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TRADITIONAL AND YET FORGOTTEN: WOODEN CONSTRUCTIONS

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Abstract: *The author uses clear and simple examples about construction methods, details, and technologies that have been proven by centuries and yet are being margina-lized and commonly replaced with problematic, short-lived, or overcomplicated con-structs, layering of materials, orunrefined technologies whose very look is questionable. Among examples there are typical constructions and details about roofing, edges, gut-ters, and ground anchoring. All of this from a perspective of an authorized architect and a former heritage preserver.*

Keywords: Traditional, yet forgotten, wooden construction, overcomplicated construction

1 INTRODUCTION

Wood gradually lost its prominent position as the fundamental material for constructions, tools, and furniture. The rise of other materials led to a loss of experience about woodwork for technology, constructions, and mainly for architecture. Contemporary assumption that wood can be imitated with other materials then leads to comical situations. A conversion of wood designs into stone was done in Classical antiquity.

Fig. 1 Antic conversion of wood designs into stone, I.Krčmář 2008

Saint Florian was often pictured with a building like that, but the transition away from wood in Austro-Hungarian Empire gained momentum when Maria Theresa's building regulations condemned most wooden buildings for reconstruction or demolition. Bur-ning cities on all sides of fronts in the Second World War ruined the reputation of wood and it was replaced with steel everywhere except cottage colonies. Temporary structu-res were also done as steel-sheds -- a form that can still be seen in today's shopping malls -- even though steel is worse from fire-safety point of view.

Wooden buildings recently made their return from exile in Siberia or Canada, through Poland under a deceitful promise of savings. New manufacturers introduced many puzzling designs, because lost evolution and traditions mean a regression way before timbered framing, back to log huts of wooden ages and even further, when a saw was expensive and wood plentiful. Pseudo-folklore now extends logs beyond roof overhang and rot has not given its feedback yet as these building are fairly young. The pinnacle of absurdity is metal plating on those logs, even Baba Yaga's shack on a chicken leg, which was the only building with protruding logs in the whole fairy tale Mrazík, at least had a sturdy case for a window in the middle and not just cheap plastic frames, placed like they would be on a masonry wall, i.e. at any place where a chainsaw massacre left a hole.

Wooden buildings affect us more that we want to accept, not just as an archetype of traditional folk's house, but also through details imitated in stone in Classical antiquity, masonry in classicism, or cast-iron at turn of the 19th and 20th century. From layout or tectonics of the facade to profiling of bevelled edges, that make a wooden building look thinner, and also smooth out the surface and get rid of splinters, which decreases the area that absorbs moisture and needs to be painted. Old buildings have proven these methods and yet they are being forgotten. The situation is similar with ledges and drip edges. We should not accept "some frills" that untrained builders or planners do wi-thout understanding.

2 FOUNDATION

For wood, like for metal, the best seal is a hole, which drains precipitation or condensed water. Common anchors have drains, but less is known that

horizontal masonry con-structs must not have hollows where the wood would stand in water. The best solution is to imprint the wooden beam lengthwise and then grout transversely to the side.

Great effort to protect wood can even lead to non-sanded felt on concrete, into which the wooden wall plate presses and creates a perfect pool, specially if the upper layer blocks moisture and water drops travel all the way from the ridge. Barns, hayracks, granaries, and mills that are mounted on flat stones under corners and frame joints, be-cause it allows breathing in full length and have a layered or masonry "quiff" interleaved with slightly greasy slate or similar stone that will not let moisture into wood, last for so long without a maintenance that alternatives makes you smile.

3 STRUCTURAL ANALYSIS

As the saying goes, a wooden building survives everything except structural analysis with latest norms. Analysts have a major problem with sagging beams even in new building, although many old ones have dramatic sagging and still serve well, because the measurement of cavities and anchoring points is not precise enough to assess the real behavior of constructs.

