NextFEM **Designer**

Operating manual

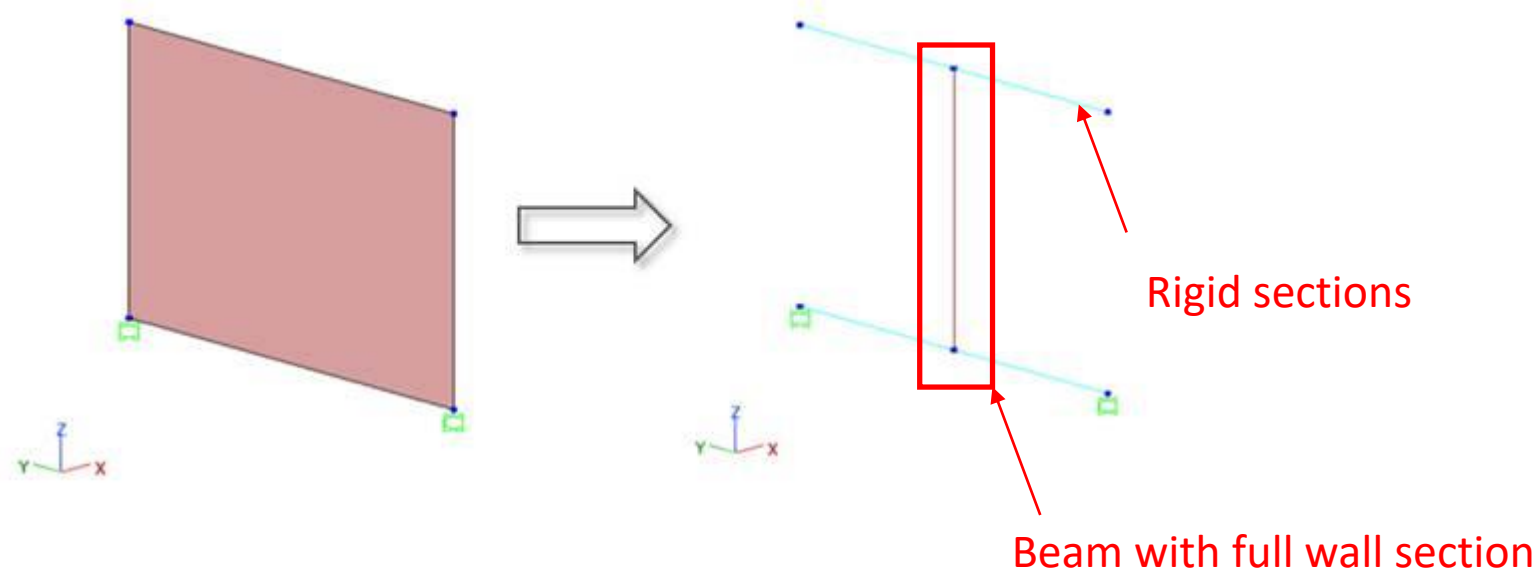
Use of Wall element

Rev.01 - April 2022

The Wall element

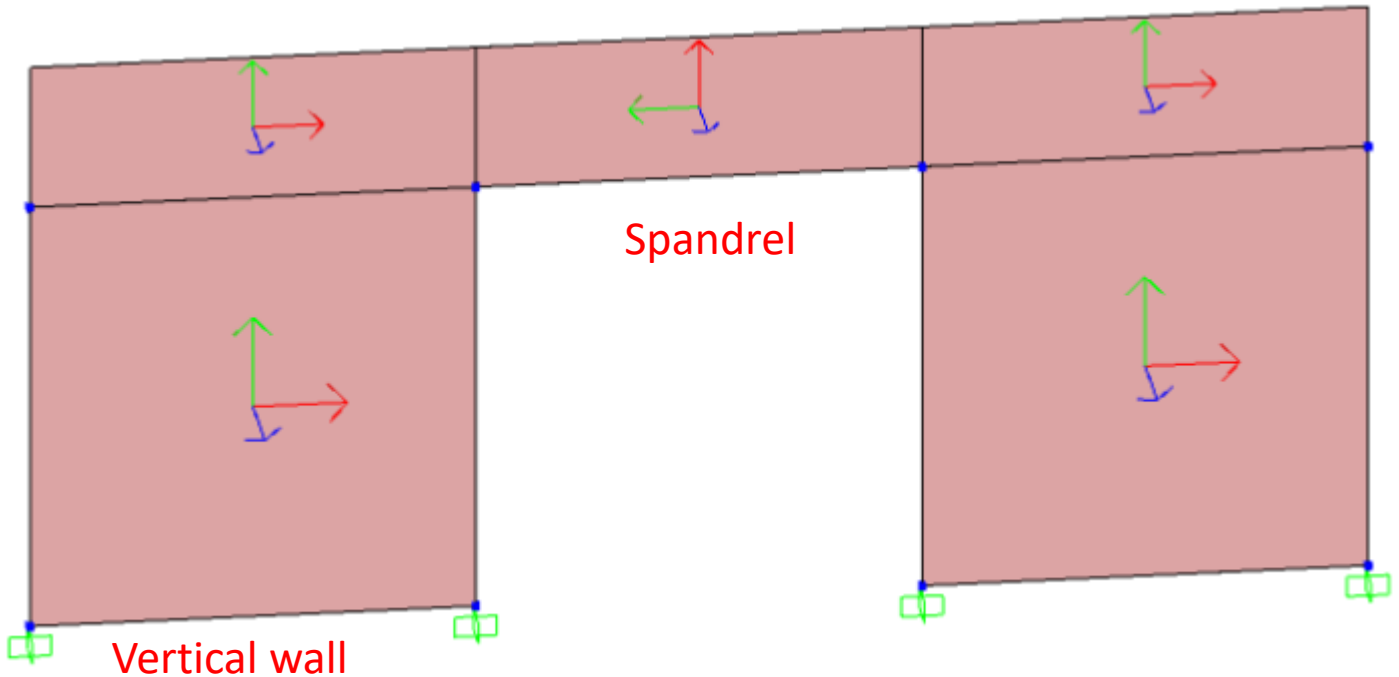
The Wall macro-element is designed for the two-dimensional representation of reinforced concrete and masonry walls.

