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Sustainable Urban Rehabilitation in Europe

GENERAL BUILDING ENGINEERING

FLAT CEILINGS IN BUILDINGS

Erasmus+

WHAT IS THE CEILING ?

Ceiling - horizontal structural layout separating individual floors of the building. The ceiling transfers loads to vertical load-bearing elements (walls or columns). On the upper surface of the ceiling, the floor is laid, and the bottom surface is usually covered with plaster, creating the ceiling [1], [5].

Fig. Monolithic reinforced concrete ceiling in progress [6].

FUNCTIONS OF CEILINGS

- permanent load transfer - own weight, weight of partitions, in the attic also partly the weight of roof truss,
- transfer of utilitarian loads - weight of furniture, room equipment, stored goods and persons staying in it,
- increasing the stiffness of the building,
- protection of rooms on particular storeys against penetration of sound, heat,
- creating a floor for floors and floors,
- limiting the spread of fire [1], [5].

RIB AND SLAB FLOOR- DEFINITION

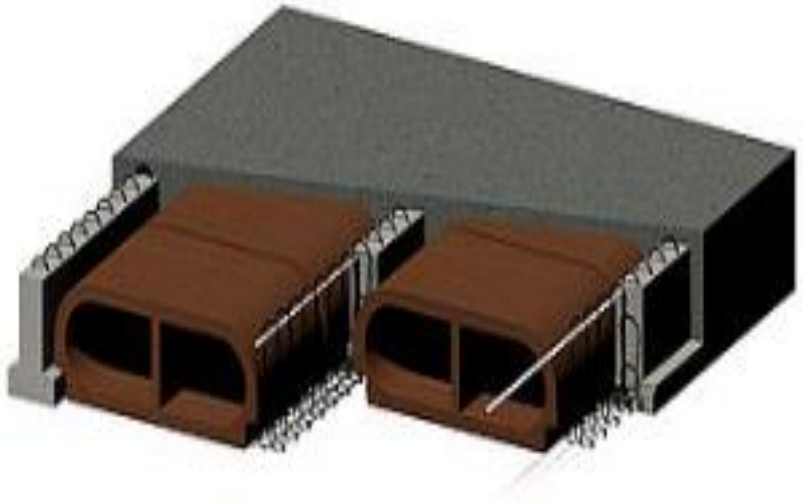
Structured ceilings are those in which load-bearing elements are beams (known as ribs) with an axial distance not exceeding 90 cm. The ribs are arranged in the direction of the smaller span between the supports, resting them on the walls of the building and the beams. Elements filling the ceiling can be rigid and durable (ceramic blocks, hollow blocks made of expanded clay, gravel bricks, lightweight concrete, gypsum) or unstable and non-rigid (boxes made of wood or plastic). The upper part of the ribbed ceiling is a concrete slab poured on the construction site (the so-called concrete), which stiffens the structure, prevents it from being pressed, and forms a foundation under the floor [1].

RIB AND SLAB FLOOR

- rib (monolithic, prefabricated, partly prefabricated) with cooperating plate (usually monolithic),
- filling (hollow - cooperating or not cooperating in transferring loads),
- distribution rib - perpendicular to the main ribs in ceilings with a span of more than 4m, stiffens the ceiling, ensures cooperation of the main ribs in the transfer of concentrated loads,
- tie beam - element of the ceiling support on the wall [1].

DZ CEILING

It consists of prefabricated reinforced concrete beams, whose axial distance is 60 cm. A characteristic feature of beams in DZ ceilings are stirrups in beams that protrude above the plane of blocks, thanks to which there is a better connection between the beam and the concrete. The height of the beam is 20 cm, the width of the web is 6 cm, and the bottom foot 12 cm. Beams are reinforced with bars with diameters ranging from 6 mm to 16 mm depending on the spread and load values [4].



