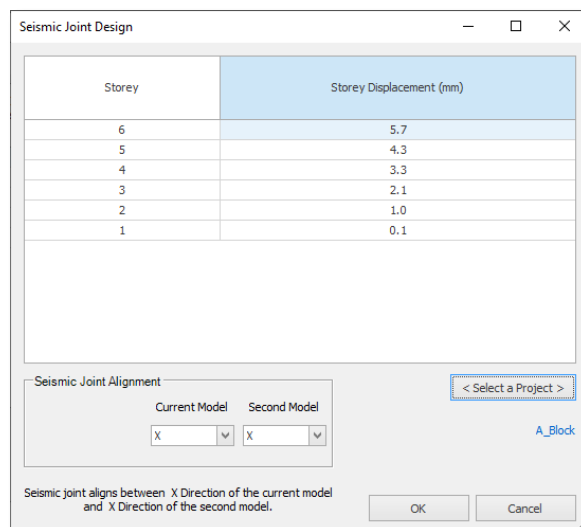
If the floor elevations of the building or independent unit under design are the same as those of the adjacent building or unit, the minimum distance referred above may be reduced by a factor of 0,7. Users may control this by using the “Storey levels are same” option.

Calculation details of seismic joint conditions change according to whether the buildings belong to the same property or not. (**EC-8 4.4.2.7 (2) a and b**)

If the “**Use First Building’s Displacements**” button is used, current model story displacements will be set to second model story displacements.

In case the “**Second Model**” option is used, the window given above will be pop-up. If there is no problem with the seismic analysis of the selected second model, story displacements for both directions will be saved. Users may set the seismic joint alignment by using the options that are given in the “**Seismic Joint Alignment**” box. The statement about the alignment given below the box will be updated accordingly.

In case the number of stories of the second model is greater than the current model, story displacements up to the number of current model stories will be used. For the opposite case, missing story displacements will be used as zero.



| Storey | Storey Displacement (mm) |
|--------|--------------------------|
| 6      | 5.7                      |
| 5      | 4.3                      |
| 4      | 3.3                      |
| 3      | 2.1                      |
| 2      | 1.0                      |
| 1      | 0.1                      |

Seismic Joint Alignment

Current Model: X  
 Second Model: X

Seismic joint aligns between X Direction of the current model and X Direction of the second model.

< Select a Project >  
 A\_Block  
 OK Cancel

## Calculation Details

According to **EC8 4.4.2.7 (2) a**, “for buildings, or structurally independent units, that do not belong to the same property, if the distance from the property line to the potential points of impact is not less than the maximum horizontal displacement of the building at the corresponding level”.

$$Seismic\ Joint = Max(\delta_{1(i)}, \delta_{2(i)})$$

According to **EC8 4.4.2.7(2) b**, “for buildings or structurally independent units, belonging to the same property, if the distance between them is not less than the square root of the sum- of the squares (SRSS) of the maximum horizontal displacements of the two buildings or units at the the corresponding level”

$$Seismic\ Joint = \sqrt{\delta_{1(i)}^2 + \delta_{2(i)}^2}$$

$\delta_{1(i)}$  = i'th storey displacement of current model

$\delta_{2(i)}$  = i'th storey displacement of second model

Since the buildings belong to the same property, calculations are done to **EC8 4.4.2.7 (2) b**.

Floor elevations are the same for both structures. Therefore, calculated seismic joint reduced by multiplying 0.7 according to **EC8 4.4.2.7 (3)**.

| Storey          | Z (m) | X Direction Storey Displacements of Current Model (mm) | X Direction Storey Displacements of Second Model (mm) | Calculated Seismic Joint (mm) | Reduced Seismic Joints (EC 8 4.4.2.7 (3)) (mm) |
|-----------------|-------|--------------------------------------------------------|-------------------------------------------------------|-------------------------------|------------------------------------------------|
| St: 5 (+16.50m) | 16.5  | 10.8                                                   | 4.3                                                   | 11.6                          | 8.2                                            |
| St: 4 (+13.30m) | 13.3  | 8.3                                                    | 3.3                                                   | 8.9                           | 6.3                                            |
| St: 3 (+10.10m) | 10.1  | 5.4                                                    | 2.1                                                   | 5.8                           | 4.1                                            |
| St: 2 (+6.90m)  | 6.9   | 2.5                                                    | 1.0                                                   | 2.7                           | 1.9                                            |
| St: 1 (+3.70m)  | 3.7   | 0.2                                                    | 0.1                                                   | 0.3                           | 0.2                                            |

According to **EC8 4.4.2.7**, the seismic joint should not be less than **8.2 mm**.

Suggested Seismic Joint: **10 mm**

## Summary

In this document, calculation details of the seismic joint condition according to **EC8 Clause 4.4.2.7** are explained. Results of the “Seismic Joint Design” macro are verified with hand calculations.

## Thank You...

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