SECTION 1. ARCHITECTURE AND CONSTRUCTION

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1.1 Reconstruction of built-in boiler room

In recent years and in the near future, the main directions of structural reorganization of industrial construction are the expansion and reconstruction of existing industrial facilities [1, 2, 3]. Also, in connection with the modern trend of technical re-equipment of industrial enterprises, there is a need to reconstruct the buildings and structures in which they are located. Reconstruction involves rebuilding a building with the aim of partially or completely changing its functional purpose. Reconstruction of existing buildings is associated with improvement of production, improvement of operating conditions, change of basic technical and economic indicators, etc., which is accompanied by strengthening of structural elements of these buildings.

This study examines one of these buildings - the administrative and household building (Fig. 1) of an industrial enterprise, located on the territory of the former house-building plant #2 in the village of Masonry of the Lviv region. The body is made of different volumes separated by deformation seams.

The purpose of the reconstruction is to improve the equipment of the built-in boiler room with the replacement of solid fuel boilers. The boiler house under investigation is built into the existing administrative and domestic building (Fig. 2).

Before the reconstruction, it is necessary to carry out an inspection of the existing premises of the boiler house [4, 5, 6]. The survey is conducted with the aim of objectively obtaining data on the actual technical condition of building structures, taking into account changes over time. During operation under the influence of aggressive factors of the external environment, peculiarities of technological processes, there is a risk of violation of the quality of materials, products and structures.

Figure 1. General view of the administrative and household building (photo of "Ecobusiness-Lviv" LLP)

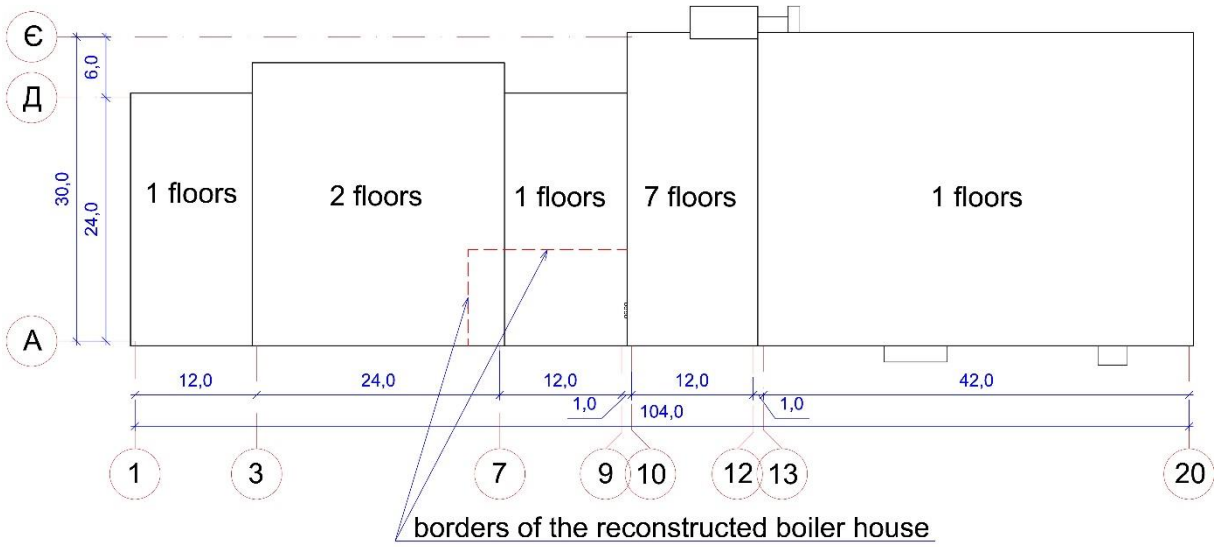

Figure 2. Layout of the boiler house within the building

The starting materials for determining the technical condition of building structures, for their reconstruction, are the results of their technical surveys, which must be performed in a volume sufficient for a full understanding of their technical condition. The result of the survey is the determination of categories of the technical condition of the building structures and the building as a whole.

The technical condition of a separate structure is characterized by one of four categories:

- "1" - normal;
- "2" - satisfactory;
- "3" - not suitable for normal operation;
- "4" - emergency.

