



## A study on Health status assessment of road construction project workers in and around Bengaluru

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### **ABSTRACT**

*Road construction workers include asphalt workers, ground preparation workers, and heavy vehicle operators who are directly or indirectly exposed to occupational hazards. The road construction sector has the largest number of unorganized workers in India. They are the backbone of our nation's infrastructure building in all the aspects. Both men and women are integral part of this community, but women join as unskilled workers and remain to be unskilled till their working life span. One or other health issues due to hazards working environments such as dust, noise, heat and cold, vibration, and chemicals. Noise induced hearing loss, respiratory diseases, musculoskeletal problems, skin and eye irritation are the prevalent health problems found among these workers, thus this study intended to focus on health problems among road construction workers.*

*The descriptive nature of the study included 474 road construction workers. Snow ball sampling Technique was adopted for the selection of respondent and data collected through interview method. Health assessment studies provide evidence based link between causative agents and health outcomes. Road construction activities present variable occupational health hazards including exposure to hazardous substances including silica dust, asphalt, organic solvents, and agents, such as noise, vibration, and heat, urinary tract infection, musculoskeletal problems, backache, skin problems and respiratory related problems are affecting workers' health. Pointed are the major health issues. Excessive exposure to these substances and agents may result in illness, injury, permanent disability, or even death. Fumes and vapors generated during the application of hot asphalt to the surface cause skin irritation, rashes, burns, and respiratory problems*

**Keywords:** *Road construction workers, Occupation health and Safety*

### **Introduction:**

After the United States of America, India is the second largest road network in the world, at about more than 4 million kilometres. More than 50% of Indian roads are paved (about more than 2 million kilometres). Government of India, under the National Highways Development Project and various private builders are implementing multiple projects for construction or up gradation of paved roads. The process of tarring the roads in India consists of various steps with potential exposure to allergens, pollutants, and carcinogens. It begins with laying down large stones, followed by small stones, then pouring molten bitumen (asphalt) over it and finally dusting it with stone dust.

Brushing of dust in preparation of the surface, crushing of stones, and mixing of cement for adjacent concrete work expose the workers to air borne particles. Handling of concrete mixture and molten bitumen, coupled with



ignorance of protective clothing causes prolonged skin contact with these particles. Asphalt fumes are mixtures of various organic compounds including polycyclic aromatic compounds. Chronic exposure to these could possibly lead to occupational health or dermatological adverse health effects. There is also a risk posed by exhaust from the passing traffic

Studies show that bitumen fumes cause respiratory symptoms and increased mortality among road construction workers. There is sparse evidence for the adverse pulmonary effects suffered by road construction workers in India, although there are studies on drivers, and other road construction workers. This study was aimed at assessing the occupational health issues

Asphalt mixing involves the mixing of bitumen with mineral aggregates through heating. The mixing and its application process exert high risk of fatal and nonfatal injury and disease. Construction workers operating heavy machinery during roads operations are also exposed to fumes from diesel exhaust, vibration and high levels of noise. Most of the heavy vehicles are powered by diesel. Exposure to diesel fumes can cause eye and nasal irritation, asthma and chronic bronchitis. Heavy machinery operations are associated with high levels of whole body vibrations. Noise from heavy equipment is another occupational problem to which most of the road construction workers are exposed. Occupational noise leads to accidents specific to road construction activities

The present study deals with the identification of potential health hazards and risks to highway construction workers associated with various construction activities and assessment of the workers' health status. The study will also provide a base for mitigation measure design to be considered during planning phase for the minimization of health risk to workers for future highway construction and reconstruction projects.

### **Objectives**

The present study was designed to;

Identify potential hazards and risks to health of highway construction workers using hazard identification checklist.

Collect data regarding socio-demographic indicators, health determinants, and health status of construction workers through interviews using questionnaire.

Measure health surveillance parameters including PEFR and audiometric screening of workers

### **Hazard Identification**

In order to assess health hazards at the road construction, a hazard identification checklist was developed following the international labor organization (ILO) guideline. The checklist focused on the identification of factors and agents with the potential to cause health damage to workers including physical hazards (exposure to noise, vibration, and dust); agronomical hazards (poor work postures, use of excessive force, repetitive movements, and handling of heavy objects); chemical hazards (exposure to toxic and irritating chemicals); and mechanical hazards (potential injuries due to falls, slips or trips, and confined spaces).

### **Health Assessment**

In order to assess the health status of the workers, a questionnaire was designed. The questionnaire comprised three sections including socioeconomic information (age, education, monthly income, and family size), health determinants assessment (access to clean drinking water, safe food, first aid services, and provision of PPEs),



and health status assessment (lung performance, hearing performance, prevalence of musculoskeletal disorders, and other health problems).

#### **Measurement of Peak Expiratory Flow Rate**

Lung performance of 300 workers was measured using Mini-Bell Peak Flow Meter (Spain). Peak flow meter works on the simple principle of airflow measurement in the lungs. Reading on the peak flow meter scale indicates how open the lung's airways are. Average PEF values of construction workers were compared with normal values, i.e., 300-600 l/min.

