In this issue

Fire safety

Fire, which provides heat and light, serves many useful purposes as long as it is under control. However, when fire is unregulated or uncontrolled and, most importantly, unintentionally lit, it is often a source of danger. It can lead to catastrophes, resulting in avoidable loss of material and life. Unintended fires can arise in least expected environs due to various causes such as carelessly thrown cigarette butts, short-circuits in electrical wiring, storage of hazardous chemicals and other combustibles and even from certain industrial practices. Very often post-accident investigations point a finger at lack of safety practices and/or at human negligence. Huge fires in residential buildings, slums, theatres, hotels, discotheques, cinemas and other auditoria have resulted in loss of life and also economic loss. In addition, workplace fires and explosions kill hundreds and injure more than thousands of workers each year.

Protecting life and property from fires caused by shoddy construction or maintenance of buildings is one goal of Fire Safety Engineering. Fire safety codes aim at use of alternative methods and materials of construction which are at least as safe as the methods and materials specified in any particular fire code.

Safety refers to freedom from harm or risk. 'A totally safe building does not exist. The only totally safe highway is one with no vehicles. The only totally safe electrical wires are dead ones.' Managing the risk to an acceptable level is what we really mean when we refer to safety.

For the most part, fire-protection and life-safety requirements of building codes are *prescriptive* and relate to means of egress, fire separations, suppression and fire-alarm systems. A *performance-based* analysis of the building, its fire-safety features and its ability to protect occupants from the effects of fire is very useful.

Around the globe there is growing interest in performance-based fire-safety design as an alternative to prescriptive, code-compliant design in order to provide cost-effective fire-safety solutions. This interest is based on the development and verification of new scientific and engineering methodologies in the form of computer models.

Computer fire modelling has only recently evolved into a practical analysis tool. There are many fire models and quantitative calculation tools available that can 'predict sprinkler actuation, glass breakage, occupant egress and heat transfer to structural elements. The most general use of computer fire modelling is to predict the spread of combustion products from a fire, and therefore predict a fire's impact on a building's environment'. These models have been developed into two distinct formats: (a) field models and (b) zone models.

Field models are capable of predicting with great detail the fluctuation of temperature and the location and velocity of flows induced by fire within a compartment. On the other hand, zone models provide the ability to predict a hazard due to fire. They do provide an indication of the transport of combustion products through a number of rooms and are able to describe the temperature of gases produced by a fire, their location as a function of time, the concentration of toxic products within these expanding gas volumes, and the fire's overall impact within a building. These models can also be used to predict the hazardous environment caused by a fire.

It is stated that 'computer fire modelling is not appropriate for all buildings and all fire scenarios. Continued research and development concerning fire dynamics and the establishment of calculation methods to evaluate fire phenomena are still necessary for the future enhancement and utilization of computer fire models'. A. K. Gupta *et al.* (**page 18**) discuss many aspects of Fire Safety Engineering, briefly mentioned above. They deal in detail on the fire models and algorithms developed at the Central Building Research Institute at Roorkee. Three models, namely (a) CALFIRE, relevant for fires in domestic, commercial and small industrial buildings; (b) NEST, for sprinkler actuation time estimation and (c) SAFE-R, which provides an estimate for necessary time of evacuation in fire-emergencies, are discussed.

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Monsoon

Monsoon never ceases to amaze. In 1921, G. C. Simpson (*Q. J. R. Meteorol. Soc.*, **47**, 151–172) wrote: 'I believe very few educated people would have any difficulty in giving an answer to the question – What is the cause of the monsoon? They would refer to the high temperature over the land compared with that over the surrounding seas; would speak of ascending currents of air causing an indraft of sea-air towards the interior of the country. It is only when one points out that India is much hotter in May before the monsoon sets in than in July, when it is at its heights – or draws attention to the fact that the hottest part of India, the northwest, gets no rain at all during the monsoon – or even shows by statistics that the average temperature is much greater in the years of bad rains than in years of good rains, that they begin to doubt whether they do know the real cause of the monsoon.' In this issue J. Srinivasan (**page 73**) proposes a diagnostic equation that simulates amazingly well the seasonal variation of rainfall over tropical land masses, including India. The equation relates seasonal rainfall at a location to evaporation, the net energy available in the atmosphere, and the vertical stability of the atmosphere, all at the location. Of course, it is expected that vertical stability is determined by non-local effects. The interesting point is that by not invoking land–sea contrast anywhere in the formulation, Srinivasan hints at the possibility that monsoon could exist without land–sea contrast. If true, many a geography books would need corrections. Simpson would not be surprised.

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