

**INDUSTRIAL HEALTH, HYGIENE AND SAFETY CONDITIONS IN LOCAL
PRIVATE MANUFACTURING INDUSTRIES IN KHULNA CITY:
AN EXPLORATORY STUDY**

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Abstract: In our country, the factory act, 1965 has prescribed provisions to be complied with by the factory owners regarding health, hygiene and safety of the workers. The study attempt to explore information regarding the compliance of these provisions by the local private local manufacturing industries in Khulna City. The authors also attempt to know the workers' satisfaction regarding the prevailing health and safety conditions in their industries and their state of awareness regarding the factory act, 1965 and health, hygiene and safety provisions of the factory act.

Keywords: Factory act; Industrial health; Hygiene; Safety; Private manufacturers

Introduction

Man and material are two distinct types of elements in any organization. Material elements include raw materials, machines, furniture, building, finance, etc. In spite of contemporary computerization and ever-increasing automation technology, human input remains the most important element in every organization. Because, without the touch of human hands, all other elements remain standstill.

Human work behaviour is influenced by situational variables, these situational variables are commonly called working conditions. There are actually three groups of working conditions: physical working conditions (illumination, noise, atmospheric conditions, etc.), working conditions relating to time (hours of work, rest pauses, etc.) and working conditions relating to the social situation within which the individual works (Tiffin and McCormick, 1968).

Before industrial revolution, people used to work in home and small shops. Industrial Revolution changed this situation. Factory replaced the home production and small shops. The working conditions were severely unpleasant. The employees were being used as a commodity to be bought and sold. The laissez-faire political philosophy was prevailing at that time and Government took little actions to protect the workers. Workers formed trade unions to protect themselves and trade unions spread from factory to factory (Ghosh, 1993). By the late 1800, a few employers created the post of welfare secretary. These welfare secretaries were engaged to improve working conditions and they were also engaged to prevent workers from forming unions (Werther and Davis, 1993). At that time of working conditions when the workers were being considered little more than beast of burden, Robert Owen (1771-1858) a Scottish manufacturer, built model worker-villages by the side

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of his cotton mills. He also provided decent health and sanitation facilities and established schools for children and workers. Since 1910's there had been a growing flow of several protective labour laws regarding wages, safety, hygiene conditions, social security and compensation (Haque, 1981). In British India, the factory act was formed in 1888 for the betterment and safety of the workers. This act was amended in 1891, 1911, 1922 and 1934. Now, the factory act, 1965 has been formed according to the factory act, 1934. Although this act was amended in 1972 but it is still known as the factory act, 1965. This act prescribes provisions to be complied with in case of health, hygiene, safety and welfare of the workers, working hours of adults, leave and holidays with wages etc. (Khan and Alam, 1990). The law prescribes the minimum provisions to be complied with and a progressive employer must go further (Pylee and George, 1995).

Various studies conducted before and after independence (Husain, 1956; Husain and Farouk, 1963; Khalily, 1980; Ahmed, 1989; Ali, 1995.) revealed that factory owners hardly complied with the rules and regulations regarding health, hygiene and safety provisions laid down in the factory act. Among these studies, the studies, which had been conducted before independence, did not provide information regarding the compliance of the provisions laid down in the factory act by the employer's after independence. Among other studies, Khalily's (1980) study included both private and public sectors, Ahamed's (1989) study focused on the working conditions in the industries of Dhaka and Ali's (1995) study focused on the health, hygiene and safety measures in Garments industry of Bangladesh.

Aim of the Study

1. To examine critically the compliance of provisions regarding health, hygiene and safety conditions by the local private manufacturing industries in Khulna City.
2. To know about the workers satisfaction regarding the existing health, hygiene and safety conditions in their factories.
3. To bring to light the awareness of the workers regarding the existence of the factory act, 1965 and health, hygiene and safety provisions laid down in the factory act.

Materials and Methods

The choice of the local private manufacturing industries is based on the fact that local private sector has been called upon to play a significant role in the economy of our country. Besides, among the various branches of private sector, trade and commerce sector employ mostly white-collar employees whereas manufacturing sector employs white collar as well as blue-collar workers. The Khulna City is taken for the study because Khulna City is an industrial city and no separate study has been undertaken on the industrial health, hygiene and safety conditions of the industrial workers of the City. It should be noted here that a few garment factories used to work in Khulna City but now none of these factories exist anymore. That is why this study did not include any garment factory.

1. **Sample Size** (Selection of industries and factories): five different types of industries were selected randomly from Khulna City for the study purpose and one factory was selected randomly from each of this industry i.e. total five factories were selected randomly.
2. **Sample Size** (Selection of workers): Ten workers were selected randomly from each of these five factories and in total fifty workers were interviewed for the study purpose.
3. **Interview of the factory managers:** Factory Manager of each of these five factories were interviewed regarding the compliance of health, hygiene and safety provisions in their factories i.e. five factory managers were interviewed for the study purpose.

4. **Method of data collection:** Personal observations and interview techniques were used to collect relevant data and information for the study purpose. Two sets of questionnaire were prepared in this regard separately for the factory managers and workers. In order to collect information about the workers' satisfaction regarding the health and safety provisions in their factories, Likert's five-point scale was used.
5. **Analysis of data:** All the data were tabulated and the results were analyzed using tools such as percentages, averages etc.

Results and Discussion

Khan (1992) described the various provisions to be complied with regarding health, hygiene and safety of the workers. Through observation, interview of the Government and other controlling agencies, concerned authority and workers the study found the following information regarding the requirements and compliance of different provisions on health, hygiene and safety of the workers laid down in the factory act, 1965.

Requirements and compliance of provisions regarding health and hygiene of the workers laid down in the factory act, 1965:

Cleanliness: The factory act, 1965 (section12) stipulates that each factory shall be kept clean from liquid waste materials arising from any drain privy or other nuisance and in particular it must –

1. Remove the accumulation of dirt and refuse from the floors and benches of workrooms and from staircases and passages and dispose of in a suitable manner;
2. Clean the floor of every work-room with disinfectant where necessary or by some other effective method at least once in a week;
3. Have effective means of drainage if the floor is liable to become wet due to manufacturing process.

Besides the above-mentioned provisions, the factory act also stipulates that all internal walls and partitions, all ceilings or roofs and tops of passages and staircases must –

1. Be repainted or revarnished at least once in each five years (where they are painted or revarnished);
2. Be cleaned at least once in each fourteenth months by such methods which may be prescribed (where they are painted or varnished and have smooth imperious surface)
3. Be white-washed or colour-washed and it should be carried out at least once in each fourteen months (in any other case)

Wastes and Effluents: The factory act, 1965(section13) stipulates that each factory must have effective arrangements for the disposal of wastes and effluents due to manufacturing process.

Ventilation and Temperature: The factory act, 1965(section14) provides provisions regarding ventilation and temperature. It stipulates that there must be adequate ventilation by the circulation of fresh air in each workroom and the temperature of each workroom must be such which will create reasonable conditions of comfort and prevent injury to health. The air requirement for industries depends upon the threshold of space usage. Although, it has been suggested that 8-liter of air per second per person of outdoor air is an acceptable range; it has been strongly recommended that the air supply should never be less than 15cubic feet per minute per person (Ahmed, 1992). The required interior temperature of an industry may vary according to its type of production but in general CIBS recommended internal environment temperature can provide us with an acceptable range (Fig. 1).

Dust and Fumes: Section 15of the factory act, 1965 provides provisions regarding dust and fumes. It stipulates that if a factory generates dust or fume or other impurity due to manufacturing process to

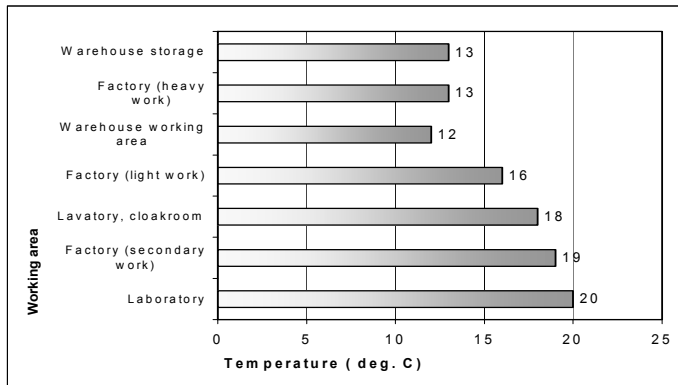


Fig. 1. CIBS recommended internal environment temperature (Code for interior Lighting)
Source: Martini, D., (Ed.), 1984.

such an extent and such a nature for which workers employed therein may be injured, effective measure should be taken to prevent its accumulation in any work-room and its inhalation by workers. In this respect air velocity is another aspect to be considered to remove Dust and Fumes from the interior air volume. The air velocity should remain between 0.15 and 0.5 m/sec. under normal condition (Ahmed, 1992).

Artificial Humidification: Section 16 of the factory act, 1965 provides provisions to be taken by those factories in which humidity of the air is to be artificially increased in relation to the temperature changes (Table 1)

Table 1. Relation between desirable temperature and relative humidity for industries.

Type of Industry	Desirable temp. range °C	Desirable Relative Humidity %
Textile carding	24-27	50
(cotton) spinning	16-27	60-70
weaving	20-24	70-80
Tobacco	21-24	55-65
Paper	16-27	25-50

Source: 'A.S.H.V.E. guide', Ahmed, 1992.

Overcrowding: Section 17 provides with the provision to be maintained regarding over-crowding. It stipulates that none of the workrooms of any factory must be overcrowded to such an extent so that it may be injurious to the health of the workers working therein. The area per worker ratio is one of the indications of degree of crowding in a space. In about 20% of the industries in Bangladesh each worker has more than 10m² of floor area; whereas 65% of industries are in overcrowding condition with only 5m² floor area per worker (Fig. 2).

Lighting: Section 18 of the factory act, 1965 stipulates that sufficient and suitable lighting must be (natural or artificial, or both) provided in each place of a factory where workers are working or passing. Day lighting and artificial lighting serve different functions but they can be compatible and complementary to each other (Chiara, 1990).

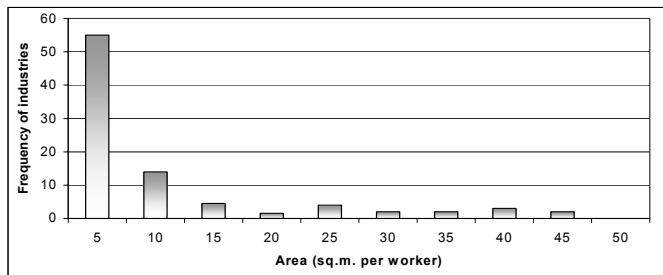


Fig. 2. Crowding conditions in the industries of Bangladesh. (Source: Ahmed, 1992)

The relation to the horizontal illumination intensity, which prevails outside at same time, is a measure of proportion of total light, which is available in the indoor space (Fig. 3).

$$\text{Daylight factor} = \frac{\text{illumination intensity at point of measurement}}{\text{illumination intensity in the open}}$$

According to Henn (1965) the daylight factor should not be less than 1% in a room of an Industry; for very fine work the required factor may rise up to 10%.

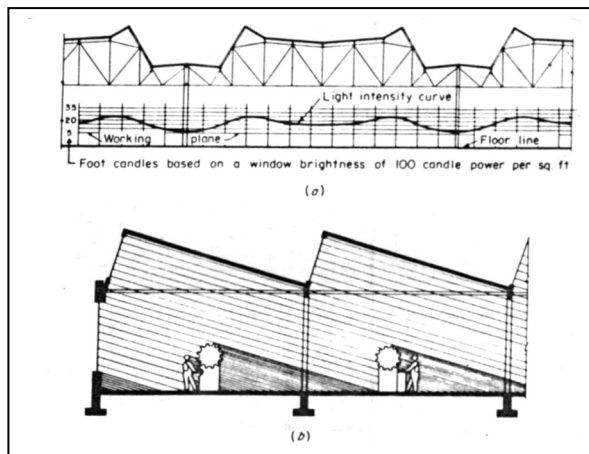


Fig.3. Good natural lighting relates to both window and roof design. a. Window in a monitor roof provides good uniformity and intensity. b. The windows in a saw tooth roof cast shadows that block working area. Source: Chiara and Callender, 1990.

Drinking Water: Section 19 provides provision to be taken regarding drinking water. It stipulates that a suitable point (conveniently suited for all workers) of a sufficient supply of wholesome drinking water must be provided and maintained and in each factory where more than 250 workers are working, there must be provision for cooling the water by effective means during summer and distribution of that water among workers.

Latrines and Urinals: Section 20 of the factory act, 1965 provides measures to be taken regarding latrines and urinals. It stipulates that in each factory there must be adequate number of separate urinals and latrines for male and female workers. It also stipulates that these urinals and latrines must be maintained in a clean and sanitary condition at all times with suitable detergents or disinfectants or with both (Table 2).

Table 2. Provisions to be provided for workers toilet according to the factories rule 1979.

PROVISIONS IN WORKERS TOILET	NO. OF WORKERS
W/C (Latrine)	1 for every 25 workers-up to 100 workers, Then, 1 for every 50 workers
Washing basin and shower taps	For workers involved with injurious and noxious substances
	For all other workers
	1 for every 15 workers
	1 for every 20 workers
	2 for every 21-35 workers
	3 for every 36-50 workers
	4 for every 51-160 workers
	5 for every 161-200 workers
	More than 200 but up to 500 workers
	5 plus 1 for every 50 workers
	More than 500
	11 plus 1 for every 100 workers
Urinals	1 for every 50 workers, up to first 100 workers
	Then, 1 for every 100 workers

Spittoons: Section 21 of the factory act provides measures to be taken regarding spittoons. It stipulates that a sufficient number of spittoons must be provided at convenient places in every factory. It also stipulates the authority must monitor the usage of spittoons and put notice that it is punishable to spit within the factory premises other than in the spittoons.

In light of the above discussions the compliance of legal requirements regarding health by five sampled factories will be evident from the following table (Table 3).

Table 3. Compliance of provisions regarding health and hygiene by 5 sampled factories.

SECTIONS	REQUIREMENTS	OBSERVATIONS		COMMENT
		Measures taken	Measures not taken	
Section	Compliance of legal provisions regarding health	Measures taken	Measures not taken	Provisions especially for cleanliness, temperature control, ventilation and disinfecting are highly neglected.
Section 13	Disposal of waste and effluents.	5	--	
Section 19	Sufficient supply of drinking water	4	1	
	Provision of cooling the water.	2	3	
Section20	Adequate number of separate urinals and latrines	4	1	
	Clean these urinals and latrines regularly	2	3	
Section17	Adequate space for the workers in the workplace	3	2	
Section 18	Sufficient and suitable lighting for workers	3	2	
Section 14	Adequate ventilation by the circulation of fresh air.	3	2	
	Optimum temperature..	--	5	
Section 12	Remove the accumulation of dirt and refuge	3	2	
	Wash the floor of every workroom using disinfectant.	2	3	
	Effective means of drainage	3	1	
	Whitewash or colour washes at least once in each fourteenth month.	3	2	
Section 15	Ventilation for the dust or fume	2	3	
Section 21	Sufficient number of spittoons and maintenance of these spittoons in a clean and hygiene conditions.	1	4	

Requirements and compliance of provisions regarding safety of the workers laid down in the factory act, 1965:

Precautions in case of fire: Section 22 of the factory act, 1965 provides precautionary measures to be taken in case of fire. Fire Grading Committee (UK) recommends two and half minutes as an evacuation time to a place of safety. