

The residential area for mountain elevation settlements choice with the given structural features of the houses

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Abstract. The article on the basis of the analysis of the spatial and architectural-design solution of the buildings, an attempt is made to generalize the practice of design and construction of residential buildings in the complex relief and to develop appropriate recommendations for their use in various conditions of complicated relief.

The design of the unique mountain relief whenever requires an individual approach, which takes into account the identification meet the specific conditions of aesthetic expression of building settlements.

On the basis of studying domestic and foreign design the evaluation of the typology of residential buildings erected on difficult terrain. The issue discusses of special application design solutions in residential buildings with respect to different relief situations. To evaluate the relationship between urban spaces with the surrounding landscape and favorable climate, topography, allowed us to establish an open and semi-enclosed planning structure of residential development, which established the following preferred typological principles of design:

radiation rectangular layout structure with the tracing of the street network from an oblique angle in the direction of relief for uniform ventilation of all highways and streets;

providing taking into account the orographic situation of the relief justified the special linear highways and boulevards of the ducts;

when planning planning-spatial composition of buildings on slopes it is advisable to use the lower part of the slope at the production and warehouse area, medium - under public service, and the upper one for residential development and landscaping;



on slopes with high inclination, the main use of slope powerful anabatic and katabatic winds to plan the placement of residential and industrial zones so that the slope winds to every zones was directed perpendicularly;

the optimal placement of buildings and development make efficient use of stock and valley winds; the terraced building and the cascade building on the slopes of the streamlined shape.

On the basis of the comparison space planning and architectural and design solutions five characteristic types of buildings (house on "chicken legs", cantilever house, terraced house, deep house, house-bridge), erected on difficult relief determined the scope of their application under different conditions of complexity is a relief space.

The recommendations were developed allowing designers to choose the most suitable type of house with the appropriate structural frameworks for optimal decision making in the design of residential development in the mountainous relief.

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The relief forms, sets the layout and character of settlements and thereby naturally contributing to the intense growth and development of settlements. But, still the problem of efficient use of relief settlement remains without proper attention.

The degree of degradation is included in the territory of natural resources increases in direct proportion to the intensive development of settlements. Such natural resources include areas with mining, expressive relief, which can often have high recreational and aesthetic qualities.

Unique mountain relief every time requires an individual approach based design identify aesthetic expression of building settlements, corresponding to a specific situation.

The rational land use from the view point of preserving their natural uniqueness is one of the most important tasks faced by urban planners today. This is particularly relevant theme in an urban environment.

The urban area in modern terms is often subordinated to the logic of economic feasibility, which in itself implies the presence of unused places and degradation included in them of natural resources.

Such places are areas with mountainous relief, which often can not only have high recreational and aesthetic qualities, and cultural-historical significance. The steepness of slopes exerts direct impact on the nature of building. If a smooth phase characteristic is correct or regular planning. First of all it concerns tracing of the streets taking the curvilinear forms according to changes of a relief. The building up to certain values of the slope can retain the regularity of the building with the use of traditional constructive solutions to the buildings themselves. However, in case of significant deviations, the building areas of the model buildings become difficult. The main difficulty is overcoming the difference in height on the sides of the building in the direction of the slope, the value of which increases with increasing slope and length of the building.

Slope type building is the most ecologically favorable, and therefore should be streamlined and airy with powerful aeration corridors. Territories, unsuitable under building (an abrupt relief ravines, etc.) have to be used under recreations and gardening.

The basic typological principle are the open and half-open structure of the residential development of a streamline shape providing a direct connection of city spaces with an adjacent favorable landscape.

In this case, the slope preferred:

- planning of radiation of a rectangular structure with a trace of the street network from an oblique angle in the direction of relief for uniform ventilation of all highways and streets;
- providing reasonable special route stretches along the highways and boulevards of the ducts that contribute to the penetration of a favorable night breezes into urban development;
- planning-spatial composition of buildings on slopes with small inclination angle, it is appropriate lower part of the slope to take under the production warehouse area with strong convective flows, average under the facilities, and the upper residential zone and landscaping;
- on slopes with high inclination, the main slope of the heat spot with a powerful convective flows should be developed along the slope horizontally, and residential and industrial areas so that analytical slope and katabatic winds to every zones was directed perpendicularly;

- optimal placement of buildings and development make efficient use of stock and valley winds;
- terraced building and the cascade building on the slopes of the streamlined shape.

