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WOODEN DETAILS IN THE ITALIAN ALPINE REGIONS

Detajli v lesu v italijanskih alpskih področjih

izvleček

Alpske regije Italije so znaèilne po ostri klimi, prostor je gorski in pokrit predvsem z iglavci: to je tudi glavni gradbeni material.
Arhitektura je kombinacija kamna in lesa - nad kamnitim temeljem stoji leseno telo objekta, krit je s skodlami. Raziskave Gradbenega laboratorija Univerze v Trentu se ukvarjajo predvsem s tipologijo tradicionalne gradnje kladnih zvez in okvirnih konstrukcij. Kladna zveza je znaèilna med 1000 in 1500 metri visoko, tako za bivalne kot za gospodarske objekte. Gospodarska poslopja izrabljajo padec terena: vhod v hlev je navadno spodaj in spravilo sena z zgornjega dela - vse s terena.
Konstrukcijski sistem sten je v kladni zvezi s preklopi v okroglih brunih (z zarezovanjem).Tesnjeno je z naravnimi vlakni, z volno ali z glino, vèasih z malto. Skodle so velike 70 cm x 10 do 15 cm in zagotavljajo vodonepropustnost s preklopom. Kritina je obte na s kamni ali z lesenimi klini. Naklon je okrog 26 stopinj: pri strmejšem bi sneg odnašal skodle, bla ji ne bi tesnil.
Posebno znaèilni so napušèi, ki odpirajo mo nosti novih "prostorov" za spravilo (predvsem drv), pa tudi za varovanje pred zunanjimi vplivi (senca, zašèita pred de jem, previs šèiti pred glodalci). To je tudi kljuèna znaèilnost lesene vernakularne arhitekture alpskega dela Italije.

ključne besede:

les, kladna zveza, preklop, okvirna konstrukcija, lesena kritina, skodla, napušč

abstract

Italian Alpine regions are typified by harsh climatic conditions, mountainous terrain and coniferous trees: the latter are also the main building material.
The architecture is a combination of stone and wood - above a stone foundation stands the timber body of the building, which is covered with shingles.
Research at the Laboratory of Building Design in Trento mainly deals with the typology of traditional log joints and frame structures.
The log joint - "blockbau", is typical in residential and service buildings at altitudes of 1000-1500 meters above sea level. Service buildings utilise the terrains inclination: the entrance to the cowshed is usually below, and to the hay loft from above.
The construction system in the blockbau technique is with overlapping round logs (with notches). Sealants are natural fibres, wool or clay, sometimes even mortar. The shingles measure 70 cm x 10-15 cm, impermeability is ensured by overlapping. Roofing is weighed done by stones or wooden pegs. The slope is about 26 degrees: if larger, the snow would tear the shingles, if smaller impermeability would diminish.
Overhangs are very distinct, thus opening possibilities for new useful storage spaces (mainly firewood), but also protection from external influences (shade, protection from rain, overhanging protects from rodents). This is also the key characteristic of timber vernacular architecture in Italian Alpine regions.

key words:

wood, blockbau, framework, sfingles, overhang

The Alpine regions of northern Italy are characterized by cold and dry climate; the territory is mostly mountainous and covered with abundant forests of predominantly broad-leaved and coniferous species, such as white pines, spruces, larches and beeches.

In the past, the abundance of wood had significantly favoured the use of this material for the construction of buildings or parts of them. In traditional rural building, wood is often combined with masonry. In the Alpine regions the combination of masonry and wood varies between particular areas and sometimes also in building typologies. Masonry is generally used for basements of traditional rural service buildings, while the upper floors and roof structure are in timber or in wood. Roofs were generally covered with wooden shingles.

In a research carried out at the Laboratory of Building Design of the University of Trento, undertaken to identify and classify the constructive typologies of wooden traditional buildings, a finding was that the techniques used mainly for the construction of traditional rural buildings can refer to massive systems and framework systems.

The mainly used tree species were the larch (*Larix decdua*) and spruce (*Picea abies*). The larch is exceptionally resistant to the action of atmospheric agents and it has good physicalmechanical characteristics. The spruce can compare to the larch, but it is less resistant to atmospheric agents. Usually spruce was preferred for inner structures and panelling.