DZ Ceiling

ADVANTAGES AND DISADVANTAGES OF CEILINGS DZ

Advantages:

- lower beam weight and lower thickness compared to the previously used DMS floor,
- smaller keying, i.e. bending of individual beams, compared to other ceilings,
- easy assembly, hollow blocks are laid by hand, no construction machines are required.

Disadvantages:

- this ceiling can not be used under dynamic loads,
- the overburden layer has long achieved the required strength from 2 to 3 weeks, during this time the roof can not be loaded [4].

ACKERMANN CEILING

Most often used in single-family housing, with a ceiling span of up to 6.5-7 m. It consists of a fill in the form of ceramic hollow bricks and reinforced concrete ribs.

Ceramic blocks used to fill the ceilings are produced in three heights, which at the same time define the type of brick - 18, 20, 22 cm. The axial spacing of the floor fins is 31 cm. These ribs are not prefabricated beams, but are made on site, whose reinforcing bars, suspended on special V-shaped stirrups, are placed at the bottom of the gaps formed by the row of hollow bricks. [4].

Ackermann ceiling [2].

ADVANTAGES AND DISADVANTAGES OF ACKERMAN CEILINGS

Advantages:

- even, smooth and homogeneous in terms of materials,
- it is easy to make a hole for stairs, ventilation ducts or flues.
- it does not require a crane.
- the cost of ceiling materials is lower than the other ribbed floor slabs by up to 25%.

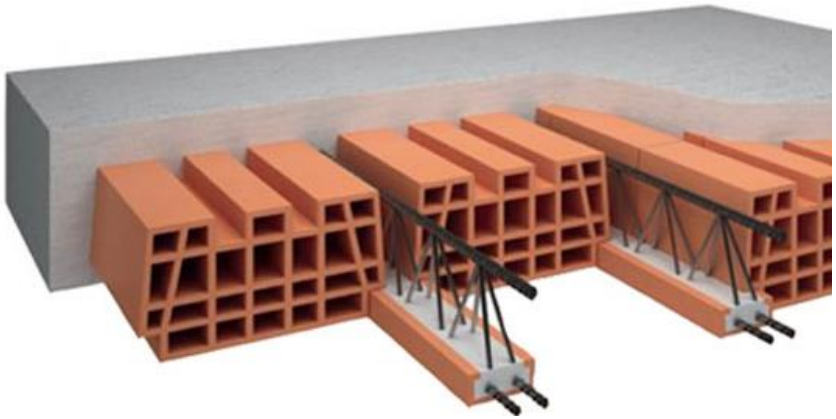
Disadvantages:

- requires full formwork, because the blocks will not be supported on prefabricated beams.
- it requires the reinforcement to be made in a place where in the case of other ribbed beam slabs there are ready beams,
- you can not freely add or change the partition walls on the ceiling [3].

FERT CERAMIC CEILING

One of the most popular ceilings used in single-family housing. It consists of beams and ceramic hollow blocks as well as a super-concrete layer.

Selection of beams consists only in checking whether the user loads adopted by the designer (floor, partition walls, plaster) do not exceed the permissible ceiling loads. FERT type ceilings are made in spans from 2.7 to 6.0 m with grading every 30 cm [4].



FERT Ceramic ceiling [2].

TERIVA CEILING

TERIVA ceiling is a monolithic-prefabricated, high-beam ceiling. The ceiling consists of truss beams, concrete hollow blocks (sometimes with cellular filling elements) and concrete laid on the construction site. TERIVA ceilings are intended for both residential construction and public utility buildings with a spread of up to 8 meters [4].

TERRIVA ceiling [4].