Although construction on the hillside or mountain terrain is conducted exclusively on individual projects, all of them can anyway divided into two types :

- stepped houses;
- Houses of variable floors.

First have a stepped shape corresponding to the slope of the plot, and are divided into cascade sectional (consisting of sections of equal height, shifted vertically on the floor-floor or on-floor) and terrace. Terraced houses consist of one-, two - and three-story buildings, running along and across the slope. The roof downstream of the building is terrace-balcony for upstream. If the cascade section of the house is designed for construction on slopes with a gradient from 7% to 17%, the decking is at least 25-30%.

The construction of the terraced houses ensures a high density while maintaining a high level of comfort. Also when building a house it is possible to compensate for part of the territory at the expense of the terraces (roofs of houses).

The second type of building — house of variable height across a long side or diagonal slope. They have a roof on one level and a different number of floors in different parts of the building, depending on the elevation difference. Construction of houses of variable height perhaps on the slopes of any incline.

Here offers some improvement typology, which will help in the design of development not only take into account the uniqueness of the natural landscape of the territories with mountainous terrain, but also to give them a more complete description.

The feasibility study of the project development that have a direct or indirect impact on the state of the environment shall:

- check out harmoniously with the natural and landscaped environment;
 - The maximum preservation of natural topography;
 - Max combined with the natural terrain;
 - Environmental friendliness, efficiency and safety;
- is to build a beautiful urban environment.

Therefore, the types of buildings are considered subject to the following evaluation criteria:

- a harmonious combination of natural landscape environment;
 - The maximum preservation of natural topography;
 - Max combined with the natural terrain;
 - Environmental friendliness and safety;
- to build a beautiful urban environment.

For comparison there are 5 types of buildings:

- A hut on “chicken legs”;
- Console house;
- Semi-detached house;
- sunken house;
- the bridge-home.

A hut on “chicken legs”: (support which occupies only a small space relative to total volume) the embodiment of careful attitude to nature. At least it is in contact with the ground, can be used successfully on the Northern slopes, in areas with dense and high vegetation. Accommodation is possible in any territory, including unfavorable for construction. Complex and innovative design solutions; requires the insulation of all walling of the house, which leads to a significant increase in the cost of this type of home (table. 1).

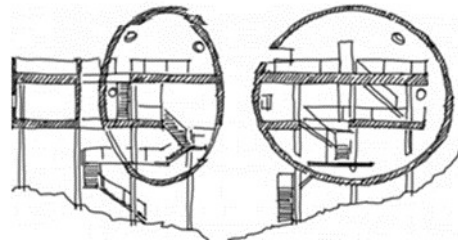


Table 1

Rating	characteristic	Recommendations
a harmonious blend with the natural landscape environment	Sharply stands out from the environment, but saves a free space on the ground level	To neglect the harmony, using the contrast of opposing nature, or fit the environment at the expense of facing materials
maximum preservation of the natural terrain;	Uses a minimal portion of the surface of the earth under the main supporting structure of the house is maintained or the soil is formed of natural open space under the house	Suitable for areas where you want to save the skin of the earth
the maximum combined with the natural topography	The required minimum area for the base of the supporting structure	Accommodation is possible in any territory, including not favorable for construction site
ecological safety	The enclosing structure is open on all sides	requires additional measures to protect from adverse environmental influences
to form a beautiful urban environment	Maximum visibility in all directions thanks to the fact that the house towers above the visual barriers, shrubs, fences, trees, etc.	Perfect for creating new points

Cantilever house: (rigidly fixed by one side with the free two) should be placed in the place of sudden changes in terrain or on the upper boundary of the terrain. The volume of the house are three spaces: the building, inside the building, under the building. Each of them can be used as recreation or Parking, etc. Also reveals a spectacular view of the main part of the house. In economic terms, a complex and innovative design solutions lead to a significant increase in the cost of this type of home (table. 2).

