



GENERAL BUILDING ENGINEERING

TIE BEAMS IN BUILDINGS



Erasmus+

WHAT ARE TIE BEAMS?

Tie beam is a structural element in the form of a reinforced concrete beam placed in the walls of the building, whose main function is to connect the ceiling or flat roof with masonry walls, which allows transferring loads from ceilings to structural walls.

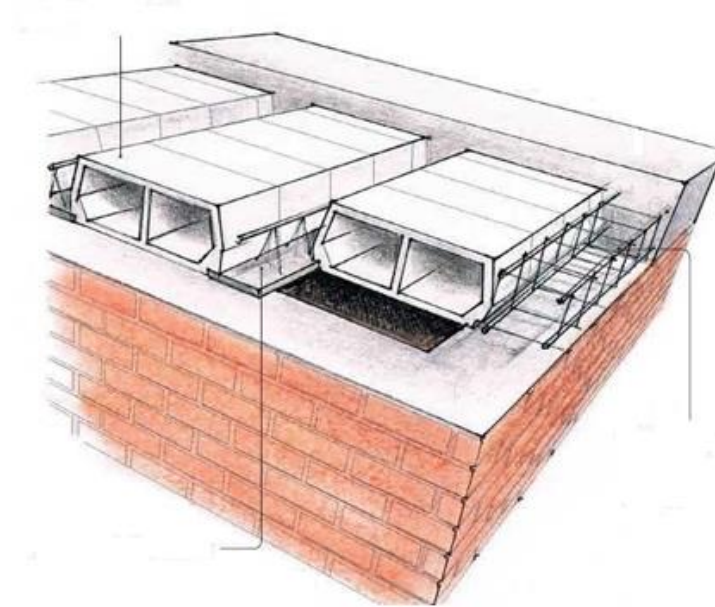


Fig. Diagram of connection of a wreath with a high-beam ceiling [1]

Tie beams can be divided into:

- Monolithic - performed on the construction site.
- Hidden - created by combining reinforcement protruding from prefabricated elements.



Fig. Ceiling coarse slab with finished wreath reinforcement [2]



Fig. Prepared formwork for the rim and monolithic ceiling [3]



A tie beam with a prefabricated ceiling.



A tie beam made on the first layer of a brick wall with visible thermal insulation.



Monolithic tie beam reinforcement [2]



Reinforcement of the tie beam through a pillar.

Connection by means of reinforcement of prefabricated floor slabs and a tie beam.

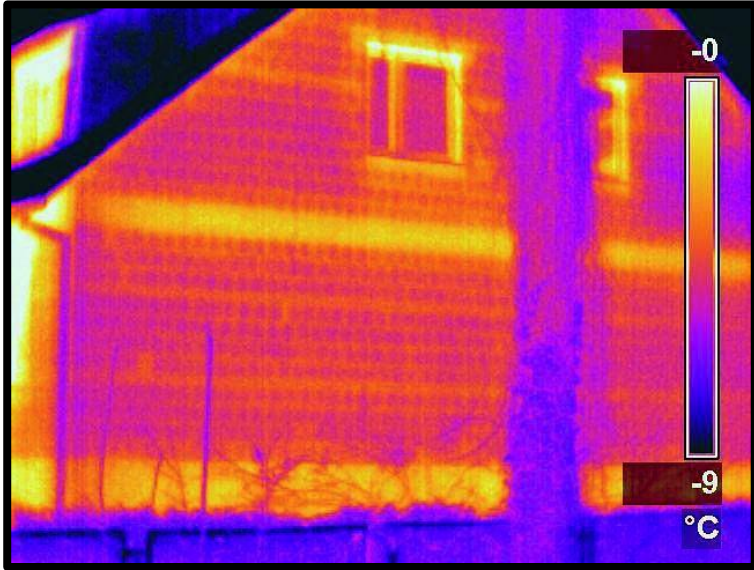




HOW DO WE DESIGN TIE BEAMS?

The basic principles of tie beam design:

- The wreaths are connected with the entire ceiling and their transverse field should be at least 250 cm².
- The rims should form a closed circuit along the edge of the floor.
- For the reinforcement of wreaths, the most common are 4 bars Φ 10-12 mm joined by stirrups Φ 4.5-6 mm at a spacing of 20-50 cm depending on the loads carried by the rim.
- The minimum longitudinal reinforcement is from 230 mm³ for a 4-storey building up to 350 mm³ for higher buildings.
- To reduce the losses caused by thermal bridges, inserts made of insulating materials with high thermal resistance coefficients should be used.



Thermal bridge on the rim [4]

