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To cite this article: Aleksandra Repelewicz 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **471** 082006

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# Sealing Log Houses

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**Abstract.** The paper presents traditional and contemporary method of “mossing” – filling the gaps between bales in wooden houses, with particular emphasis on old houses transferred to new places. The old and contemporary methods were analysed and the author’s method applied experimentally in old wooden log house, moved in 2016, is presented.

## 1. Introduction

Among diverse construction forms considered environmentally-friendly, particularly noteworthy is the increasingly popular in recent years’ process of moving old log houses – dismantling and rebuilding them in new locations [1]. Such undertaking requires the assessment of the technical condition of the structure and the preparation of a detailed inventory of the building components, combined with marking (e.g. with numbers) of all wooden elements of the structure. The building is then dismantled and transported to a new location where it is reassembled, and the most damaged components are replaced. Roofing and window- and door frame-woodwork are often replaced during the reconstruction process. It is uncommon to preserve the old windows which are then renovated and reinstalled in window openings, and this process requires the dismantling procedure to be performed very carefully. On the completion of the construction of the walls and roof, the investor is faced with one of the more challenging tasks – the sealing of walls, i.e. filling in the gaps between the logs.

## 2. Traditional methods of sealing log houses

In Poland, the traditional method of sealing log houses is known as “mossing” (*mszenie*), and the word comes from the oldest known method of chinking: inserting layers of moss between the logs [2]. Moss was the cheapest and most widely available raw material; it has good insulating properties and the method of filling in the gaps between the logs did not require great skills and was also relatively quick. The moss which became loose and fell out from the gaps with time was easy to replace. This method of sealing is especially popular amongst investors who wish to reconstruct houses in ways most resembling the traditional method.

Another inexpensive and simple method was sealing the logs with clay – also a widely-available and cheap material. Clay on its own, because of its change in volume and cracking once it dries, was inadequate for use as sealing material. Depending on the region, various organic fillers were used: chaff, hay (most often oat straw) or oakum. At the same time, these fillers also improved the insulation standard of the seal. The use of clay was not a durable solution, but the ongoing repairs were simple and cheap, and consisted in wetting the area with cracks and missing fragments and refilling them with damp clay. The clay fill was sometimes painted, for instance with a white or blue paint, which made the log houses more aesthetically pleasing.



Another traditional method of chinking wooden houses is the use of wood wool known as *welnionka*, i.e. wood slivers cut from spruce timber. The slivers are gathered in the form of decorative braids and inserted into the gaps between the logs, known as *plazy* in Polish. Chinking can be one-sided (where the second, internal side of the braid is cut flush with the walls) or double-sided, where the decorative braid is visible on both sides of the wall. Chinking with wood slivers has replaced the traditional use of moss, particularly in Podhale. If done well, the use of wood wool is more durable and also much more attractive visually, as there exist various patterns and methods of braiding the wood slivers. Chinking with wood wool continues to be used in old houses; however, this method is quite costly in the case of new homes, as it is very time-consuming.

### 3. Contemporary methods of sealing log houses

In today's world, all these above-mentioned methods of sealing log houses are still in use and each method has its supporters who emphasize its natural properties and ecological character. Unfortunately, the first two methods are not durable and the high costs put off many investors, who all face the task of finding the ideal method of durable and cost-effective chinking when building a new log house and especially when moving an old house to a new location. There is a marked lack of professional literature on the subject and experimentally determined solutions. As the extent of the issue is not substantial, there are very few systemic solutions offered by research centres and construction companies.

The solutions currently used on the market include:

- polyester unwoven fabric (effective with narrow gaps);
- bands of synthetic felt;
- expanding tapes;
- wood wool or oakum;
- mineral wool with a waterproof seal from the outside;
- hemp rope;
- specialist putties or fillers. [3,4,5]

Each of these methods has its advantages and disadvantages; however, they all fulfil their intended purpose if the gaps between the logs are for the most part uniform and quite narrow. In the case of gaps which greatly vary in height (which in old wooden houses, especially those inhabited by the poorer members of the community, happened quite frequently), the situation becomes slightly more challenging. This is when an issue with wide and irregular fissures comes to the fore.

The issue of using modern sealing methods in historical houses which are moved to new locations invariably leads to the aspect of interaction between tradition and innovation [6]. The methods should be chosen in a way which preserves the character of old village houses, while guaranteeing the most advantageous physical parameters of insulation [7].

### 4. An experimental method of sealing log houses

One of the villages in the Island Beskids was chosen as the new location for a log house which was moved from the neighbouring village. The structure was built from larch logs and the width of the gaps between the logs varied between 1 and 5 cm. Originally, the house was sealed with moss, which was supplemented with clay in places. Unfortunately, this method of sealing had a negative effect on the logs, and some of them degraded in contact with the moss, which was prone to becoming damp when not supplemented and packed tight.