Inserting thin laminate or composite plates is a considerate solution for delicate joints. The plate takes care of sagging and buckling and also breaks the thermal bridge, which could help to prevent otherwise common dew where wood and metal meets. Experi-mental epoxy-sawdust or epoxy-cement casts are also good. Dowel joints without metal reinforcement, therefore with similar deformation and expansion properties, are the most reliable solution for thousands of years. Some experienced carpenters can do partial replacement of wood constructs that uses these joins.

Beam ceilings tied to vertical walls are of a similar design, but suffer from higher structural and condensation strains.

4 FIRE

Combustibility of wooden constructs was one of limiting factors for wooden buildings. On top of many mandatory services (watchmen, fire watch on town hall towers, and la-ter firemen) and buckets with water, property owners separated buildings from fire ha-zards out of their own interest.

If we exclude wooden smoke flues, already forbidden in our countries for roughly 200 years, then in Alps are still common wooden chimney cowls, treated by scorching low-resin wood with dense growth rings before use. Scorching works like fire-resistant layers of ash in ceilings. Scorching is also used to prevent rot in stakes of some trees (mostly oak in our countries) and is best combined with humidity control.

Massive wooden members with thorough treatment, which includes hammering of beam ends and other cuts, last 30 minutes in standardized fire for every 3 centimeters of thickness. Smooth, planed, surface also has smaller area that absorbs humidity and pa-int. Larger surface area of "splintered" wood decreases the time needed for ignition of wood. Fire in an improperly designed and implemented wooden construct is impossible to contain without a high pressure fire engine.

5 DRIP EDGES

The second important part of wooden constructs is a detail of drip edge nose at all edges of a wooden construct. A recommendable treatment for shingle or hardwood slats is homogenization of their ends by hammering or scorching and polishing with a grinding wheel for stainless steel.

A wooden construct without treatment keeps residual moisture that turns into rot and leads to destruction of the construct. A metaphorical drop of water is all that the well know dry rot fungus needed to become the first imported calamity in Europe. The im-portance of humidity has to be realized at edges of moisture barriers or airtight insulati-on and at crossings of mutually-supported horizontal construct as they have to be pro-tected by overhangs from all sides.

Overhanging roof is the best protection even for protected masonry or vertical wood constructs. Hardwood slats and hardwood or slate shingles are preferred over metal flashing, which is especially improper for historical buildings unless flashing was a part of the original from later periods.

6 SURFACE

The third important point for survival of a wooden construct in Central European clima-te is an appropriate surface finish -- impregnation, nowadays pressure treatment. The surface should be breathable and slightly greasy = water repelling. I am not going to go into chemical-technological properties, but it is important to remind that pure lime de-composes wood similarly like waste oil and even traditional impregnation with bull blood has to add salt and other ingredients to avoid wood-decay worms and fungi. Mo-dern materials have various colours and just 150 years ago were shingles commonly pa-inted red to imitate more expensive ceramics.

Some paints and modern intumescent coating or cladding with fire-resistant drywalls go against their purpose when applied to protect a wooden construct -- they needlessly add weight, change aesthetics and prevent moisture from escaping, which leads to early destruction. Cladding with wooden planks or shingles, as can be seen on some chapels in Beskydy, has better parameters than half-timbered framing with split log infill and does not look like a storage of firewood.

Half-timbered constructs with wainscoting or cladding were problematic even many decades ago, mainly because of stability of the cladding itself,

moisture and the frequent need to repair cracks between various materials. Problems are not reliably solved today, unless we think that various ever-elastic putty is really forever and does not change the color of facade paint. Scorching or hammering does not have an exclusive manufacturer, so it is not advertised even though it is the best surface treat-ment.

7 ACCESSORIES

Preserving credibility of historical wooden buildings requires us to ignore decades of changes and look for traditional accessories, e.g. poles from hard and flexible wood (walnut, hazel, ash), not just to make gaps for ventilation of gable walls, but also as gut-ter holders.