ADVANTAGES AND DISADVANTAGES OF TERIVA CEILINGS

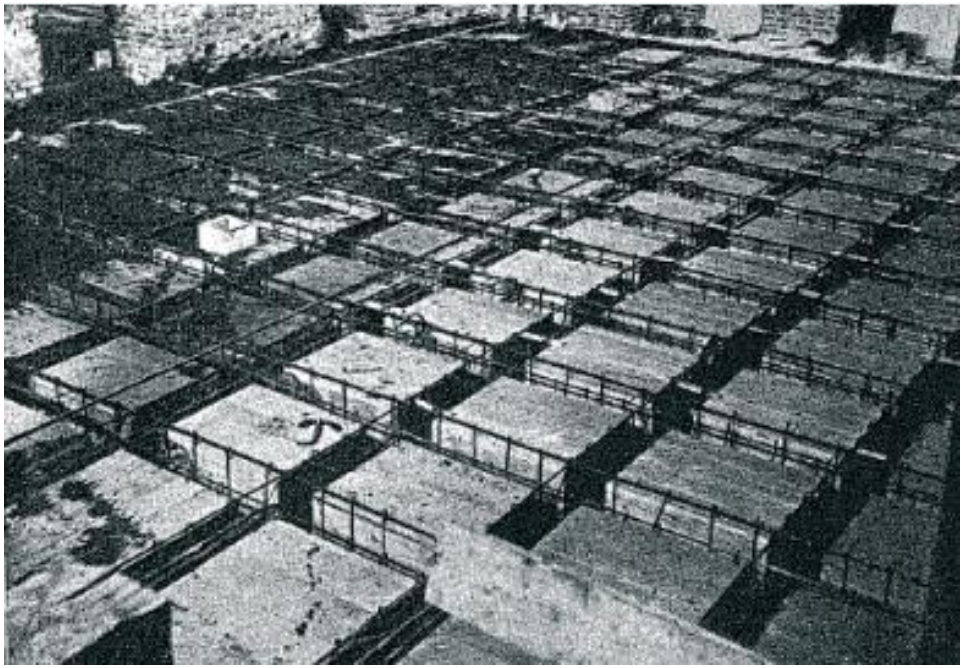
Advantages:

- the possibility of manual assembly without the use of heavy equipment,
- availability prefabricated
- possibility of assembly on construction sites.

Disadvantages:

- susceptibility to keying,
- the need to care for the overburden layer,
- necessity of using many mounting supports and formworks,
- high labor costs [8].

RIB AND SLAB FLOORS IN HERITAGE BUILDINGS



Coffered ceilings [9].

RIBS CEILINGS

Ceilings with different variations (some like the Ackerman ceiling used today), were generally made using ceramic hollow bricks based on reinforced concrete beams between them. The required full formwork, and quite a long time from the moment of execution to the full use of the ceiling [9].