The first two categories allow the building to be operated without restrictions and additional repair work. Assignment of the third - obliges the owner to take measures to eliminate the identified problems. In the fourth category, the operation of the building is prohibited, reinforcement is required.

According to the structural scheme, the administrative and household building in axes "6-9/A-B" is solved with a transverse full frame, in axes "10-11/A-B" - with a longitudinal full frame (Fig. 3). The housing in axes "6-7/A-B" is two-story, in axes "7-9/A-B" – one-story, in axes "10-11/A-B" – seven-story. The case is designed according to the typical ИИ-04 series.

The grid of columns in all axes is 6,0×6,0 m. The columns of the body in the axes "6-9/A-B" are reinforced concrete with a section of 300×300 mm, in the axes "10-11/A-B" they are reinforced concrete with a section of 400×400 mm All columns in the direction of support of the crossbars have consoles with a height of 150 mm.

Reinforced concrete crossbars, T-shaped cross-section, 400 mm wide, 450 mm high with undercuts for resting on column consoles (Fig. 4).

Cover and cover hollow reinforced concrete slabs (link, wall, row) 220 mm high, 1200 mm and 1500 mm wide. The slabs rest on the shelves of the brand crossbars (Fig. 4).

The outer walls are made of hinged expanded clay concrete panels with a thickness of 300 mm (Fig. 5). The lower row of wall panels rests on foundation beams.

Spatial stiffness and stability is provided by reinforced concrete diaphragms of stiffness 140 mm thick and floor discs made of reinforced concrete connecting and wall plates.

According to the analysis of the results of the survey, it was determined that the main supporting and enclosing structures: foundations, columns, crossbars, slabs and ceilings, wall panels are in the "2" category of technical condition - satisfactory. However, the structures of windows, doors, and floors are in the "3" category of technical condition - not suitable for normal operation and need repair or replacement.