Roofing started with thatching, initially from straw, somewhere from more durable reed, and roof ridges in some windy regions were being reinforced with wooden shing-les or wainscoting. Slate roofs have advantages, but wooden shingle is the most com-mon cover of traditional roofs and walls. Asphalt felt on triangular slats is suitable for wooden village buildings from the turn of the 19th and 20th century, although con-densation can still occur on the bottom side. On a related note, insulation of the whole area of a roof leads to unacceptably high side fascia and can completely suppress pro-portions of otherwise perfectly refurbished wooden building.

Artificial "folklore" of contemporary wooden buildings has metal on edges of a mo-dern roofing, the kind you would expect on a masonry building, with many metal fla-shings up to the ridge.

Fig. 2 Gerstein house, author I.Krčmář 2013

Vents, windows, and masoned replacements of rotten parts introduce problems with structural system and condensation that are magnified by overheating in the winter and by filling chinks and even vents with thermoinsulating foam. Original design of log huts, with minimal gap in the middle (to break the thermal bridge) and slate or plaster filling had more stable temperature and humidity and did not cause micro-cracks.

Color of wooden members or recoloring depends on the region. Carpatian area and Jurkovičovy Pustevy or Luhačovice are an extreme example of polychrome wooden constructs in our areas, where the usual finish is oiling or waxing. Many buildings will look like an imitation with any finish, though.

Another negative impression is cast by openings, sawed holes without any casing, filled with improper material or color. Historical building do not use just green, yellow, red, brown, and white, but also gray. Sun-faded shades of gray do not have the tradition of Swiss or Germany, we take it as acceptable only for forgotten warehouses and mountain huts, but it still a full fledged color for all materials and decorations.

Layers like glue, foils, styrofoam, and plastic cladding that imitates wood or other material are alien to our environment, have short lifespan, and also dangerous for long term use because of volatile substances. Archetype of pleasant wood finish leads to ir-rational extremes where metal constructs like railing and stone portals are painted brown. Classical graining of soft wood interior pieces or metal safes is a different cate-gory and hard to find nowadays.

The interaction between traditional constructs and materials is important when desig-ning new building, especially in a heritage sites, because removal, remediation, and actually any modification affects neighboring constructs and materials. If a temporal relocation is required, we have to temporarily replace the function. The replacement is important even for flat arches, where horizontal forces often lead to destruction.

Fig. 3 Trees cut down after a forest fire in Tatras that spread through the root system, just like humidity. Author I.Krčmář 2006

The knack of old masters got lost also because Central Europe abolished private corporations after year 1948, state corporations and training institutions after year 1990, and degraded craftsmen into temporary workers. The result can be seen all around, but it can be improved with paragons of good realizations and judgements of the rest.

There is a need to at least talk about wooden construct interleaved with wedges and screws, holes from chainsaw massacres, and about logs that extend far beyond roof, a roof that looks like it belongs to a different house.

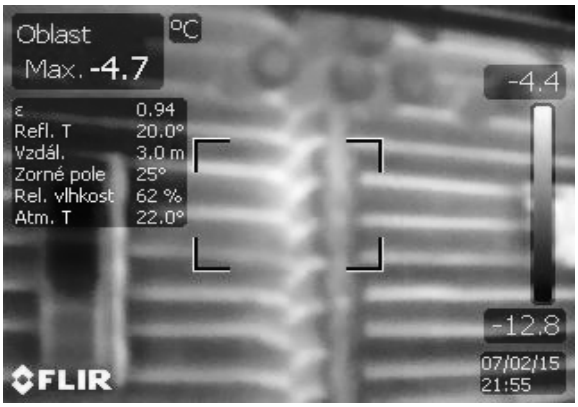

Fig. 4 Similar detail – above trees cut. Gerstein house. Infrared photo I.Krčmář 2015

8 CONCLUSION

Forests of Central Europe were and hopefully will remain a natural environment for animals and human recreations and outside of state protected areas also a source of material for new buildings and restoration of historical buildings. Pollution from heavy-industries to monoculture forests was slowly replaced as the main damaging factor by hurricanes and particularly swindlers, so when harvest after 70-90 years comes, even native trees show signs of degradation, from hidden bio-factors to easily visible mistletoe, and we clearly have different requirements for firewood and wood that should be used as supporting structure in buildings.

