Timber Structures and City Fires

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Timber Structures and City Fires

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Darmstadt after Fire storm 1944

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Abstract

At present, some builders promote timber structures as a possibility for reducing CO_2 emission from construction in general.

Fire safety precautions for these structures seem to be limited to ensure escape before collapse based on requirements of the present Building Regulations, where fire in one building at a time is considered.

However, application of timber structures in dense building areas may re-introduce the problem of city fires, which we elsewise have avoided by a deliberate introduction of a stone-based building culture.

This means that our cities may become vulnerable again to large-scale fires initiated by accident, by forest fires and by acts of war, as we have seen many times in the history.

The paper presents how a city fire develops illustrated with historical examples.

Furthermore, it presents aspects of modern buildings and cities, which increase the risk of city fires and thereby the risk of large releases of not only the CO_2 bound in the timber structures but also the CO_2 bound in everything else combustible in the city.

Although our fire brigades are somewhat better equipped than they were during the Second World War, they also suffer from cut in budgets increasing their reaction time. The increased number of synthetic materials applied in our buildings will release large amounts of toxic smoke that represents a new problem by occupying the fire brigades with evacuating the population from areas not yet ignited.

Furthermore, terror has become a new threat to the modern society. Coordinated ignition several places in a city can outmanoeuvre even the best fire brigade as seen at the attack at September 11, 2001 in New York.

Uncoordinated simultaneous acts of terror may also occur as we often see when arsonists ignite cars and buildings several places in a city at the same time.

Finally, we propose to limit the risk of city fires by requiring a max fire load of a city to be 80% of the fire load, which has proved to give firestorms in traditional cities in 1944. This city consisted of traditional five storey buildings at 25% of the ground with 2 GJ/m^2 floor. We should therefore require that the fire load of a city should not exceed 2 PJ/km^2 ground of the city equal to 2 GJ/m^2 ground. Fire load of a stone house is 0.2 GJ/m^2 floor. For a wood house, it is 18 GJ/m^2 floor, if it should fulfill the sound insulating requirements of 440 kg/m^2. This means that you can only accept 1 wood house for each 12 stone houses if you should avoid the risk of city fire.

We therefore suggest that no city should have a fire load exceeding 2 PJ/km^2 ground.

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