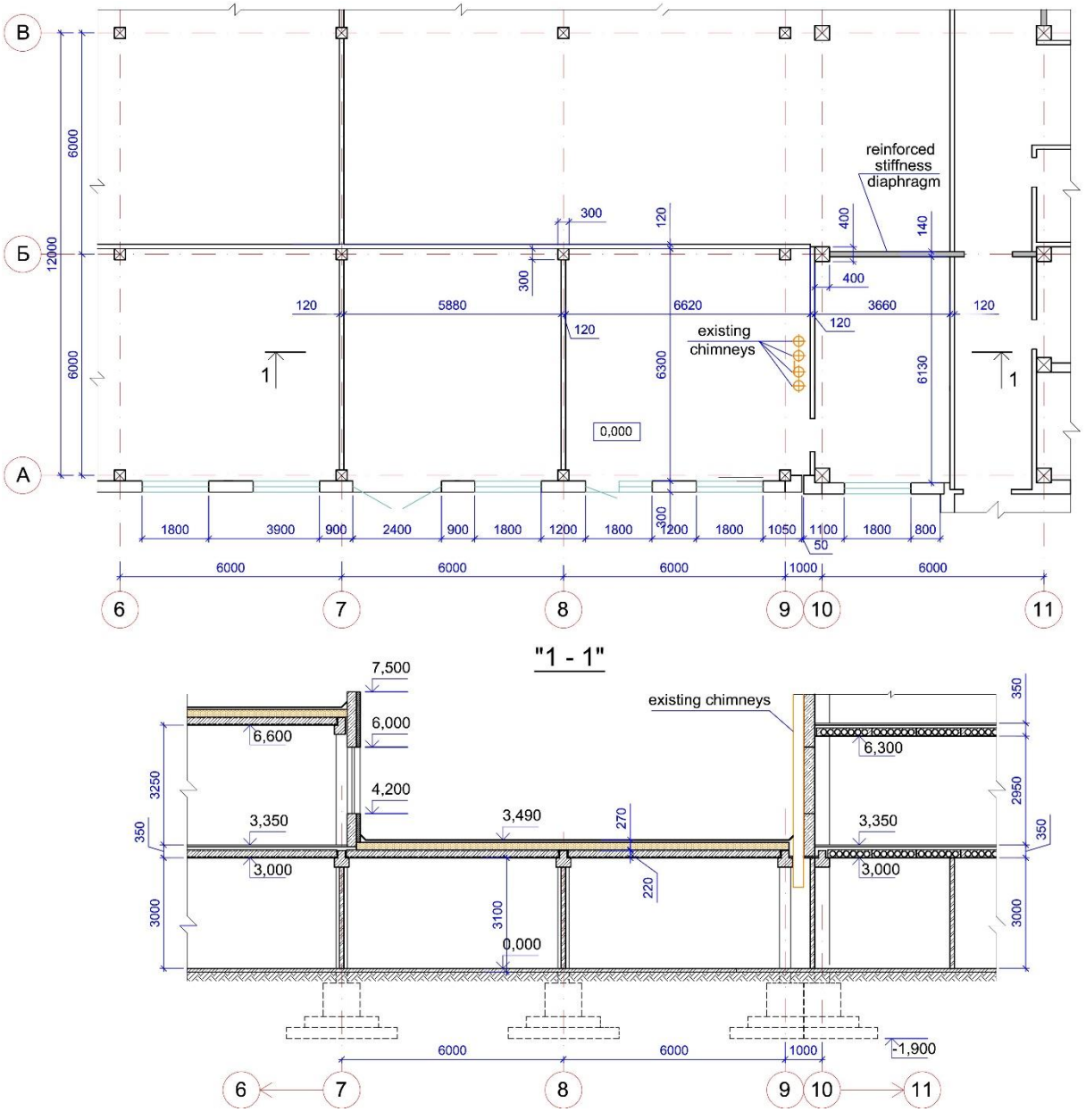

Figure 3. Plan and section of the existing building premises within the boiler house

Figure 4. View of the room in axes "8-9/А-Б"

Figure 5. View of the facades of the existing building along axis "А" in axes "8-10"

The reconstruction of the boiler house, according to the norms [7], involves the re-planning of the premises with the use of new equipment, the installation of new equipment (two solid fuel boilers with a capacity of 630 kW each) with the arrangement of foundations for it, the arrangement of floors, the replacement of windows and doors with energy-efficient ones, the insulation of external walls (Fig. 6).

In the process of re-planning, the following rooms are provided (Fig. 4): boiler room (2), wood chip storage (1), boiler room operator's room (4), technical room of the boiler room (5), bathroom and shower room with changing room (3). Degree of fire

resistance - II. The height of the premises is 2,9 m. In the boiler room, in the axes "А-Б/8-9", the height of the premises is accepted due to technological conditions – 3,82 m.

