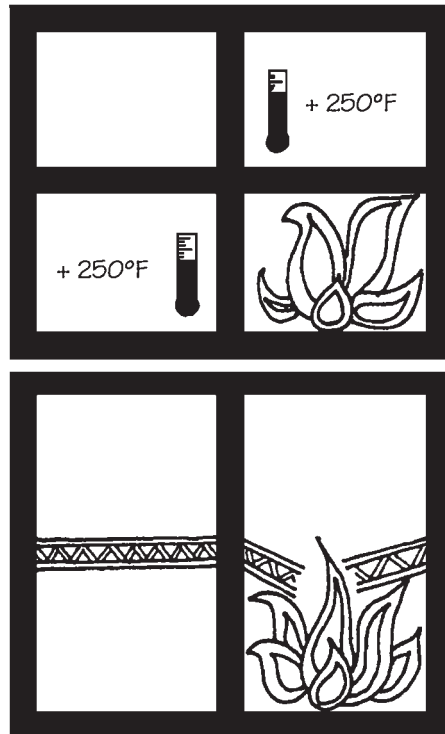


..... high strength alloy steel bars
 - - - - - cold drawn prestressing steel
 _____ ordinary structural steel

Steel loses yield strength rapidly as temperature increases. A stressed steel member will fail more quickly at elevated temperatures than an unstressed member. The higher the stress, the quicker the failure.

(Federal Emergency Management Agency graph from "Fire Safety in Buildings," NCARB Continuing Education Monograph.)



masonry and concrete fire ratings determined by elapsed time for 250 degree temperature rise on opposite side of wall or floor assembly

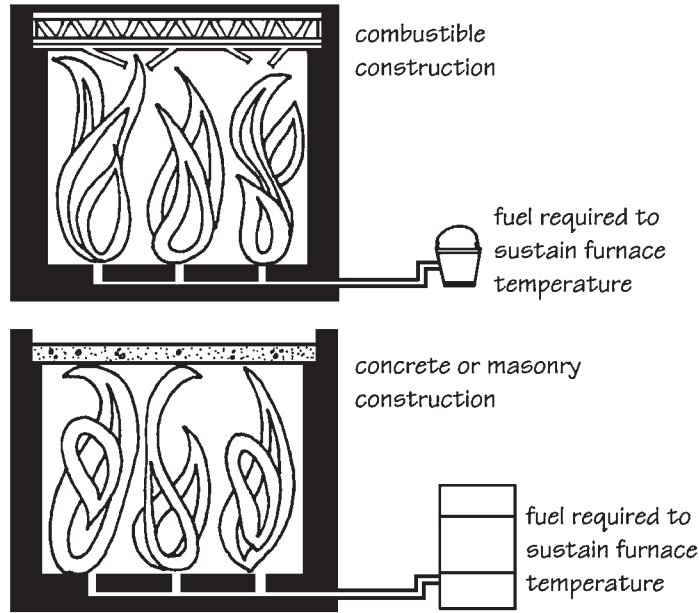
steel and wood frame construction fire ratings determined by elapsed time to structural collapse of wall or floor assembly

Figure 8-9 Structural collapse and 250°F temperature rise are not comparable criteria in determining fire endurance ratings. (From Portland Cement Association, Fire Protection Planning Reports.)

these variations in fuel consumption during the test would seem to give some indication of the relative fire endurance of the construction, they are not a recognized factor in assigning ratings.

In real building fires, heat and gas movements create positive pressures, especially in the immediate vicinity of the heat source. However, fire test standards do not specify whether the test furnace should be operated with negative or positive pressure. In the United States and Canada, almost all tests are conducted with unrealistic negative pressures, in order to prevent the escape of hazardous gases into the laboratory. In Europe, however, furnaces

COMBUSTIBLE MATERIALS
CONTRIBUTE FUEL TO THE
FIRE



NEGATIVE FURNACE
PRESSURE PRODUCES
UNREALISTIC FIRE RATINGS

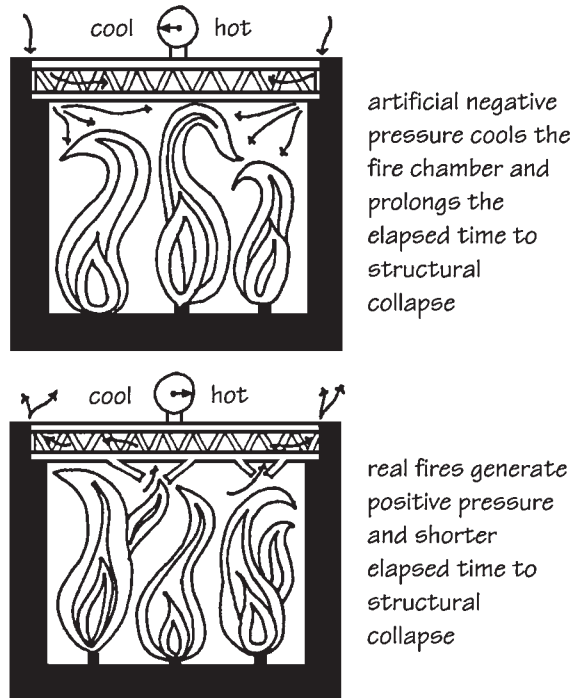


Figure 8-10 Fuel contribution and furnace pressure in U.S. fire tests. (From *Portland Cement Association, Fire Protection Planning Reports.*)

are required to operate with positive pressure and are fitted with safety devices which force emissions out an exhaust flue. Negative pressures tend to draw cool air into the furnace through cracks and gaps that typically exist in wood frame/gypsum board construction, thus extending the endurance time of the assembly beyond what it might be in an actual fire (see Fig. 8-10).