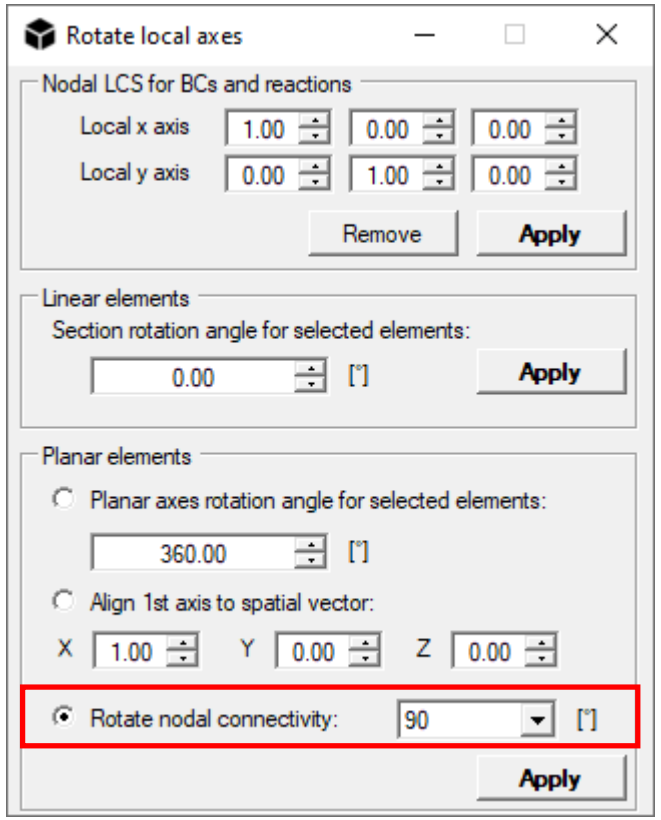
It consists of a Quad element with the appropriate cross-section (thickness) which is translated in the analysis phase into the assembly of a beam with rigid arms at the ends.



The Wall element

The element can represent both vertical walls and floor strips, depending on the orientation of the local y-axis (vertical or horizontal).
To see the local axes, use the **View / Local axes** command.





