

Zukunft Bau

ABSTRACT

Title

Duct through-penetrations in timber buildings

Background

The demand for timber buildings has risen in the last years due to environmental advantages. The benefits of building with wood can be seen in prefabrication, resulting in shorter construction times. These benefits are limited by non-defined construction details, especially fire stops. As modern buildings have more technical equipment, fire sealing systems are getting more and more important.

Research issues

The project deals with the application and the testing of penetration seals in timber buildings. Known systems, which are approved in solid and drywall components, shall be examined while being installed in timber assemblies. The transferability of testing conditions from penetration seals in solid and drywall components to testing in timber assemblies shall be probed.

In Germany the provided solution is a combination of the timber structure with a solid element in the area of the through-penetration. Wood is substituted by concrete or mortar. The sealing of the ducts takes place within this concrete plug. In this research project this method shall be replaced by the new method "timber-in-timber". Modules with defined characteristics are connected with the timber assembly where the ducts shall be installed. The ducts and penetration seals shall be installed in this timber modules. Due to the known characteristics of the timber modules, transferring test results to similar situations will be easier compared to testing all penetration seals in different wall constructions. The timber modules shall be made to be used in all different types of timber assemblies. The method "timber-in-timber" leads to visual, ecologic, and economic advantages

In preliminary experiments the applicability of different common penetration sealing systems in timber modules was tested. Some of the probes were tested under more difficult conditions to find and examine failure mechanisms. Based on the results of the preliminary experiments, two full scale fire tests were conducted. In the first test the timber modules with installations and fire stops were fitted into a wood frame wall, in the second test into a cross laminated timber wall. Regarding the criteria integrity and insulation, most of the tested assemblies resulted in fire resistances of 90 and 120 minutes.

Conclusion

The test results show, that penetration sealing systems exist, which can be applied in wood assemblies. Some of them need to be modified to be appropriate for use in timber, other just need to be installed in a different way. Few of the examined penetration sealing systems should not be installed directly in timber assemblies.

Project parameters

Duct through-penetrations in timber buildings

Project Management:

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Prof. Dr-Ing. Dirk Lorenz

Researcher:

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Overall costs: 264.400 €

Share of federal funding: 149.400 €

Project period: 18 Monate

Figures



Fig 1: Full scale fire test, frame wall with penetration sealing systems



Fig 1: Full scale fire test, CLT wall with penetration sealing systems inside oven

