

# Dismantling of Buildings and Structures

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**Abstract:** The article reveals the importance of dismantling works. Information is given on the methods of dismantling construction objects, on the stages of demolition of buildings and structures. And also on the inspection of the object before dismantling.

**Keywords:** Dismantling, reconstruction, construction, installation, operation, demolition, dismantling of structures, physical and moral wear and tear, communications.

## Introduction:

One of the technological methods of reconstruction of residential buildings and developments is demolition, dismantling and dismantling of buildings with a high degree of physical or moral deterioration. Demolition of buildings, as a rule, pursues, in addition to solving urban planning problems, economic ones, when modern buildings with higher indicators of construction volume and quality of architectural planning solutions are erected on the vacated area.

Experience in demolition work includes several methods:

- destruction of buildings by directed explosion;
- elemental dismantling of buildings using cranes;
- destruction of load-bearing and enclosing structures of buildings by mechanical means;

Preparatory period. Before the start of dismantling works of buildings, organizational preparatory

measures must be carried out in accordance with SHNK 2.01.16-21

- the degree of readiness of the object for dismantling is ensured;
- the protection of existing communications passing through the work site is monitored and ensured;
- protection of green spaces not included in the list of those to be liquidated is organized ;

During the preparatory period, temporary fencing of the work site is carried out to ensure unimpeded entry and exit of vehicles.

When locating a building to be dismantled near existing ones, it is necessary to protect them from dynamic impacts by strengthening the foundations, increasing spatial rigidity by laying window openings and installing special ties and other methods.

**Research stages.** The main period of dismantling

works of the object is divided into 3 stages:

- the first stage consists of dismantling engineering equipment, heating, water supply and sewerage systems, dismantling floors, window fillings, etc.;
- the second stage consists of dismantling the above-ground structure, storage and loading into vehicles;

The dismantling process is carried out using mobile cranes and special safety devices, etc.

The assembly and dismantling of building structures of residential, civil and industrial buildings is carried out using various methods. The choice of the method and method of its implementation is determined mainly by the volume of work, the degree of cramped construction site, the conditions for combining assembly and other types of construction and assembly work, the completeness of the supplied structures, the range of available assembly cranes, the design solutions of buildings, the technological condition of the dismantled structures and nodal connections of buildings, and the established timeframes for dismantling work.

There are several ways to dismantle buildings and structures:

- The manual method is used in conditions when it is necessary to preserve some structural elements in the building or when there is a risk of damaging other nearby objects. When using this approach, simple tools are used - a crowbar, a pick, a sledgehammer. This method is considered the most expensive of all existing ones in terms of time and cost of dismantling an object.
- The mechanized method involves the use of special equipment - cranes, bulldozers, excavators - this method makes it possible to demolish buildings as quickly as possible and is often used to dismantle large buildings.
- The combined method of object liquidation combines manual dismantling with mechanized destruction of buildings. This is a more frequently used method of dismantling, which is used in dense urban development conditions.
- The explosive demolition method requires the involvement of a large number of specialists, many permits and approvals. It involves careful scientific calculation of the algorithm for conducting operations, places for laying explosives, etc. Most often it is used for demolition of large objects located far from residential areas.

Demolition involves the gradual dismantling of buildings and the organization of work on the removal of materials and waste. During the work, architectural forms are removed, along with utility networks and

final cleaning of the territory is carried out.

The design of building demolition pursues several goals at the same time, namely:

- increasing the level of security for residents and adjacent facilities;
- mechanization of dangerous consequences for others;
- organizing actions to protect utility lines located near the facility.

In case of partial development or complete demolition of a building, it is mandatory to inspect it. The results obtained will then become the basis for determining the sequence of works.

To ensure safe dismantling work, the following must be done:

- study the operating documentation;
- visually carefully inspect the structure of the object;
- identify hazardous areas for adjacent buildings.

Sequence of liquidation of a construction project:

- establish precise data on the number of buildings subject to demolition;
- description of the tactics and sequence of work on the development of structures;
- carrying out work to protect the facility from premature collapse;
- justification of methods for disposal of construction waste;
- soil restoration work;

The main problems that have to be faced when designing to achieve the appropriate level of safety for people and to select the appropriate option for demolition and partial dismantling of building structures. The difficulties are expressed in the following:

- high density of development of territorial zones, which does not allow the use of large-sized equipment;
- compliance with conditions aimed at preserving adjacent objects and maintaining a proper environmental situation;
- prompt cleaning of public areas from construction waste;

Features of dismantling objects - dismantling of buildings is carried out according to the scheme:

- complete liquidation of the structure is dismantled to the ground using special equipment. This method is recommended for very damaged objects;
- dismantling of the construction object dismantles

the construction materials, which can be used later. The technology for liquidating the construction object is selected taking into account the type of structure, strength indicators, and construction materials used;

- manual dismantling - the object is dismantled using only hand tools, this method is labor-intensive and very low productivity;

- mechanized - special equipment, excavators, dump trucks are used to collect garbage.