#### **Audiometric Screening**

Hearing screening of all subjects was conducted using Ambco Field Audiometer 1500 (USA) to calculate the person's hearing efficiency. Test was performed in sound proof containers with background noise level of <20 dB. Audiometric test was performed for both the ears of the subject by setting frequencies of 500, 1000, 2000, and 4000 Hz. Hearing level dial on the audiometer was set at 5 dB. Results were compared with commonly used international classification system of hearing degrees provided by American Speech-Language-Hearing Association

#### **Data Interpretation and Analysis**

Data collected through questionnaire and measurement of various parameters were computed and tabulated. Data analysis was performed using Microsoft excel and SPSS statistical package. Quantitative variables are expressed as mean, standard deviation, standard error of mean, and qualitative variables are described as percentage values after calculations based on various responses. The statistical differences in mean values according to job type for different parameters were tested using Student's t-test. P value of <0.05 was considered statistically significant to investigate the relationship between the job types of workers involved in various construction activities with their lung and hearing performance

#### **Results and Discussion**

##### **Hazard Identification**

Survey using hazard identification checklist revealed concerning situations of highway rehabilitation work sites with reference to occupational settings. Physical health hazards observed during the survey of various sites were noise, vibration, and heat. Operations of mechanical excavators and bulldozers were found to produce high levels of noise. No control measures were observed at the sites to reduce noise exposure to workers.

Vibration was a major problem, and workers were found to be exposed to vibration hazards while working, especially when driving heavy vehicles. Another common physical health hazard found in these settings was the heat from the asphalt preparation, which is responsible for severe heat stress. The workers were found to be involved in preparing hot mixture of asphalt at temperatures 150-190°C, resultantly causing the generation of hot spots. This poses a potential risk of health effects either directly or indirectly that are likely to be aggravated with changing weather conditions. Direct and continuous exposure to high temperature can lead to disturbance in the temperature regulation mechanism in the human body. This can cause unconsciousness, hypothermia, and heat stroke.

Workers dealing with asphalt were also found to be exposed to chemical hazards. The equipment used for the preparation of hot asphalt was in poor conditions and workers were directly exposed to asphalt fumes. Hot



asphalt is dangerous when it comes in contact with the skin and can lead to severe burns. Other hazardous chemicals found at the worksites were silica dust, gasoline, and diesel exhaust.

Numbers of ergonomically hazards were observed during the survey including poor work postures, handling of heavy hand-held tools, use of excessive work force, and repetitive movements. It was observed that ground preparation workers were exposed to these hazards in the daily work routine. These ergonomically hazards were found to be responsible for musculoskeletal problems and physical fatigue among the workers. Risk of injuries from passing traffic and other mechanical hazards were common safety issue at sites. Heaps of construction wastes evidently blocking the passage way for workers were prevalent, thus presenting threats of slips, trips, and personal falls.

### Health Determinant Assessment

Analysis of data collected for health determinants was based on opinions of the respondents for various questions regarding the presence of hazards affecting their work efficiency and provision of public services at workplace. Table 1 & 2 shows the opinions of the respondents regarding workplace hazards affecting their ability to work. These workers were also asked about services provided by their employers at the workplace; 53% of the workers voiced their concerns that they had no access to safe drinking water at the workplace, 48% complained of access to safe food for eating during working hours, and 82% were not satisfied with the first-aid facilities and provision of personal protective equipment by the employer

**Table-1**

Opinion of respondents about workplace hazards Affecting ability of work

Target Group	Noise		Vibration		Extreme Temperature		Dust		Chemicals	
	n	%	n	%	n	%	n	%	n	%
Ground Preparation Workers	19	25	10	13	24	32	45	60	9	12
Asphalt Workers	16	21	2	3	36	48	18	24	55	73
Heavy Vehicle Drivers	62	82	27	36	16	21	12	16	16	21
Control Group	12	16	0	0	10	13	4	5	9	12

Table-2

Target Group	Musculoskeletal Problems									
	Back pain		Difficulty in moving arms		Difficulty in bending knees		Difficulty in moving head		Fatigue	
	n	%	n	%	n	%	n	%	n	%
Ground Preparation Workers	38	51	19	25	30	40	15	20	46	61



Target Group	Musculoskeletal Problems									
	Back pain		Difficulty in moving arms		Difficulty in bending knees		Difficulty in moving head		Fatigue	
	n	%	n	%	n	%	n	%	n	%
Asphalt Workers	10	13	5	7	12	16	8	11	33	44
Heavy Vehicle Drivers	34	45	18	24	25	33	19	25	41	55
Control Group	8	11	3	4	5	7	3	4	20	27

### Conclusion

Data collected with reference to the prevalence of various health problems among highway construction workers were directly related to the nature of the job performed by the workers. Results revealed that cough, asthma, and skin rashes were major health problems of asphalt workers due to continuous exposure to chemical fumes. Ground preparation workers mostly complained of back pain, leg cramps, and cough. Lung diseases were found to be more prevalent in asphalt and ground preparation workers. Highest rate of hearing problem due to heavy noise was found among heavy vehicle drivers. Musculoskeletal problems were prevalent among ground preparation workers and heavy vehicle drivers as a result of awkward posture and repetitive muscular activity, whereas fatigue was the common complaint by all the workers under study. The socioeconomic status such as low monthly income, and education level, as well as inadequate health determinants such as inadequate access to clean drinking water and safe food and unavailability of first aid are the additional factors causing deteriorated health conditions among workers. Noncompliance of ILO guidelines for working hours, non-use of PPE, and attitudes of contractors towards workers are also important factors that need to be addressed. The findings of the present study are of significance not only in the context of occupational health and safety studies for academic and research reasons but also are important with reference to the need for health policy planning of developmental projects during construction phase

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