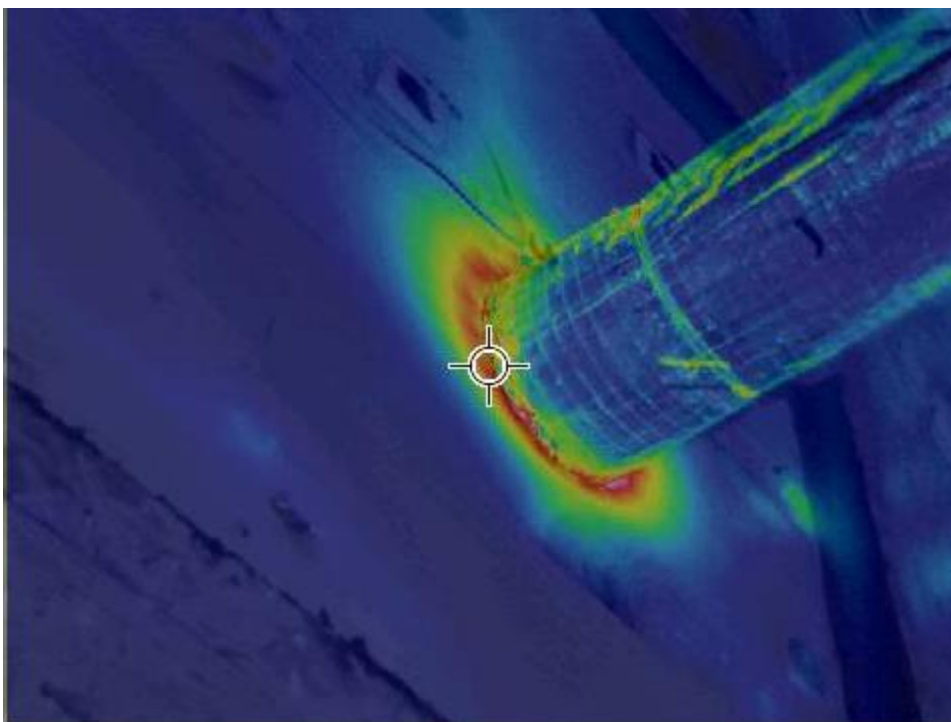


Bild 3: Thermography full scale fire test, annular gap, mineral wool pipe lining

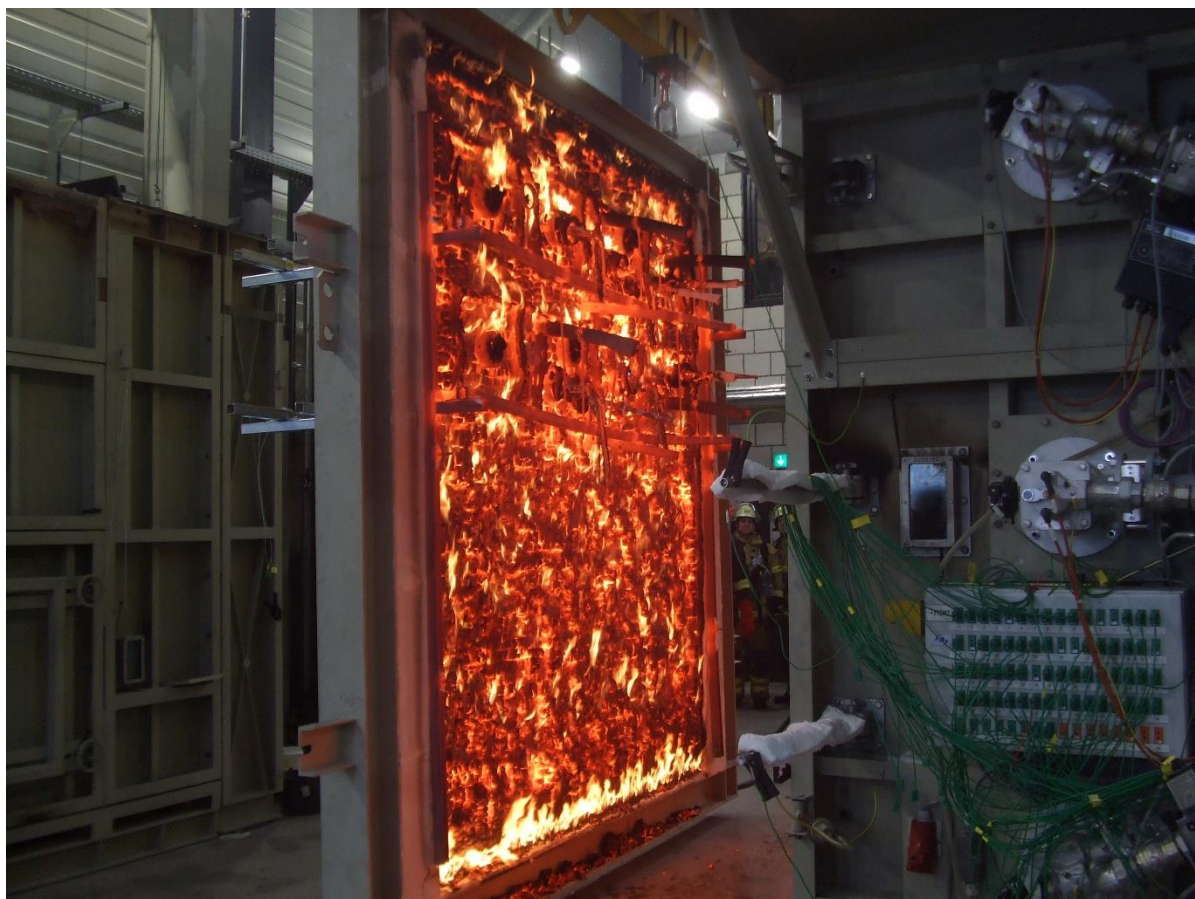


Bild 4: Full scale fire test, wall after fire exposure



Bild 5: Full scale fire test, CLT wall while extinguishing



Bild 6: Timber module after exposure