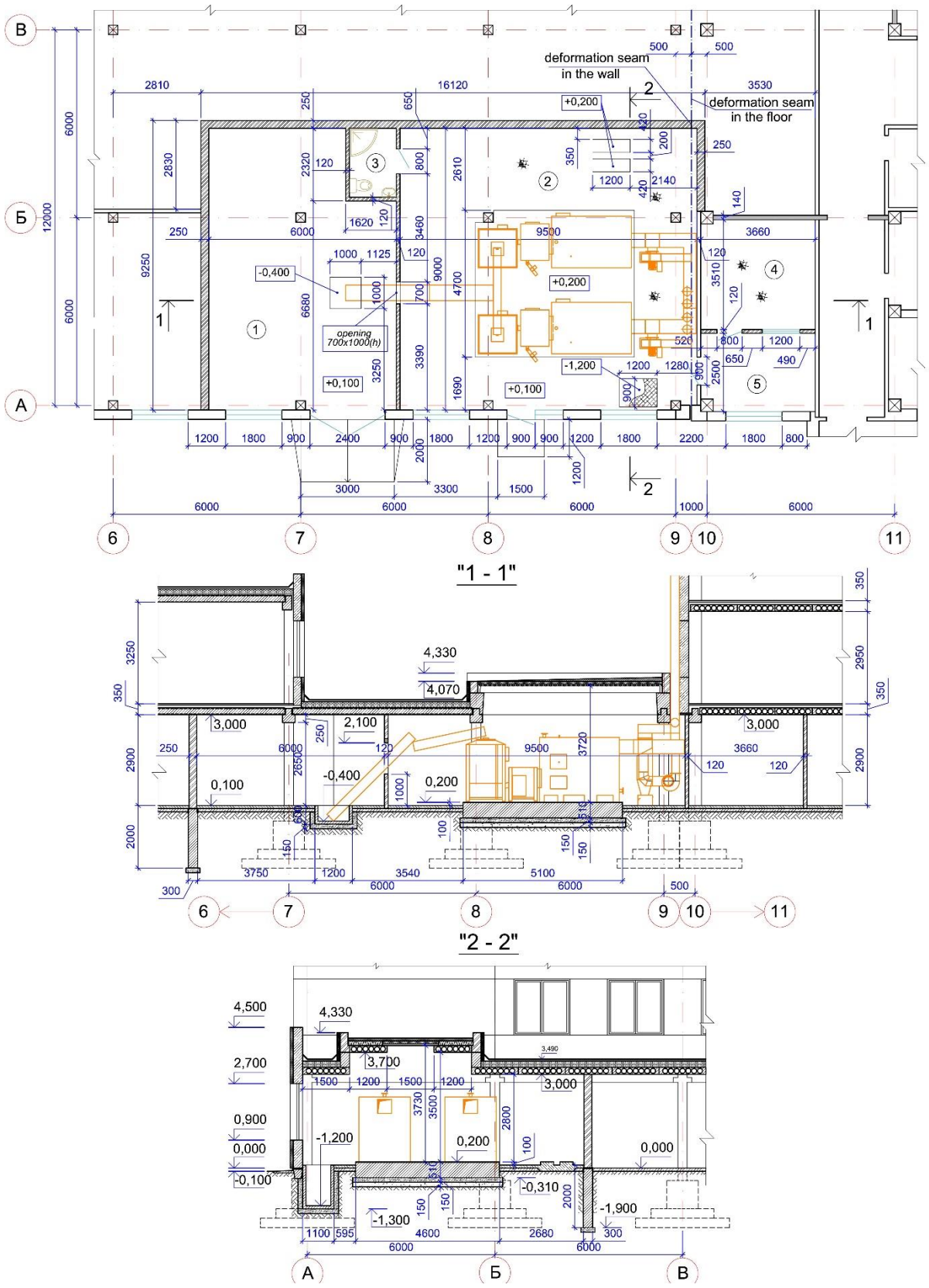

Figure 6. Boiler house plan and sections after reconstruction

The reconstruction involves the partial dismantling of existing partitions and the installation of new walls and partitions. New partitions with a thickness of 120 mm and walls with a thickness of 250 mm are made of full-bodied bricks of the M100 brand on M50 cement mortar. Walls and partitions are reinforced with masonry mesh.

Under the new walls with a thickness of 250 mm, a strip monolithic reinforced concrete foundation with a width of 300 mm is arranged. Marking of the sole of the tape foundation -1,900. The basis of the foundation is a rigid, homogeneous, dark gray loam.

Under the new equipment (boilers), a slab monolithic reinforced concrete foundation with a thickness of 500 mm is arranged, with a laying mark of -0,310.

The new floor construction, with a total thickness of 100 mm, is arranged on the existing concrete preparation.

It is planned to replace external and internal doors with fire doors.

Replacement of windows is planned. Windows in the boiler room are made with single glass and are equipped with devices to prevent possible scattering of glass.

External walls made of expanded clay concrete panels are insulated with polystyrene foam plates 100 mm thick with openings framed with basalt wool 300 mm wide.

According to the norms [8], in the premises of the boiler house, it is necessary to provide easily removable fencing structures with an area of at least 0,05 m^2 per 1 m^3 of the volume of the room. The total volume of the boiler room is 260,3 m^3. The minimum area of easily removable fencing structures is 260,3×0,05=13,02 m^2. Two windows with dimensions of 1,8×1,8 m, one window with dimensions of 0,9×1,8 m, and a part of the roof (on profiled flooring) with dimensions of 1,5×5,5 m in plan were adopted as easily removable fencing structures. The area of easily removable fencing structures is 16,35 m^2.

During the reconstruction, above the boiler room in the "8-9/А-Б" axes, a partial lifting of the covering by 700 mm is provided. At the request of the customer, two versions of the coating structures were developed in these axes (with maximum preservation of the existing structures and completely new structures).

In the first option (Fig. 7), it is proposed to dismantle three rows of paving slabs (2 slabs of 1,2×6,0 m and 1 slab of 1,5×6,0 m) at the place of raising the covering, to arrange a monolithic reinforced concrete belt, along the monolithic belt, along the edges, install 2 slabs 1,2×6,0 m (previously dismantled), arrange and fasten profiled flooring HC44-1010-0.6 (which serves as an easily removable roof) on the installed slabs.