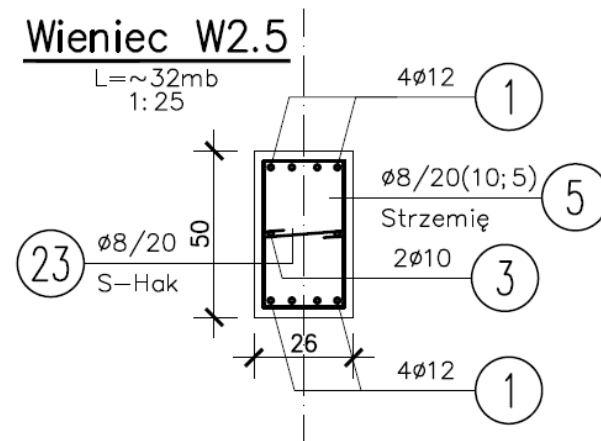
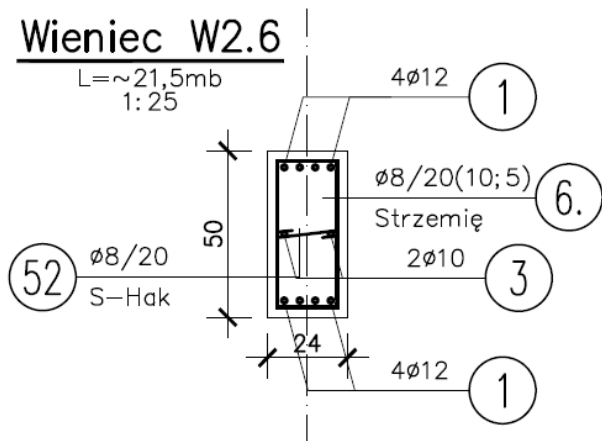
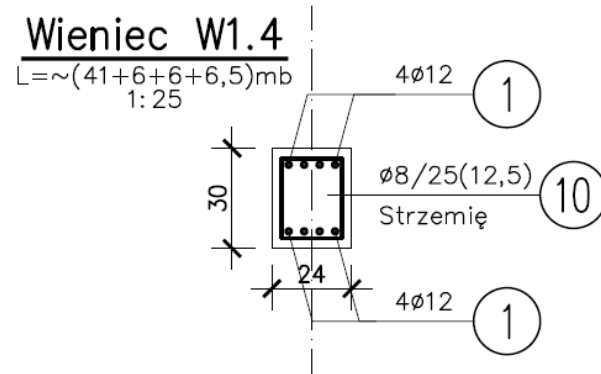
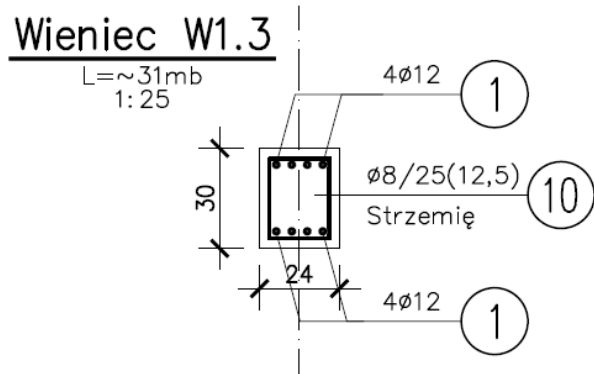


Thermal bridge on the rim [5]

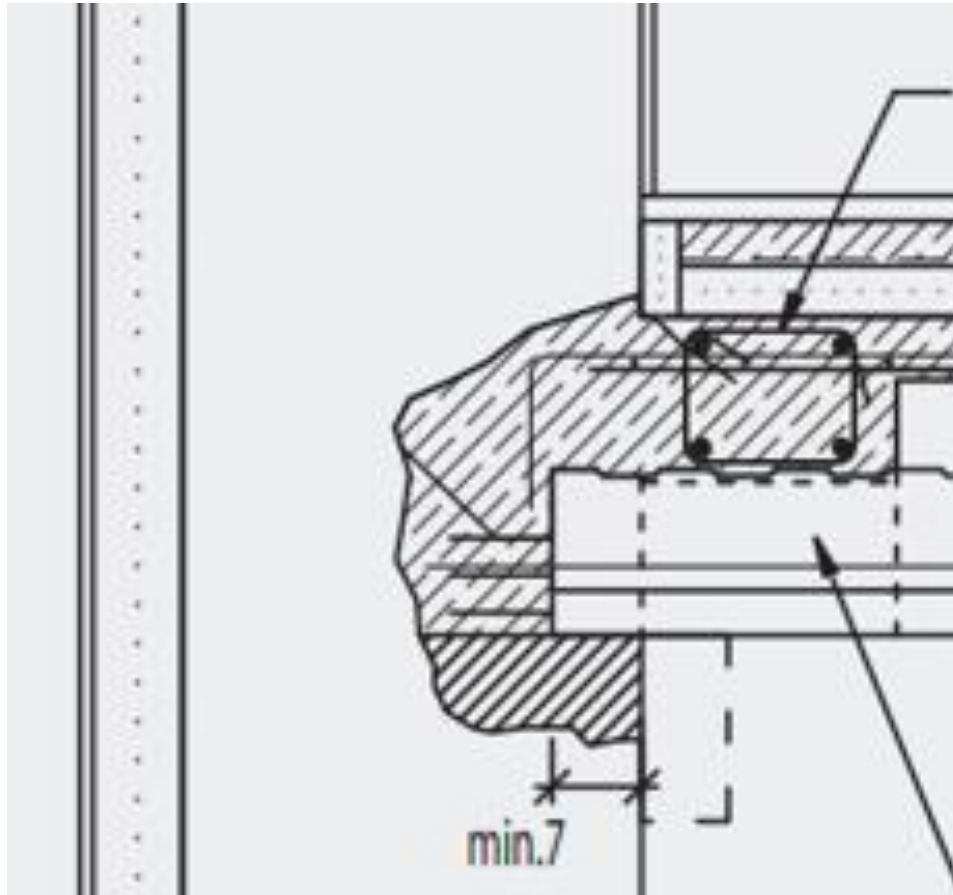
THE BASIC FUNCTIONS OF THE TIE BEAMS IN BUILDING CONSTRUCTIONS:

- They counteract the formation of cracks on the walls due to thermal deformation and uneven settlement.
- Alignment of the deformation difference at the interface of differently loaded walls or walls made of different materials.
- They play the role of a secondary load-bearing structure operating in the event of failure of structural walls.
- Connection of structural walls of the entire building.
- Transferring loads from the ceiling.

EXAMPLES OF REINFORCEMENT SCHEMES FOR TIE BEAMS:



EXAMPLES OF REINFORCEMENT SCHEMES FOR TIE BEAMS:



Tie beam in rib and slab floor

[source: rectolight catalogue]

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