In the case of complete demolition of a building, dismantling work is carried out in four stages:

- dismantling the roof, removing the roof covering, lathing, and ceilings;

- from the nose - destruction of capital walls and load-bearing structures from top to bottom, so as not to cause the fall of massive slabs and large elements from a height;

- sorting and separation of construction waste for disposal or recycling;

- clearing the site - removal of construction waste, leveling the site.

The purpose of demolition is to clear territories of dilapidated and unusable objects for the construction of new buildings. If necessary, partial dismantling of structures can be performed. Such actions are carried out in cases where it is necessary to make an extension, reduce the area of buildings or when its reconstruction is planned.

Experience in the destruction of residential buildings of the first mass series in cities has shown that in conditions of dense development the chosen method has a number of disadvantages, which include the negative impact of dynamic loads on neighboring buildings, high dustiness of territories and construction sites as a result of the settling of destruction products, due to the different dimensions of heterogeneous materials, the disposal of destruction products is excluded or made difficult,

which requires high labor intensity for sorting.

For dismantling elements of large-panel and frame buildings, self-propelled tower cranes are used, complete with process equipment, low-mechanization tools and mechanized hand tools.

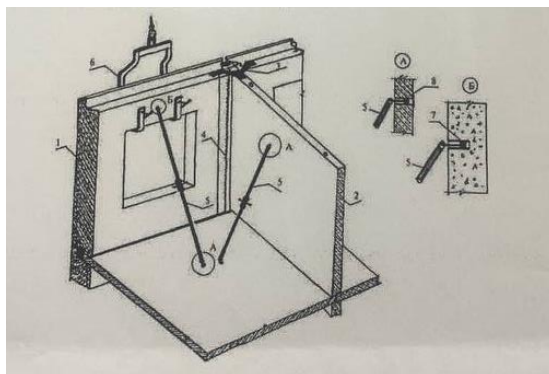
For the floor-by-floor dismantling of buildings, work production projects are developed, including a construction general plan with the placement of mechanization equipment, temporary roads, storage areas, closed warehouses, and temporary networks.

Dismantling of structures requires a certain technological sequence of work, ensuring minimal use of auxiliary inventory means to ensure the stability of structural elements, as well as the creation of safe conditions for work.

The work begins with dismantling the roofing. Technological processes include cutting multilayer roll roofing into separate sheets with loading into containers and moving into bunkers or dump trucks. Sorting of roofing and insulation materials and their separate transportation for subsequent disposal is performed.

The next stage is dismantling the structural elements of the roofing part - parapet slabs and roof slabs. To dismantle them, holes are drilled using core formers for subsequent installation of expansion anchors and slinging devices. In this case, the welded joints of the parts are cut mechanically or by gas welding.

Dismantling of the roof slabs opens access to the nodal joints of the wall and internal load-bearing partitions. Until they are released, temporary fastening of the dismantled structures of the external and internal walls is carried out using prefabricated struts and clamps. (Fig. 1) Fastening of the struts is also carried out using expansion anchors.



**Fig. 1. Temporary fastening of panels before installation**

1 - external wall panel; 2 - internal load-bearing panel;  
3 - welded fastening unit; 4 - cut of monolithic

section; 5 - struts; 6 - mounting crossbar; 7, 8 - expansion anchors for fastening struts

## RESULTS

The most rational is dismantling by cells of a residential building, first the outer panel is released from connections with the inner walls and dismantled. A traverse is used as a safety device. After its tilt to the outside at an angle of 15-20°, the destruction of the adhesion forces in the horizontal seam is achieved, free movement of the compartment to the storage site.

Experience in dismantling large-panel buildings has shown that the maximum labor intensity is recorded in the processes of removing nodal connections in the form of welded strips and overlays. The total labor costs and duration of dismantling structures are 1.2-1.4 times higher than similar indicators for the construction of new buildings. At the same time, high operational reliability of butt joints and the absence of corrosion of embedded parts and overlays are confirmed. Tests of cores selected in various structural elements show an increase in concrete strength of up to 30% over an operating period of about 40 years in good conditions.

## CONCLUSIONS

The obtained results indicate the high structural reliability of large-panel buildings and the feasibility of carrying out reconstruction or dismantling work.

An economic analysis of the costs of dismantling buildings showed high costs associated with the installation of cranes, transportation of the structure, the impossibility of their reuse as a result of the violation of the position of embedded parts, the appearance of cracks, chips and other deviations.

Dismantling works are expensive and labor-intensive, require preliminary preparation of organizational and

technological documents and the involvement of experienced specialists. Estimated cost shows that the largest costs are:

- direct dismantling work – up to 10% of the total costs;
- manual labor (dismantling and removing construction waste, transportation) – up to 40% of dismantling costs.

The organization of dismantling works or dismantling of a certain part of the building is allowed only after coordination with the relevant state authorities. It will also be necessary to draw up project documentation. Liquidation will be carried out on the basis of the drafted project and the order specified in this document.

Before demolition, specialists carefully examine the object, after which, based on the results obtained, they select the most optimal tactics for the safe liquidation of the building. Such issues are resolved only with the participation of qualified specialists.

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