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| **Citation Key from Mendeley** | **Findings** |
| Klippstein1978 | * First documented to do fire test * Tested under ASTM E119 - Underwriters lab. * Seven wall panel tests validated (previously conducted) * Model to predict the behaviour * Strength reduction factor Q * Mechanical properties * AISI -7 fire tests , US steel 3 fire tests * Average stud temperatures were needed and determined * Analytical method to predict the time/steel behaviour during fire tests. * 3.05 m x 3.05 m panel size * Wind loads designed to act laterally were excluded. * 10% deviation with 8 thermocouple locations * Inside flange HF, Outside flange CF * Plasterboard cracks and the studs near to the crack loses temperature rapidly while others retain the temperature. * ASTM E119 read the manual * Plasterboard loses ability to provide lateral restraints. * Effective restraint unknown * Although one stud fails the others can carry load for some time. This may imply in my tests as well * Assumption - Failure of studs by weak axis only. * Concept of load ration FT/F is used * F = 23/12 FalA allowable stresses in the studs. 23/12 is the safety factor in allowable stress method. * Inelastic buckling critical for stud heights upto 4-4.5 m while elastic buckling governs beyond. Equation for inelastic buckling only was developed/proposed * Failure load at room temperature * Studs deflect laterally causing bending stresses and have to be accounted for in FT calculation. * Section 3.7 in ASTM was used (find the standards) * Allowable stresses for axial load at failure temperatures * Proposed LR * Material property tests were done separately to find the variables for the equations. * Elastic modulus decreased rapidly for sheet steels than plate steels. * Stub columns tests were conducted to determine Qt - strength reduction factors at ambient and elevated temperatures. * Equation predictions were conservative in comparison to experiments * Pb 12.7 and 15.9 thick. Studs 600mm apart * Hinge conditions were assumed for the tests. Specially made * Limitations of the equations- heavily dependent on the empirical determination of the variation in stud temperatures * Equation applies only to uninsulated walls and gypsum pb assemblies. Not sure about other configurations * Uncertainties in the assumed linear relationship of deflection vs time. * Usage of average stud temperatures in lower LRs is questionable. * All the data measurements were manual and no auto data logging was used. So room for human error prevails. * The equations can’t predict c sections with different buckling modes but for local. No lateral-torsional effects. |
| Mehaffey1994 | * A model for predicting heat transfer through gypsum plasterboard assemblies. But with wooden studs. * 2D mathematical model was created. * All the thermophysical properties of gypsum pb was determined. * Type X and C pb were used. 12.7 (C) and 15.9 (X) mm thick * Chemically bound water significantly influences the fire performance. Water evaporates as steam during fire test. * Heat transfer through gypsum is significantly retarded till Pb calcinates. * 12.7 has 732 kg/m3 while 15.9 648 kg/m3 - mass density. * TGA analysis was carried out. 20 degree/min scanning rate * 17.5% mass loss at 100 and 160 degree. * Scanning rate influences mass loss. * Specific heat calculated by DSC. 2 & 20 degree C / min was the rate. * Use the image from this paper * Core of gypsum pb should not contain less than 65% of gypsum. * Enthalpy of pb at apparent specific heat vs time was proposed. * Dried sample will yield different results but for the undried ones as the temperature is delayed in undried samples, effect of convection from sample surface, amount of trapped vapour etc. But these effects were not considered in the study. * Type C experienced less shrinkage in comparison with type X * Plasterboard thickness varies with temperature due to paper layer burn and core thickness reduction due to calcination as vapor pores shrink at elevated temperatures. * Fissures and the effect of joint openings were not considered in this study. * Detailed investigation was carried out for wooden studs as well but out point of interest is on steel studs * Heat transfer within cavity was studied. * Cavity-grey space, heavily sooted, vapor and soot from boards and wooden studs. Air density 1.206 kg/m3 * Because of low thermal mass detailed investigation was not performed. * Convective heat transfer co-eff for model was 9 W/m2C-1 on ambient side. * All emissivity was kept at 0.9 for wooden studs, plasterboards and cavity. * View factor calculation was reduced by assuming pure radiation within the cavity where heat emitted from fire side cavity is absorbed on the ambient cavity. * “ Radiant energy leaving a solid surface is assumed to be first absorbed by the cavity gas and subsequently reemitted to other surfaces “. This reduces the view factor calculation. * Pyrolysis of wood considered, but not moisture and mass transfer. * 2D heat transfer through conduction governed by the PDE * MS-Fortran was used to solve 2D PDE for calculating the heat transfer. * Segment of the wall was only modelled. Only from stud half to the other half representing symmetry. * Assumptions in model- Heat transfer from furnace to incident surface by radiation only. * Infinite parallel palates approach was used and effective emissivity of 0.9 was employed. * Fire side convective heat transfer co-rff 25 W/m2C-1 * Comparison between exp and model showed the model is over predictive after 500 degree. The flat region in the time-temp curve could not be simulated as the moisture movement is not considered. * Model predictions high on fire side while low on the ambient side. * Zero transmission if heat through cavity gases was assumed. So model was conservative. * No structural modelling was carried out. |
| Gerlich 1995 | * Refer to thesis and rephrase if needed. |
| Gerlich1996 | * Analytical model to predict LSF walls in standard and real fire. * Unlipped C were used for the study. * Degradation of the plasterboard restraints at elevated temperatures were detailed and there effects on stud buckling were discussed. * C-sections are susceptible to local bucking at room temperatures and flexural torsional buckling at elevated temperatures. * AS 1538,3 BS 5950; and the AISI design manual were the general design standards for design of CFS sections. AISI manual was found to yield better predictions in comparison with others. Cumbersome but had design spreadsheets and predictions were precise. * Structural testing for yield strength and combined axial loading and bending was carried out to determine the ambient capacity of the steel framed walls. * Tensile and compressive stub column testing on individual studs were also carried out. * 75 x 32 x 1.15 mm and 100 x 50 x 1.0 mm stud C-sections were used for ambient capacity tests. * Both lined and unlined full frames were tested under ambient conditions. * Motive to study thermal behaviour under fire, P-delta effects due to thermally induced deflections. * Process of calcination and reduced plasterboard restraints under fire is explained in detail. * Enthalpy values were used in the model to avoid numerical instabilities due to sudden peaks in the specific heat curve. * Specific volumetric enthalpy graph. Copy from lit * Density of the Pb was not highly influenced by temperature, whereas specific heat, conductivity are. |