In the Alpine regions of the northern Italy, constructive techniques in wood and timber can be related to two codified building system: the *blockbau system* (Fig. 1) and the *framework system*. The framework system can be seen in two basic varieties: *"a ritti e panconi system"* and *"crociera system"*. The first is a very simple post and beam system characterized by the use of wooden or raw timber elements and simple joints. In the second,

Fig. 1: Buildings in the blockbau system in Valle del Vanoi.
Zgadbe zgrajene v kladni zvezi, Valle del Vanoi.

the timber elements are sawed, the joints are more refined and typical to traditional carpentry with characteristic braces. It is not quite a *"fachwerk"* system, but has some similarities.

In this article I will talk about the blockbau system and its specific details that can be found in the Alpine region.

The Blockbau system

The *blockbau system* is a typical constructive technique used in construction of rural buildings in the Alpine regions at middle and high altitudes, meaning around 1000-1500 meter above sea level. This constructive technique was used for building residential homes (Fig. 2) and service buildings, such as cowsheds, hay lofts and barns (Fig. 3). One of the most common typologies is the barn with the cowshed on the ground floor and hay-loft on the first floor. All these structures closely follow the

Fig. 2: Residential building in the blockbau system in Val d'Ultimo.
Hiša narejena v kladni zvezi, Val d'Ultimo.

Fig. 3: A barn, entirely built in timber in Val di Fiemme.
Skedenj narejen izključno iz lesa, Val di Fiemme.

Fig. 4: A barn in Valle di Fiemme with the ground floor in natural stone and the first floor in wood.
Sekdenj s kamnitim spodnjim ter lesenim zgornjim delom.

ground's inclination: the entrance to the cowshed is from the bottom and to the hay-loft from the top. Often the ground floor is in masonry and the blockbau system is used for the first floor (Fig. 4), depending on the surroundings and availability of timber.

The walls are made of overlapping logs that cross in the corners. The logs can be round (Fig. 5, left) or square (Fig. 5, right). Different solutions were used for the corner joints. The oldest and most used for service buildings is the "half-lap joint", i.e. the upper half of the log section that is removed (Fig. 6). In the most common solution, the removed parts are from the upper and lower faces of the log (Fig. 7).

Different log blocking systems have been used in order to assure better connection between the overlapping elements and to stabilize the logs on the vertical plane.

Fig. 5: Example of the use of round (left) and squared (right) logs.
Primer uporabe okroglih (levo) in kvadratnih (desno) brun.

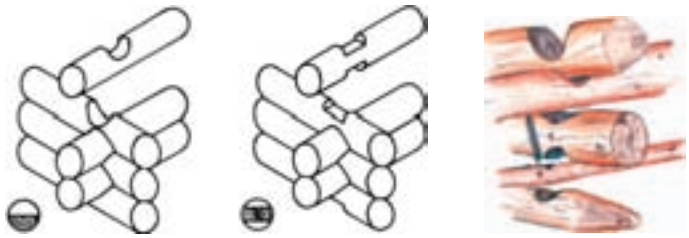

Fig. 6: Different constructive solutions for the corner joints: "half-lap joint" to the left and right, "double-lap joint" in the middle.
Primer uporabe okroglih (levo) in kvadratnih (desno) stikov.

Fig. 7: Example of corner joints with notches on either the upper or lower logs.
Primer vogalnih stikov lesa ob stiku tako na zgornji kot na spodnji strani.

The most common constructive solutions are:
- Interposition of wooden dowels or pegs between the logs positioned at fixed distances and stacked vertically one away from another (Fig. 8);
- Introduction of specifically shaped wooden elements between the logs (Fig. 8, 9, 10);
- Introduction of two vertical wooden elements that are put in appropriate holes of a wooden element placed perpendicularly to the logs (Fig. 11).

The last two constructive solutions improve the logs stability, but also ensure better ventilation of the space. In fact, the wooden wedges distance the logs one from the other, thus creating openings that facilitate ventilation of the hayloft.