Erwin Thoma presents three key criteria for woodcutting. The most important one is biological winter, when the flow of sap is diminished. The winder lasts roughly from September to January, or February in higher elevations. Moon phase is the seconds one, because a wood cut down on waning moon (from full moon to new moon) is better and quality close to new moon is higher than at full moon. The last rule is connected to zodiac, where Capricorn, Virgo, and Taurus are recommended months for harvest.

We should realize that different quality, treatment, and color of wood determines its use in construct (slats only from hardwood or larch, common spruce in their places is absolute makeshift) and so called "modern" layered lamella (for structural frames or fillings) is not the panacea. We should not forget the essence of creating an artificial environment for various human activities. Wood is a material with "limited" lifespan (easily 200 years), but for generations do humans consider its insulating, optical, and tactile properties as a symbol of quality of their artificial habitat that adds to a feeling of home.

Some oversimplifying, but time-proven, claims from a dictionary of practicing and teaching architect:

1) Wood for construction is cut after Christmas.(Humidity in trees has monthly cycles like tide. Harvesting in winter, the time of minimal humidity, storing the trunk downhill and cutting off the tip after the moisture gathers there, before transporting helps to minimize cracks when drying the wood. Fast-dried glue-infused wood will not be the most healthy one.)

2) Building season lasts from Saint Joseph to Saint Wencelaus (Mar 19 to Sep 28. Construction material has to heat up and dry a bit after the winter and has to dry out before the next winter to not decrease the lifespan, peculiarly of perimeter constructs.)

3) Do not put wood in puddles. (Never put foil on top of non-hardened board or grout layer. Stone plinths or just stones at the base of pole barns allow water to drain even today.)

4) The best seal is a hole.(Hollow floors and ventilation systems/water drainage of the base and other constructs, and culverts in retaining or bearing walls work for many years without having to manage edges or breaches of large-area seals.)

5) Fight fire with fire. (Ash layers or scorched surface are the traditional ways of fire protection. Wood on top of these layers does not burn easily and it does not devastate constructs like a heavy airtight fire-resistant drywall, that lasts just 30-45 minutes, or water from fire engines.)

6) The best insulation is permeable.(Insulation against ground humidity, e.g. clay/betonite, that insulates when wet and lets millraces, ceilings, bearing walls, or traditional bridge constructs breathe when dry.)

7) The best flashing is no flashing.(Composed roofing has better durability and permeability than metal flashing on drip edges, ridges, and valleys. We can see hardwood drip edges and gables even today.)

8) The best humidity extracting plaster is an unplastered wall.(Permeability of any other layer limits the permeability of a well built masonry construct. Keeping salted plaster on a wall or under the wall is the worst we can do. It is important to find the cause, not to cover it.)

9) The best paint for wood is no paint.(Quality weathered wood with treated surface can have a grey shade and even glaze is made in that color, so there is no need to have 100 years of carbon oil and white-green, rosewood (from '70s of the 20th century), or gold/ocher (beginning of 3rd millennium) openings. The surface can also be treated with transparent wax or oil to withstand extreme conditions.)

10) Wooden building is not an imitation. (The form must match the content, for new building like for restorations, and therefore has its architectural and technological specifics. A masonry building paneled with wooden boards or a wooden building paneled with drywall or imitations of other material is not a good example, but that does not mean that the only permissible form is "Dřevěnice" with saddle roof and planked red-brown walls one the north side.)

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