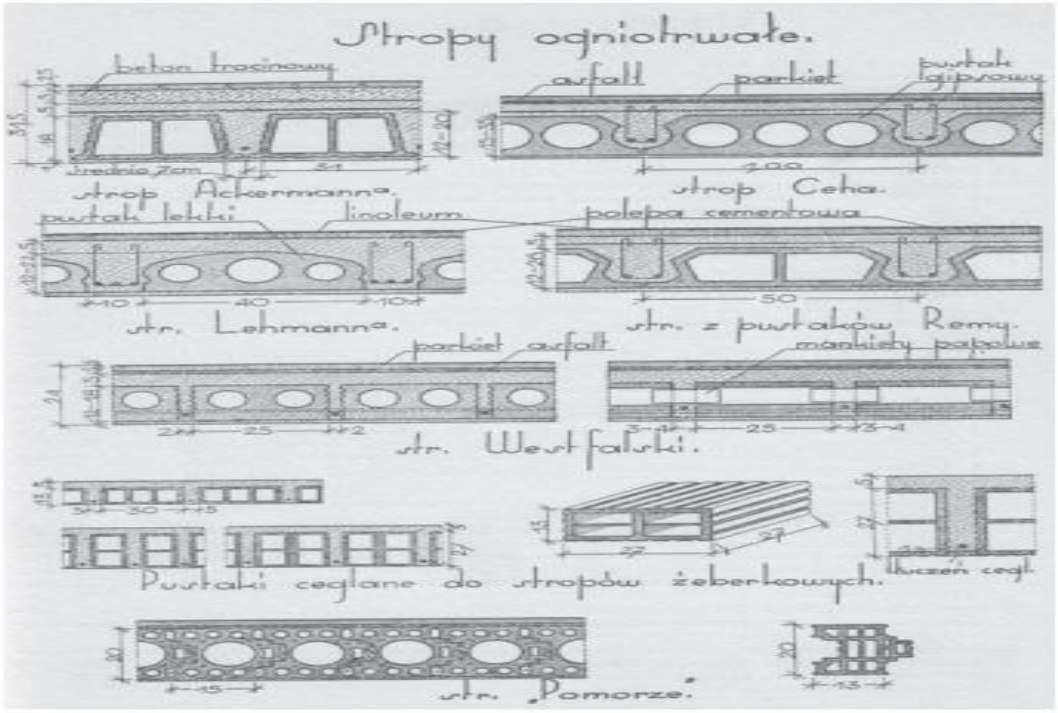
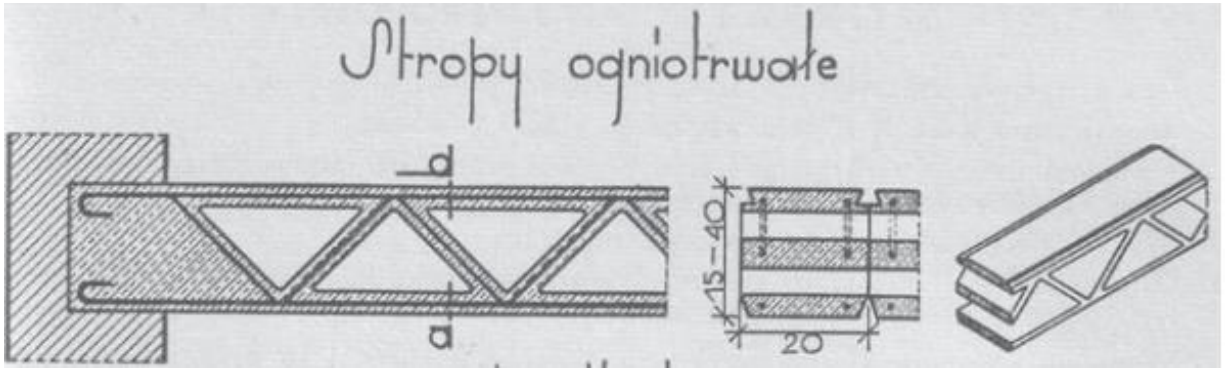
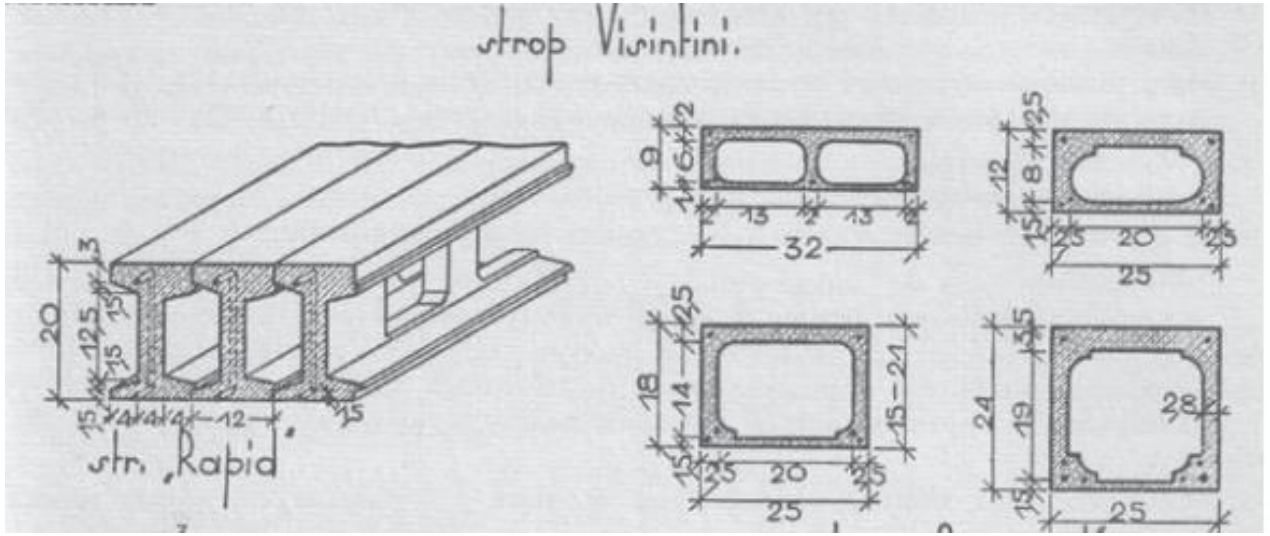