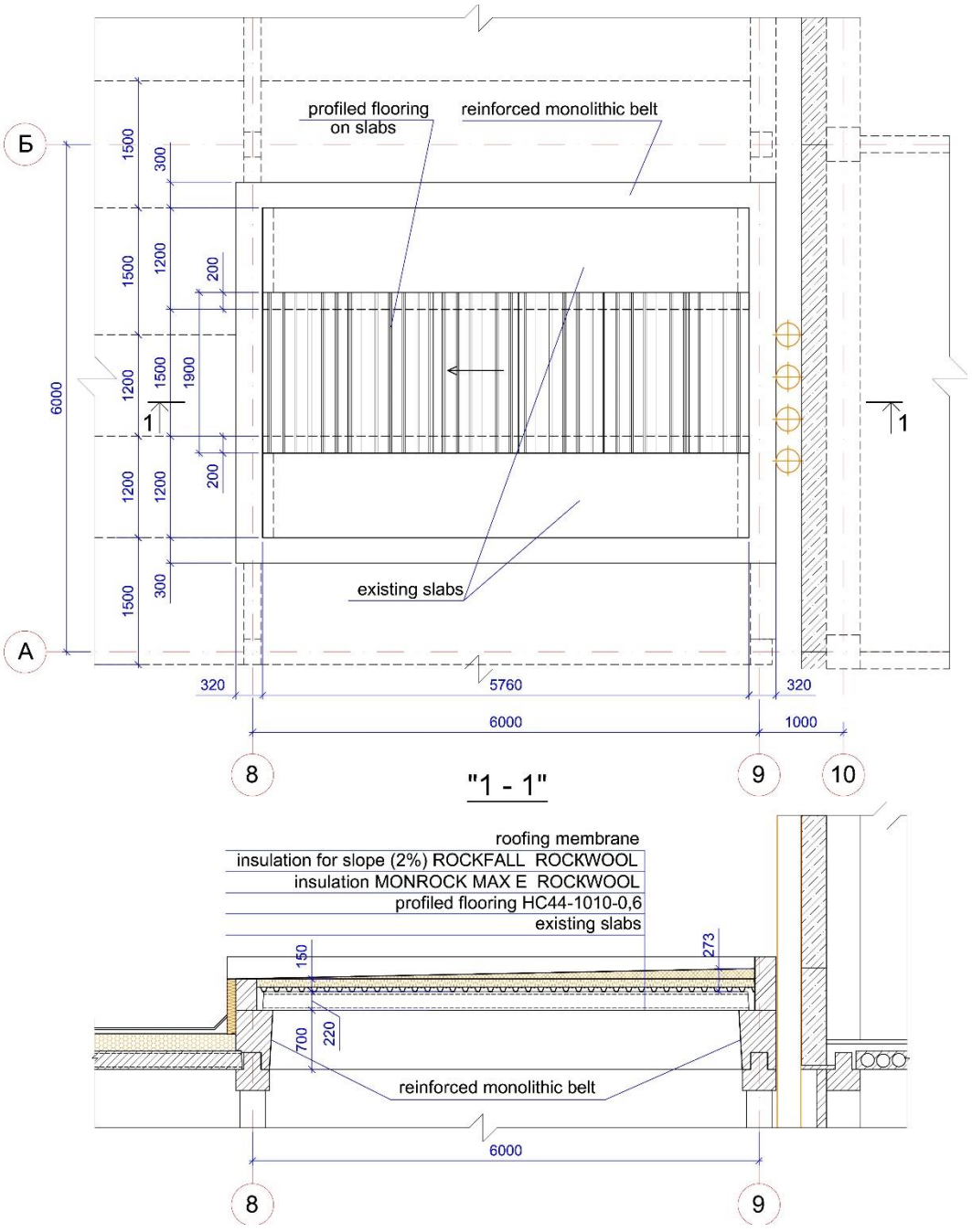

Figure 7. The first variant of arrangement of covering structures

The second option (Fig. 8) involves the complete dismantling of three covering plates, the installation of a reinforced brick wall with a thickness of 250 mm with

pilasters around the perimeter of the opening, on which a system of metal beams from closed profiles is installed. Profiled flooring HC44-1010-0.6 is laid along the beam system.

