Chapter 2

Literature Survey

1 C nstructi n sect r and the Indian ec n my

The construction sector is the second largest industry sector in India Forecasts for the market size of construction industry for the Twelfth Plan period indicate that that the aggregate output of the industry during the period 2012–13 to 2016–2017 is likely to be 5231 lakh crores increasing from 767 lakh crores in 2012–13 to 1359 lakh crores in 2016–17 As far as employment is concerned, 41 million workers were employed in 2011 Out of these, workers, 833 are considered "unskilled," 91% are skilled craftsmen, 256% are engineers, 274% are "technician, foremen, etc"; and 226% are clerical Ninety-five percent of enterprises employ fewer than 200 workers

Internati nal scenari : Review of industry data of USA also shows that construction is among the most dangerous occupations with inherited work risks such as work-related musculoskeletal disorders Work-related back injuries and illnesses are often caused by repeated exposures to activities such as lifting and carrying materials, sudden movements, whole body vibration (WBV), bending or twisting, repetitive and forceful hand activity etc

The number and rate of fatal and nonfatal injuries1 differ greatly among construction sectors In 2010, there were 352 fatal injuries among Specialty Trade Contractors accounting for 58% of all work-related fatal injuries among private wage-and-salary workers in construction In the same year, there were 113 deaths in Construction of Buildings

As per a “White Paper” published in 2009, on Construction Industry of India, various challenges for the global construction industry were identified, highlighting construction as one of the highest risks to the safety and health Typically, construction accounts for 20-30 percent of all occupational deaths and injuries and most likely illnesses, a level that is 3-4 times greater than its share of all employment Even today, workers who have spent their life-time

employed in construction without being killed on the job have suffered greatly from this employment:

- 85% have experienced one or more serious injuries;
- 100% have work-related musculoskeletal disorders;
- 70% have work-related hearing loss;
- 35% have work-related lung diseases

Considering the genuine need of enhancing the safety at construction industry, the current research is being undertaken aiming to focus on the role of engineering interventions for improving safety in construction…

Health and Safety Executive (2011) Information sheet no 16 gives information about the safe working practices for using Circular saw benches This information sheet is one of a series produced by HSE's manufacturing sector It gives practical guidance on safe working practices at circular saw benches When buying a new circular saw bench, it should be supplied with a declaration of conformity and have a CE Mark It should be designed and constructed to meet BS EN 1870–1:2007 + A1:2009 New saw blades should meet BS EN 847–1:2005 This information sheet contains notes on good practice which are not compulsory but which we may find helpful in considering what we need to do

Work-related health is about the impact work can have on people's health In the past, we've called it occupational health While work can be good for health, and health can be good for work, workers can become unwell or develop poor health from their work environment As per Work Safe, New Zealand, every week an estimated 15 people die from work-related diseases In fact, a worker is ten times more likely to die from a work-related disease than from a workplace accident Every year, tens of thousands of people develop serious health conditions because of the health risks associated with their work The burden on workers, their families and the wider economy from work-related ill-health far outweighs the burden from work-related injuries

As per Occupational Safety & Health Administration (OSHA) 1910213: Woodworking machinery requirements, each circular hand-fed ripsaw shall be

guarded by a hood which shall completely enclose that portion of the saw above the table and that portion of the saw above the material being cut The hood and mounting shall be arranged so that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut but it shall not offer any considerable resistance to insertion of material to saw or to passage of the material being sawed The hood shall be made of adequate strength to resist blows and strains incidental to reasonable operation, adjusting, and handling, and shall be so designed as to protect the operator from flying splinters and broken saw teeth It shall be made of material that is soft enough so that it will be unlikely to cause tooth breakage The hood shall be so mounted as to insure that its operation will be positive, reliable, and in true alignment with the saw; and the mounting shall be adequate in strength to resist any reasonable side thrust or other force tending to throw it out of line The frames and all exposed, noncurrent-carrying metal parts of portable electric woodworking machinery operated at more than 90 volts to ground shall be grounded and other portable motors driving electric tools which are held in the hand while being operated shall be grounded if they operate at more than 90 volts to ground The ground shall be provided through use of a separate ground wire and polarized plug and receptacle For all circular saws where conditions are such that there is a possibility of contact with the portion of the saw either beneath or behind the table, that portion of the saw shall be covered with an exhaust hood, or, if no exhaust system is required, with a guard that shall be so arranged as to prevent accidental contact with the saw

The objective of ILO Safety and Health in Construction – Code of Practice 1992 is to provide practical guidance on a legal, administrative, technical and educational framework for safety and health in the construction with a view to: preventing accidents and diseases and harmful effects on the health of workers arising from employment in construction; ensuring appropriate design and implementation of construction projects; providing means of analysing from the point of view of safety, health and working conditions, construction processes, activities, technologies and operations, and of taking appropriate measures of planning, control and enforcement