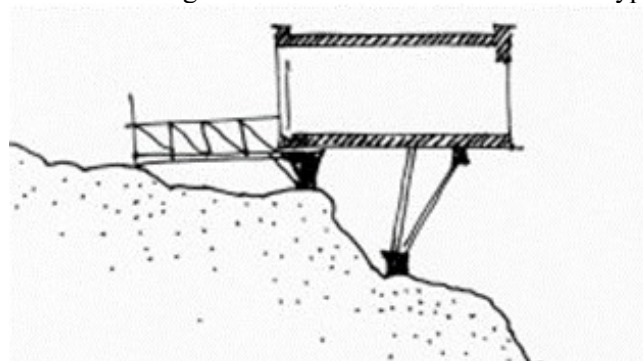


Table 2

rating	characteristic	Recommendations
a harmonious blend with the natural landscape environment	The relief is part of the supporting structure of the house, which creates a visual connection between them	To neglect the harmony, to use the contrast of the opposition of nature, or to enter into the environment due to coating materials
maximum preservation of the natural terrain;	Is formed of natural open space under the console at home	To compensate for the built-up area is possible by additional measures, for example, the device of a "green roof" or "living" walls
the maximum combined with the natural topography	There must be sufficient slope; also important is the orientation of the slope to the cardinal	Best conditions: slope slope from 30 to 60 degrees
ecological safety	The enclosing structure is open on three sides	Requires additional measures to protect from adverse environmental influences
to form a beautiful urban environment	The visibility provided along a certain direction which depends on the configuration of the slope	Use the slope facing an interesting view

Terraced house: either the complex is blocked or linked ledges, steps with horizontal displacement (table. 3).

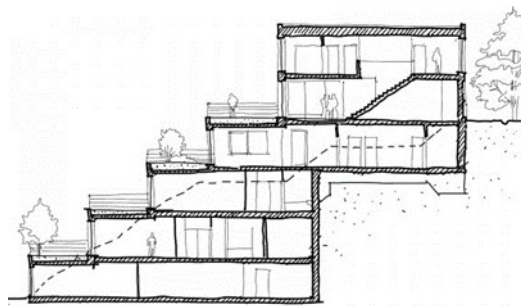


Table 3

rating	characteristic	Recommendations
maximum preservation of the natural terrain	A unified development solution; repeated in the form of relief that allows you to integrate harmoniously with this type of home.	its necessary to include complex natural elements in the structure
maximum preservation of the natural terrain;	Built-up area compensate partly at the expense of terraces; the high density allows to preserve the natural areas around	its necessary to include complex natural elements in the structure
the maximum combined with the natural topography	It is possible to use on all types of slope inclination up to 70 degrees	Best conditions: slope from 30 to 60 degrees
ecological safety	For external influence open on two sides, enclosing the common structures between the blocks of buildings retain heat frequent	Actions insulation of the facade and terraces
to form a beautiful urban environment	Visibility is ensured in a certain direction, which depends on the configuration of the slope and the method of block houses	Use the slope drawn to an interesting view

Underground house: (building that is partially or completely located in the ground) is best positioned on the southern slopes with an incline of 30 degrees. In this case, the surface comes only a facade, the rest of the volume is located underground. Thus, we get 100% free territory in the area. Allows to use for construction, not suitable for the aboveground buildings of the territory. When using this type of housing is achieved by minimal intervention in the landscape. Provides a good heat insulation, environmental friendliness and efficiency, some functions of the enclosing structure takes on the ground, you only need to ensure load-bearing capacity at home (table. 4).