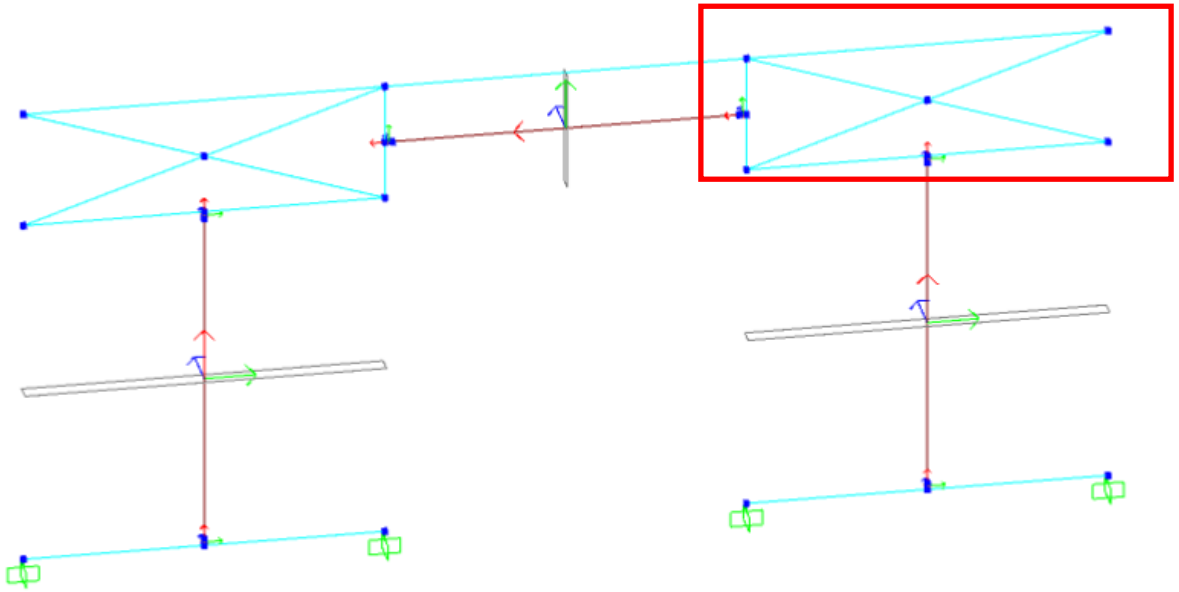
With the **Assign / Local axes rotation** mask it is possible to rotate the element y-axis.

Available macro-nutrients

NextFEM Designer has several types of macro elements, such as:

- ✓ **Wall**, suitable for elastic response of walls or bands. Accepts the insertion of plastic hinges;
- ✓ **masonryWall**, suitable for non-linear in-plane and out-of-plane response of masonry walls;
- ✓ **rigidWall**, to represent a rigid wall.

With the command **Edit / Mesh tools / Expand macroelements,** it is possible to replace all macroelements in the model. ATTENTION: once the model has been saved, this operation is not reversible.



Example of masonry wall modelling with rigid nodal zones

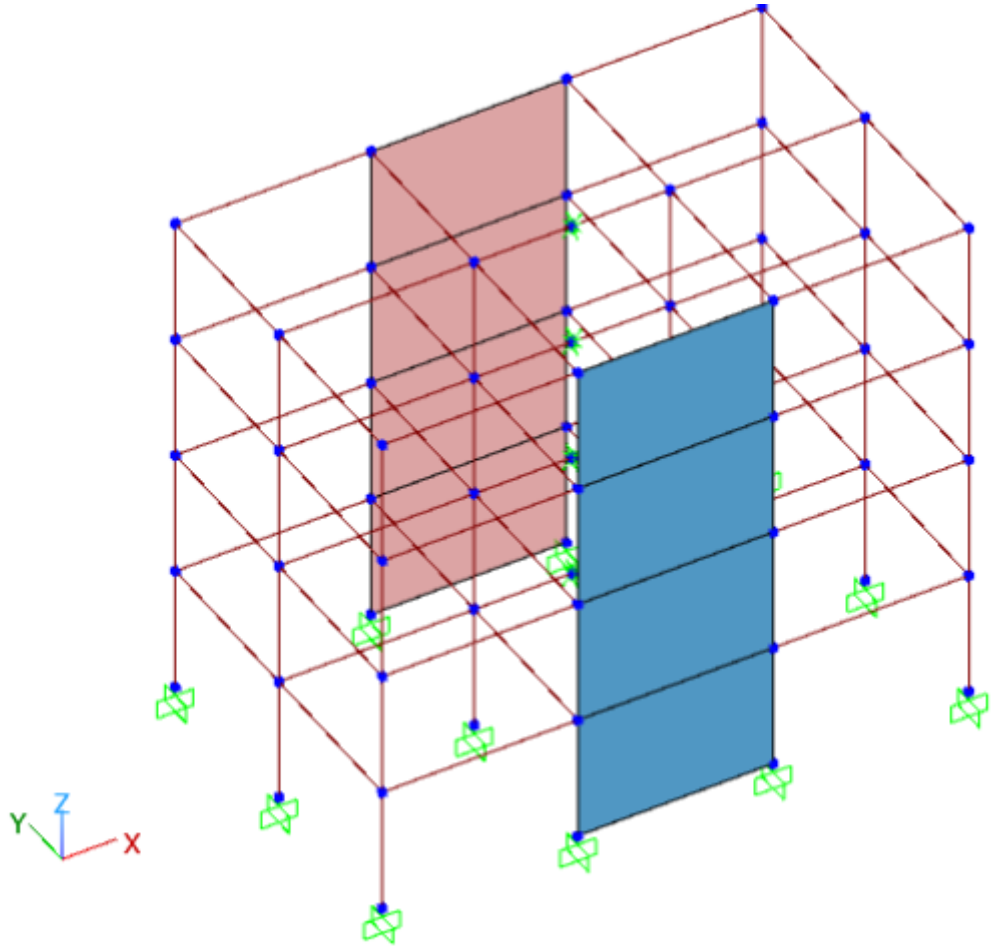
Inserting a Wall element

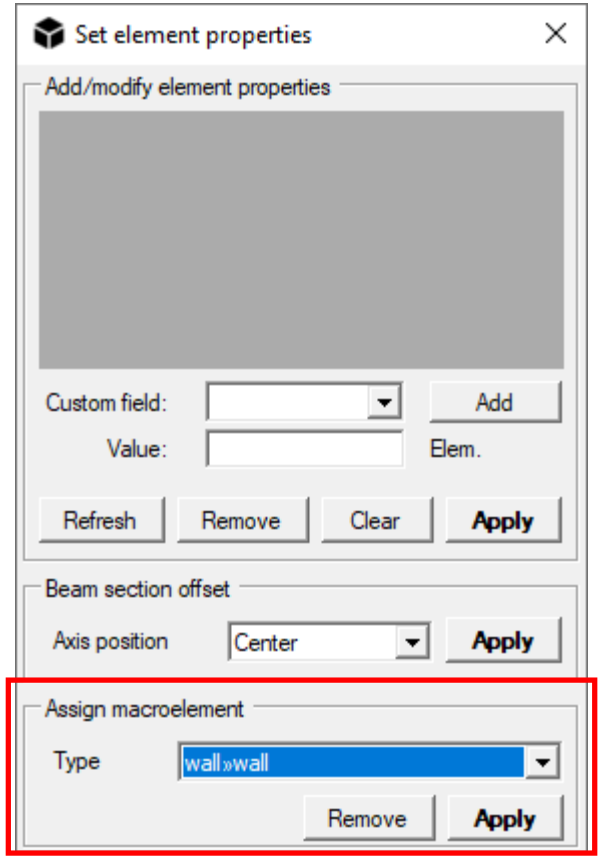
I. Drawing a Quad element, with its own section (thickness)

II. Select drawn Quads

III. Open the window **Assignment / Item properties** (or SHIFT + right mouse button)

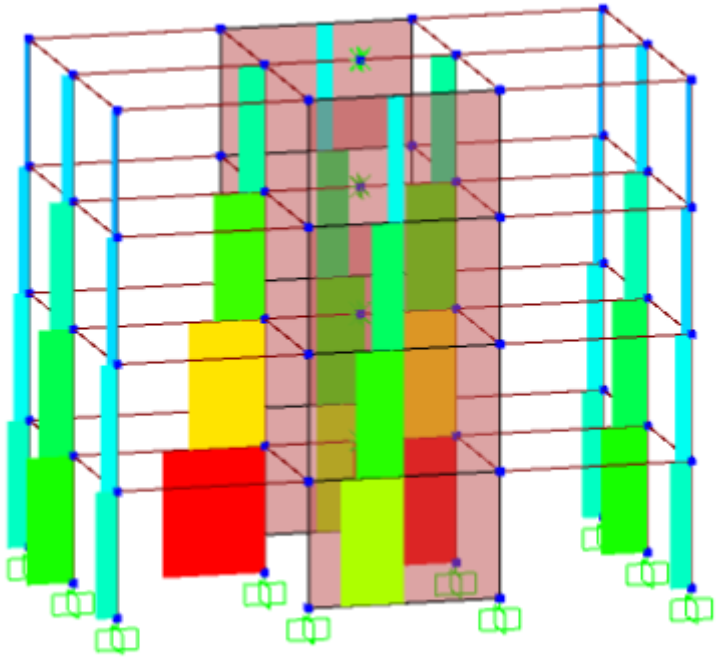
IV. Select **wall** from the bottom drop-down list and press *Apply*





Wall element - results

Stress diagrams are available for *wall* and *masonryWall* elements.



For non-linear modelling of masonry, it is possible to use:

- ✓ Wall with plastic hinges for masonry
- ✓ masonryWall, where strength changes with normal stress in masonry tongues

The **MasonryCheck** module is required to use *masonryWall*.

Wall element

Some considerations:

- ✓ Care must be taken when modelling r.c. and masonry walls with common nodes: the difference in stiffness between the two materials may lead to unpredictable responses of the less rigid element (e.g. moment in plane accentuated instead of compression from vertical loads)

- ✓ The verification for Wall elements is carried out in the same way as for beams or groups of flat elements with section cuts, without distinction. It is therefore possible to proceed as usual

- ✓ The Wall element does not transform the model into an equivalent frame; especially in the case of masonry, the traditional rules for the equivalent frame typically result in larger deformable zones. However, the linear and non-linear response of the 2 models is comparable.

- ✓ It is advisable to use Wall elements with a form ratio that is in any case limited, in order to avoid representations that are too rigid in relation to vertical shear due to rigid sections in series at deck level.

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