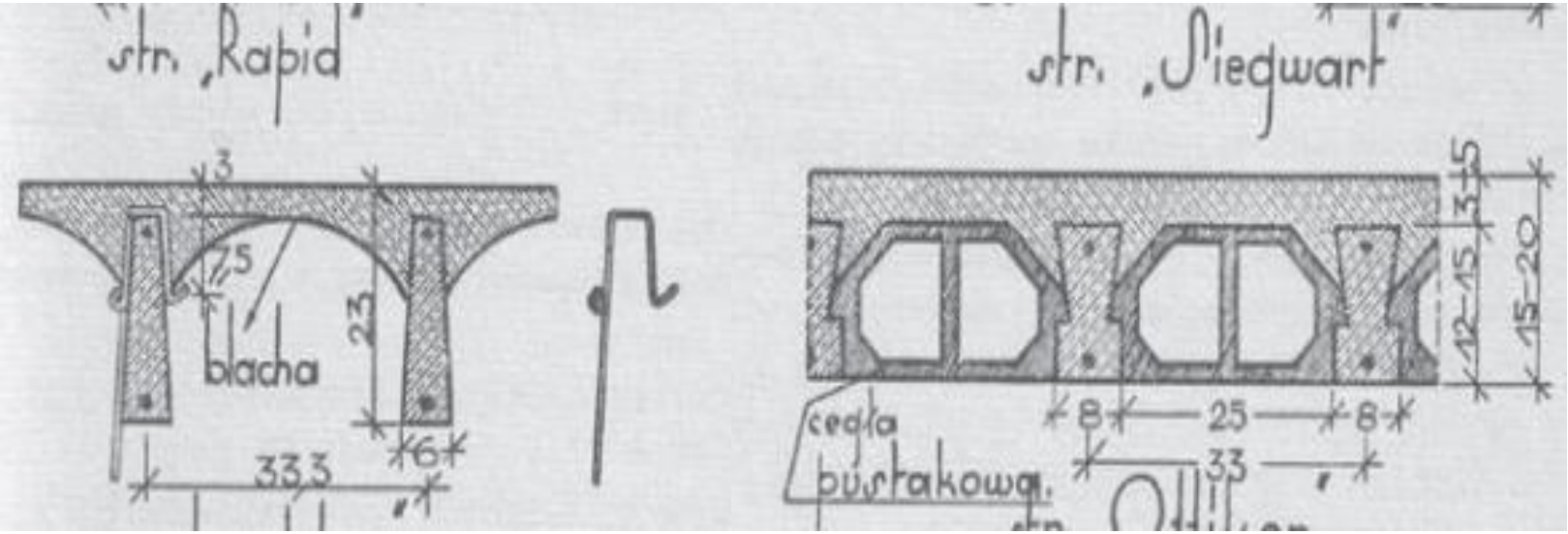
Fig. [9].



Fire proteced ceilings[9].