Aryassov et al, (2008) conducted a study on the forced vibration of ladder frames under the action of repeated interrupted loading This problem has not been yet considered in sufficient detail and width in technical and scientific literature Often vibration of ladder frames under the action of instant impulses or periodical harmonic force had been considered To solve a problem, a discrete scheme of concentrated masses with multi-degrees of freedom was proposed More complex calculation schemes can lead to significant errors in the calculation; therefore, simplified discrete schemes based on experimental tests were used

Research done by Hongwei et al, (2010) provided a brief summary of the current strategic goals, activities, and impacts of the NIOSH (National Institute for Occupational Safety and Health) occupational injury research program Three primary drivers (injury database, stakeholder input, and staff capacity) were used to define NIOSH research focuses to maximize relevance and impact of the NIOSH injury-prevention-research program Injury data, strategic goals, program activities, and research impacts were presented with a focus on prevention of four leading causes of workplace injury and death in the US: motor vehicle incidents, falls, workplace violence, and machine and industrial vehicle incidents This paper showcased selected priority goals, activities, and impacts of the NIOSH injury prevention program The NIOSH contribution to the overall decrease in fatalities and injuries is reinforced by decreases in specific goal areas There were also many intermediate outcomes that are on a direct path to preventing injuries, such as new safety regulations and standards, safer technology and products, and improved worker safety training The outcomes serve as an excellent foundation to stimulate further research and worldwide partnership to address global workplace injury problems

Gas Cylinder Rules, 2004 Rule 18 - Handling and use are as follows (1) Cylinders shall be adequately supported during handling (2) Conveyors, trolleys and cradles of adequate strength shall, as far as possible, be used when moving the cylinders (3) The cylinders shall be handled carefully and not be allowed to fall upon one another or otherwise subjected to any undue shock (4) Sliding, dropping or playing with cylinders is prohibited (5) Liquefied

petroleum gas cylinders and cylinders containing liquefiable gases shall always be kept in an upright position and shall be so placed that they cannot be knocked over (6) Cylinders used in horizontal position shall be so secured that they cannot roll (7) Open flames, lights, mobile phones, lighting of fires, welding and smoking shall be prohibited in close proximity to any cylinder containing flammable gases except those while in use for welding, cutting or heating (8) Working places shall not be classified as storage places for the purpose of licensing

Welding is an important occupational activity because from 02 to 20% of the working population in industrialized countries has been reported to be engaged in welding According to National Occupational Health and Safety Commission, Australia, many cases of acute poisoning due to excess exposure or severe short term exposure to one or more welding fume or gas have been documented However, other than lung involvement, that is, mainly respiratory irritation and related effects, few chronic, long term effects have been directly attributed to welding fumes and gases Due to the presence of chromium, nickel and aluminium, there is concern about the effects of chronic exposure on special groups such as welders of stainless steel and aluminium

Although there are a vast number of processes, it has been estimated that shielded metal arc welding (SMAW, also known as manual metal arc welding, MMAW) and gas metal arc welding (GMAW or metal inert gas welding) applied to mild steel (MS), stainless steel (SS) and aluminium account for combinations practised by 70% of welders (Liss, 1996) Welders continue to suffer both acute and chronic health problems that appear to be associated with work With respect to acute effects, as found prior to 1985, acute intoxications continue to be observed, consisting mostly of case reports of lead intoxication, and upper and lower respiratory tract inhalation (bronchitis, pneumonitis) which may be process- or metal-dependent (cadmium, decomposed chlorinated hydrocarbons, coatings on metal) Severe cases of pneumonitis from inhalation of welding fume, such as that due to cadmium, may cause permanent sequelae or fatalities The reports of increased mortality among welders due to pneumonia documented in the early time period have also been confirmed

since 1985, and prompted one group of investigators (Coggon et al, 1994) to conclude that "there are strong grounds for the classification of lobar pneumonia as an occupational disease in welders" Metal fume fever (MFF) is an acute febrile illness of short duration due to inhalation of freshly generated fume that affects important proportions of welders (up to 30% in some estimates) and results from the inhalation of freshly formed oxides, most commonly that of zinc The cause is not known but the syndrome resolves leaving no apparent chronic disorder A new finding which was reported by Blanc et al (1993) suggested that various cytokines released from pulmonary cells may be involved in the pathogenesis of MFF

Designing for safety is very important As construction is done as per the design, designers are to be fully aware of the importance of design in relation to health and safety and how, by minimal changes in design, the overall life cost of a project can be reduced One of the essential things is that they need to be competent to address such issues as health and safety and those issues arising from their design, hence the reason for good training