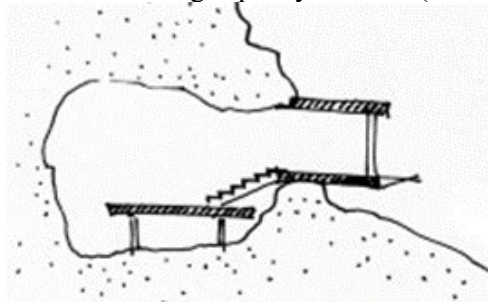


Table 4

rating	characteristics	recommendations
a harmonious blend with the natural landscape environment	Has the least impact on visual perception of the environment	Suitable for areas where you want to save the existing landscape or panorama
maximum preservation of the natural terrain;	Saves the entire or almost the entire skin of the earth	Preserves natural areas of the settlement that allows you to improve the quality of the environment
the maximum combined with the natural topography	Depends on the orientation of the slope to the cardinal, and allows the use for development is not suitable for the surface of buildings site	Best placed on the southern slopes
ecological compatibility	Protected land cover: impact of air flows, precipitation, overheating or hypothermia, is maintained uniform thermal conditions	Фасад здания должен быть размещен на южном склоне необходимых мероприятий для вентиляции
to form a beautiful urban environment	Difficult to ensure visibility: 5-6 houses located in the ground	For best visibility, the required slope with a gradient of over 30 degrees

Bridge house: built across the river, pond, ravine, Strait, etc. Building a bridge allows you to connect multiple spaces, for example, two banks, log, ravine or two hills. The design of such buildings is best to start with the search space for building (table. 5).

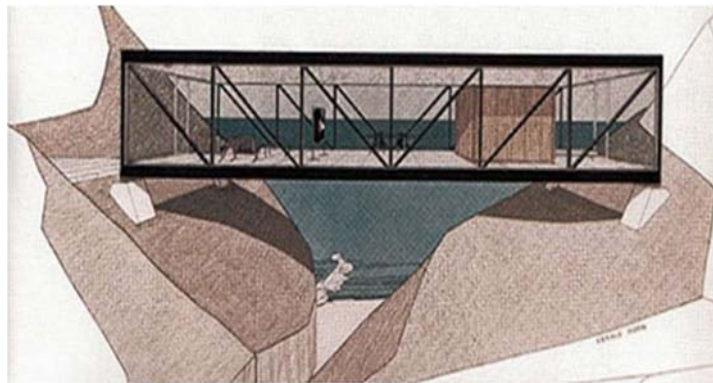


Table 5

rating	characteristics	recommendations
a harmonious blend with the natural landscape environment	Connects the two banks of the Lee of the hill; changes the shape of the terrain and its visual perception	To neglect the harmony, to use the contrast of the opposition of nature; or to enter into the environment due to coating materials
maximum preservation of the natural terrain;	Creates space under the house and connecting the space above the house; used the minimum portion of the surface of the earth	You can use the space on the roof for secondary glazing
the maximum combined with the natural topography	It is possible to place only in the log, between the shores, canyon, etc.	Need to find an appropriate bridge
ecological compatibility	Partially protected slopes	Requires additional measures to protect from adverse environmental influences
to form a beautiful urban environment	Visible in two areas along the slopes	its necessary to use the slopes drawn to an interesting view

For comparison, five types of residential development between the results on the five criteria of the study are summarized in a table where for each type of building presents the following evaluation parameters: B– high score; C – average; H – low rating. (three-plus B– the highest score, and five is less than plus C – average rating; one or no advantages H – low score) (table 6).

Table 6

Comparison of housing types in the selected criteria

Area development relative to the slope	Criterion				
	Console house	Terraced house	Home "chicken legs"	underground house	Bridge house
a harmonious blend with the natural landscape environment	C	C	H	B	C
maximum preservation of the natural terrain;	C	C	B	B	B
the maximum combined with the natural topography	C	C	B	C	H
ecological compatibility	H	C	H	B	H
to form a beautiful urban environment	C	C	B	H	C
Total	4C+1H	5C	3B+2H	3B+1C+1H	2H+2C+1B

Thus, the table allows the designers to choose the most suitable type of the building for optimal decision-making in the design of residential development in the conditions of the basin type of mountain relief.

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