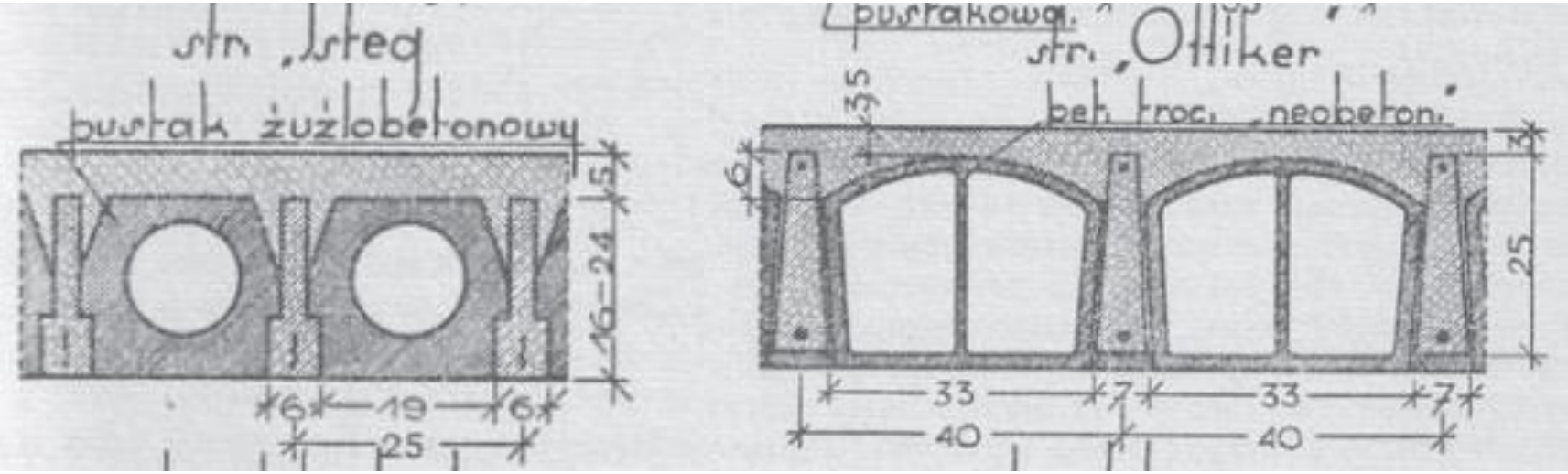


Visintini ceilings [9].



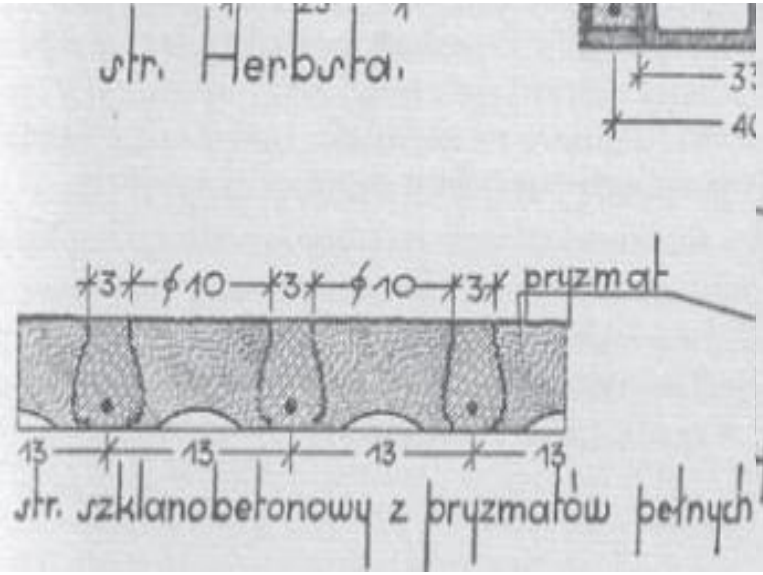
Rapid ceilings[9].

Siegwart Ceilings [9].