In two versions, the roof is insulated with mineral wool.

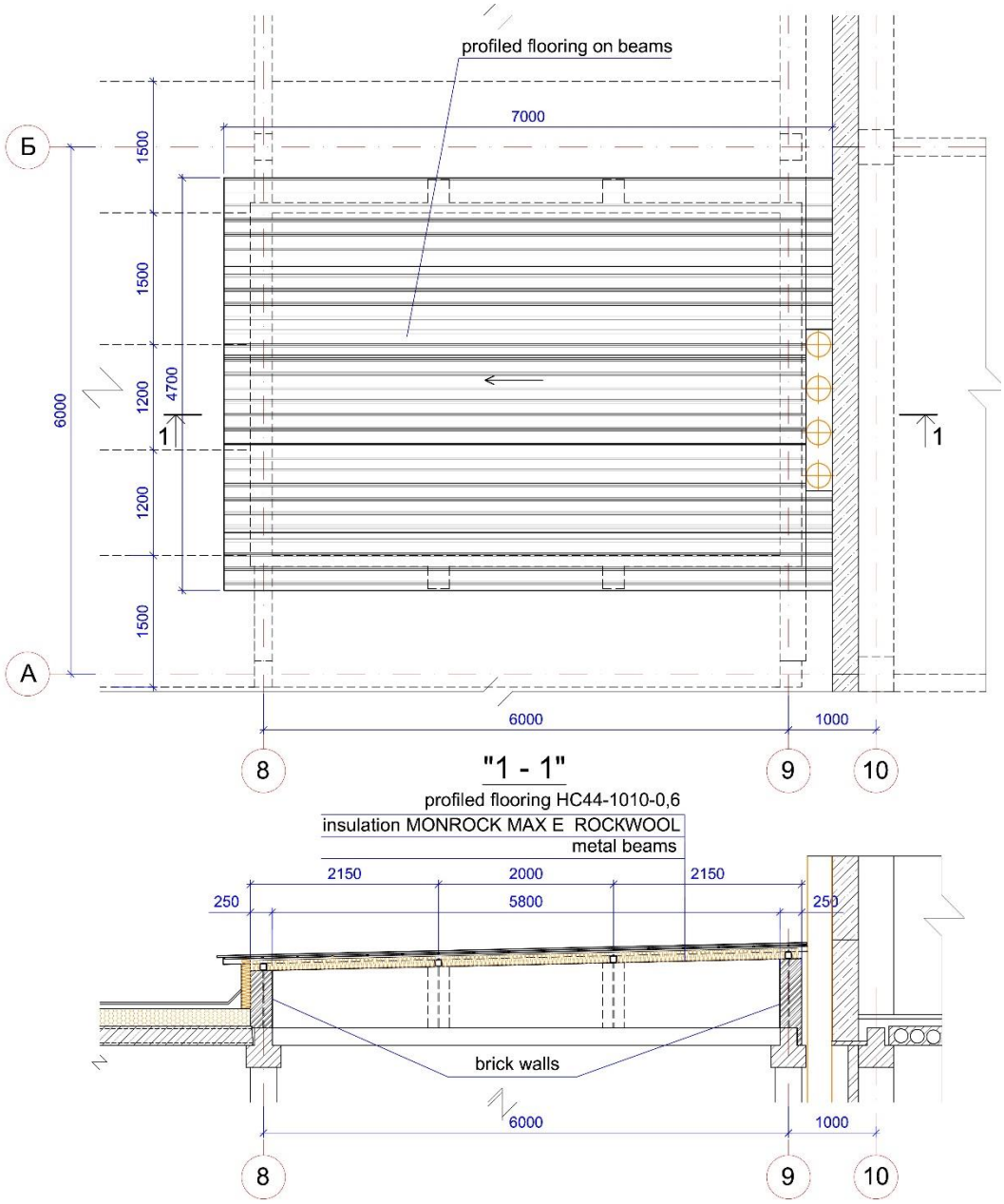

Figure 8. The second variant of the arrangement of the covering structures

Also, within the framework of the reconstruction, a full range of works, provided for such buildings, was performed. The proposed and implemented version of the reconstruction of the built-in boiler house met all the requirements and can be used in the reconstruction of similar buildings.