In residential buildings or in separate rooms, where it was important to ensure that the walls are airtight and watertight, the opening were sealed with pieces of musk or pieces of wool (Fig. 12, left) or cowpat mixed with earth and straw (Fig. 12, right). The intermediate floors are made with wooden planks that res on the external walls without intermediate supports (Fig. 13). Sometimes the span was shortened with a dividing wall. Sometimes there is a double warping; in this case the beams are 0,80 to 1,20 meter apart and there are one or two layers of boards on them (Fig. 14).

If there is a main beam under the planks or under the beams - in case of the double warping - it is supported by one or more pillars (Fig. 15).

The joint between the beams and boards is a simple abutment; nails or pegs safeguard the connection.

The buildings done in the blockbau construction technique

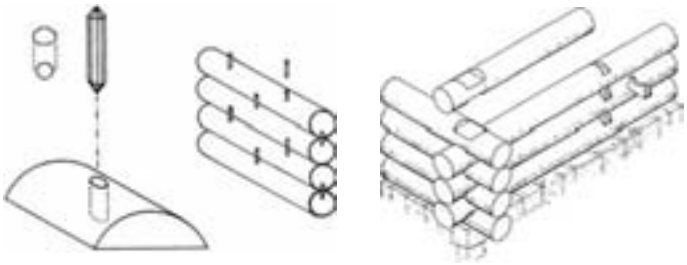

Fig. 8: Example of using connecting pegs on overlapping logs (left) or interposition of wooden elements between the logs (right).
Primer pričvrstitve brun z zatičem na levi, desno primer nalaganja brun z vmesnimi elementi.

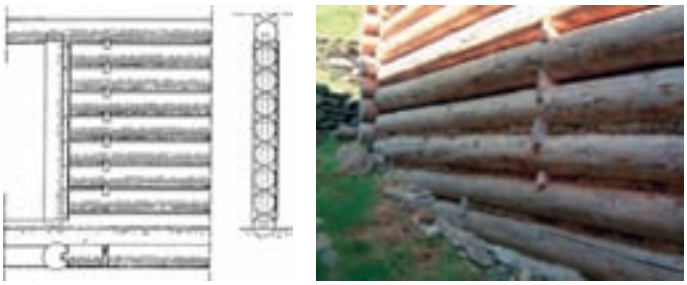

Fig. 9: Example of interposition of wooden elements between the logs.
Primer učvrščevanja brun z lesenimi elementi.

Fig. 10: Detail of the interposition of wooden elements between the logs.
Detajl vmesnega lesenega fiksirnega elementa za nalaganje brun.

Fig. 11: Use of vertical elements to improve the horizontal stability of the logs.
Uporaba vertikalnih letev za izboljšanje horizontalne stabilnost brun.

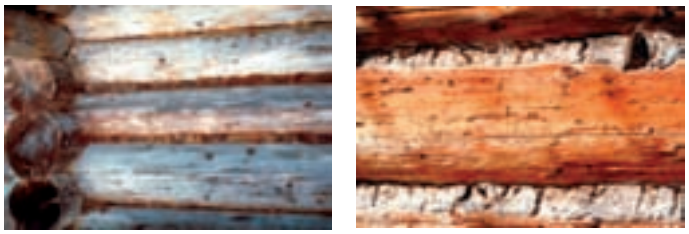

Fig. 12: Sealing of walls with musk or wool (left) and mortar (right).
Zatesnitev zidu z vlakni in volno (levo) in z malto (desno).

Fig. 13: The "cornice" of wooden floor elements (Val di Fiemme).
Zaključki (glave) lesenega poda (Val di Fiemme).

Fig. 14: Example of the double warping for the first floor.
Primer dvojne konstrukcije poda v prvem nadstropju.

Fig. 15: Left: Double warping with pillar supporting the main beam.
Right: Double roof frame with rafters and supported ridgepole.
Levo: Steber podpira glavni tram vmesne konstrukcije.
Desno: Dvojna strešna konstrukcija špirovcev s podprto slemensko lego.

Fig. 16: Example of wooden double roof frame with purlin and rafters (Val di Fassa).
Dvojni strešni okvir s podporami (Val di Fassa).

have a jutting pitched roof. Generally it has a double wooden roof frame that can be:

- With purlins and rafters (Fig. 16),
- With rafters on a truss,
- With rafters on a ridgepole (Fig. 15, right).