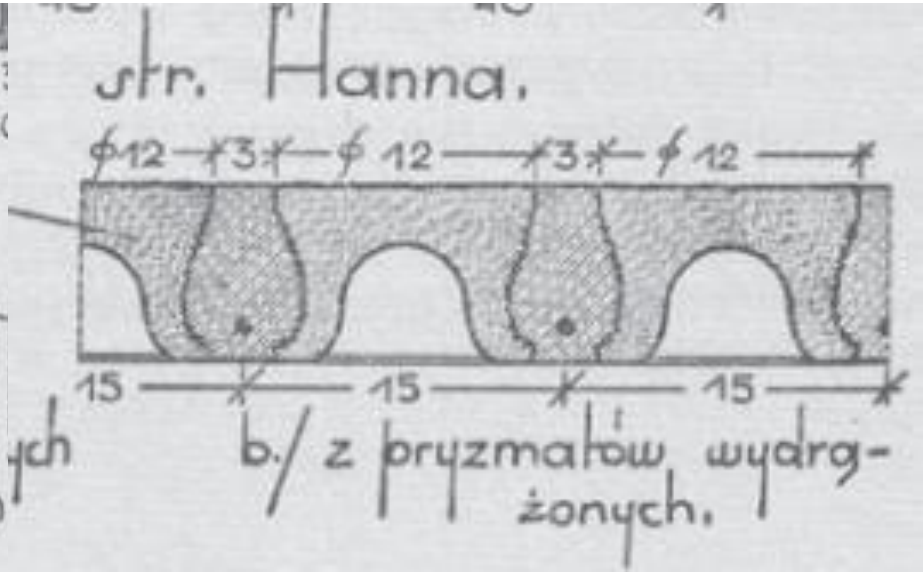


Isteg ceilings[9].

Ottiker ceilings[9].



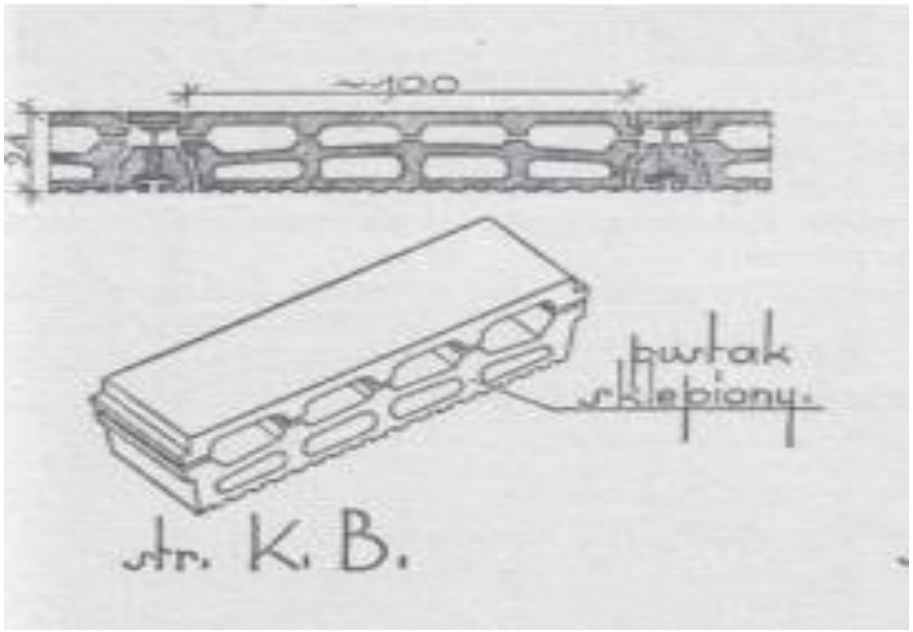
Herbst ceilings [9].



Hann ceilings [9].

K.B. CEILING

Prefabricated, basically wide-ribbed. Between the steel insert beams are two-piece ceramic blocks, the bottom of which is the supporting element. [9].



K.B. ceiling[9].

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