After impregnating and assembling the wooden structure [8], the investors were tasked with the issue of chinking the gaps between the logs. The traditional methods, due to the limited life span of the chinking, high labour intensiveness, and the significant costs in the case of the wood wool, were rejected outright. Attempts to identify the professional literature on sealing log houses were unsuccessful. The analysis of methods applied by other investors led to the conclusion that most solutions are suitable for gaps which are not wider than 2 cm. After numerous analyses of the materials available on the market and several attempts of employing various solutions, an authorial

method of chinking log houses was created, which uses a low-pressure sealant and adhesive reinforced with fibre glass. The chinking carried out using this method in 2016 survived the entire season in an excellent condition, and currently works are ongoing on the remaining walls.

The technology of using a low-pressure sealant consists in:

1. Dusting and wetting the gap to increase the adhesion of the sealant.
2. The sealant is applied with a sealant gun, as this enables the control and adjustment of the flow of the product, depending on the width of the gaps (Figure 1).

3. It should be experimentally determined to what degree the sealant expands in the gap until it hardens. This reduces the need to later add more sealant in places where the gap had not been fully filled in or where there was too much sealant applied, which caused it to flow out of the gap, leaving empty pockets. The procedure is carried out on both sides of the walls – indoors and outdoors, making sure that all the places (also narrow gaps and building corners) had been neatly filled in. This is crucial to ensure that the walls are fully waterproof and windproof, and to eliminate the formation of thermal bridges.

4. Once the sealant hardens (it is recommended to wait several hours), excess sealant can be cut off with a knife. The surface of the filler can then be made smooth with an angle grinder equipped with an abrasive disc, grit 80 (Figure 2).



**Figure 1.** Filling the gaps with a low-pressure sealant



**Figure 2.** Grinding of the joints

5. The gap fill should be slightly concave, so that its edges are in contact with the surface of the neighbouring logs (Figure 3).

6. Once the logs and filled gaps are dusted, the logs can be protected with masking tape (and if we are skilled in plastering, it is enough to place a plastering trowel under the gap to ensure that the logs are not covered in adhesive, which would necessitate more cleaning and grinding later).

7. The adhesive reinforced with fibreglass mesh (here, the Weber polystyrene adhesive was used) is then applied onto the joint, using a narrow putty knife. It is recommended to have access to several different putty knives, as gaps significantly vary in width in old houses.

The adhesive layer should be several millimetres thick. It should be made smooth with a putty knife and after approx. 30 minutes (depending on the temperature and drying time), when it begins to harden, it can be made smooth with a wet sponge, and it can be given its final shape. Dry joints are hard and tight, and the adhesive does not crack or crumble. The adhesive should not be applied in full sunshine, as this causes it to dry too quickly, and as a result, shrink and crack (Figure 4).



**Figure 3.** Wall of the house during grinding



**Figure 4.** Joints during the application of the adhesive

Once the adhesive layer dries completely (24 hours), the exterior paint can be applied with a small brush (Figures 5 and 6). The selection of paints is very extensive, and the paint manufacturers recommend to first prime the adhesive with diluted paint. In the case described, a single coat of paint was applied without dilution, which gave excellent adhesion and hiding power. Any areas made unsightly with adhesive or paint can be cleaned with a grinding machine. In the event of any mechanical damage to the joints, it is easy to make localised repairs in exactly the same way. If with time there is a need to refresh or change the colour of the joints, they can be washed and repainted.



**Figure 5.** Painting of the joints: upper joint after painting, bottom joint prior to being painted



**Figure 6.** Finished walls with the sealing process completed

## 5. Conclusions

The method of sealing log houses using a low-pressure sealant and adhesive is less labour intensive than traditional chinking with wood wool, while thermal insulating and sealing properties of the structure are similar. At some stages (grinding of the sealant), the dust created may be a nuisance, that is why it is recommended to provide personal protective equipment and ensure adequate ventilation of the premises.

A key advantage of the technology described above is its relatively low cost and the ability to perform this task without professional help. For a house with the surface area of 84 m<sup>2</sup>, the total length

of the joints would amount to 710 metres, which would give the approximate cost of PLN 36 thousand, if chinking with wood wool on both sides of the logs was chosen. The cost of chinking with a low-pressure sealant and adhesive for polystyrene, when performed independently, amounts to approx. PLN 3 thousand, which also included the purchase cost of necessary tools. Therefore, this method is an attractive alternative for those who wish to perform this work by themselves, without the assistance of professionals, those who enjoy such tasks, and those with a limited budget. At this point, it should be added that the sealants used were manufactured only by leading producers, which gave an even and dense structure in the cross-section.

To complete the chinking, the joints were coated with exterior paint in the colour of light clay, which gave the building a look as if it was sealed with clay. This made it possible to preserve the structure's appearance, despite the employment of unusual and exceedingly contemporary materials. The observation of the future use of the house in question will allow to draw further conclusions on the durability and functional properties of the technologies outlined in this article.

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