The ridgepole can be supported by the log walls, sometimes also by an intermediate pillar. In some cases, instead of the ridgepole, there is a longitudinal wall supporting the rafters. In some areas, the ridgepole can be supported by pillars outside the blockbau walls that rest directly on the ground. The connection between the vertical element and the ridgepole is a tenon and mortise joint. There are very interesting constructive details for connecting these pillars with the whole structure, as in the example in which the external pillar is locked to the blockbau wall by a curved wooden element inserted between the overlapping logs and which encloses the pillar.

The traditional roofing was shingle (Fig. 17), today often replaced by various types of tiles and sheets. The shingles are laid on joists or wooden planks. They are wooden boards: 70 cm long and 10 to 15 cm wide. They are obtained by splitting larch blocks. To assure the roof's impermeability, the shingles are laid on the small roof frame, stacked and with an overlapping of 3/4. In the oldest constructions and in particular circumstances, the shingles were simply laid on the small frame of the roof and held in position by slim logs, overlapping to the shingles and parallel to the eave line (Fig. 19). The logs were weighted down with very large stones and stopped by pegs put in the roof (Fig. 19, 20). Another way to obtain roofing stability was to nail the shingles to the roof.

Fig. 17: Detail of pillar locked to the wooden wall.
Detajl pričvrstitve stebra na leseno steno.

Fig. 18: Traditional wooden shingle roof.
Tradicionalna skodlasta streha.

Fig. 19: Slim logs holding the shingles.
Ozka bruna učvrščujejo (drijo) skodle.

Fig. 20: Detail of the stopping pegs.
Detajl pričvrstitvenih zatičev, moznikov.

In all Alpine regions the slope of roofs covered with shingles is about 26°. A higher slope could cause snow removing the shingles, while a smaller slope would diminish impermeability.

The door opening was obtained with two jambs that correlate to the overlapping logs with tongue-and-groove joints. The cut log has the tongue, while the jamb has the grove (Fig. 21). The top of the jambs are fixed in the upper log that works as a lintel. The bottom of the jambs rests on the stone basement or in the log used as sole plate (Fig. 22). The same constructive solution is used for windows higher than three logs, in order to prevent instable

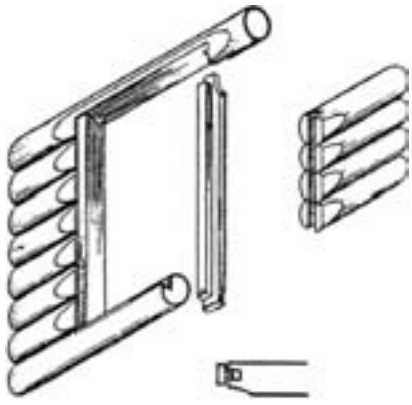

Fig. 21: Detail of the door frame.
Detajl vratnega okvira.

Fig. 22: Detail of a door of a barn in Val di Fassa.
Vhodna vrata v skedenj, Val di Fassa.

behaviour of the whole construction (Fig. 23). In other case, when the height of the windows is one or two logs, the constructive solution is simpler; they are small holes done by removing wood from two overlapping logs (Fig. 24) and the side. Upper and lower parts of the window are often raw or finished with additional boards. Often these small openings are protected by iron bars (Fig. 25, 26).

Fig. 23: Example of the window and door opening.
Okenske in vratne odprtine.

Fig. 24: The window as a small opening between two logs.
Okno kot majhna odprtina med dvemi bruni.

Fig. 25: Detail of a window protected with iron bars.
Detajl zaščite okenske odprtine s kovinsko rešetko.

Fig. 26: Detail of a window protected with iron bars.
Detajl zaščite okenske odprtine s kovinsko rešetko.

Fig. 27: Typical balcony in a Valser house, Monte Rosa Region.
Tipični mostovži, območje Monte Rosa.

The facades of many traditional buildings are characterized by balconies or overhangs (Fig. 27). The top floors of some buildings have a considerable overhang. These overhangs are often covered (Fig. 28) with wooden planks nailed to wooden structures to provide other spaces, e.g. drying hay and storing agricultural products.

Fig. 28: Typical covered overhang in Val di Fassa.
Značilni pokriti napušči določajo fasado, Val di Fassa.

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