Composed beam elements – in plane loading

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Abstract

Especially for the consulting engineering field with respect to buildings, DIANA has developed a hidden feature with which stresses in a plane can be projected as bending moments on a beam. For solid elements this option was already available (projecting on a plane).

Until now it was difficult for a construction engineer to interpret the stresses in a plane and to extract a good reinforcement setup out of it.

Because the M,D,N values are projected on the composed beam elements, also columns can be more easily evaluated. The total amount of normal or shear force is calculated directly and no summation of the stresses over de column width is necessary anymore.

The paper will show some possibilities of this new feature. For instance high building walls with window holes in it. But it can be useful also in other constructions like foundation elements with a relative high height/width aspect ratio.

The new feature will be compared with the most common way of engineering a building wall. Normally the wall sections in between the windows are substituted by beam elements and the displacements and stresses are calculated without taking into account the spreading of the forces over the wall height.
In this manner it can also be used as a comparison tool with respect to the validation of a DIANA model to a beam model, which is very important in discussions to other parties which must check the calculation (In the Netherlands for example the Dutch government BoWoTo).