

Fire Resistance of drywall assemblies with different loading condition

-Experiment on temperature prediction within wall and consideration by using numerical simulation-

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As for the frame member or the compartment member, in the present fire-resistant design method, the safety of fire-resistance efficiency is verified individually. In order to take into consideration the influence by the thermal deformation of their members, there is some room for improvement in the present fire-resistant design method. In the building standards law, non-damaging efficiency is not demanded in particular of the non-structural wall. Therefore, in the performance evaluation test, it is verified as a thing without deformation of member around wall.

However, thermal deformation arises in the member with a real fire. Thus, even if it is non-structural wall, external force is received and a crack and dropping arise on the wall. So, the heat interruption performance and the flame interruption performance are spoiled early and there is a possibility of carrying out fire spreading enlargement. Moreover, there is not sufficient knowledge about the influence which deformation of the frame and compartment member has on the fire resistance efficiency of compartment member. In this research, the dry wall with thermal stress and forced deformation was assumed on the influence of the heat deformation which arises in both a frame and compartment member.

On the experiment, thermal stress and forced deformation were reproduced by loading test, and the fire resistance test was conducted using the model compartment fire of full-scale. From the experiment, it studied about the factor of the fire resistance efficiency decrement of drywall with thermal stress and forced deformation. Then temperature prediction of wall was considered using the numeric simulation by the finite element method.

From the experimental results, the fire resistant performance decrement of drywall with thermal stress and forced deformation is caused by falling of board and joint clearance. From the results of the temperature prediction by a numeric simulation, it became clear that the behavior of falling of a board, joint clearance, and the heat conductive of a stud influences temperature distribution within drywall.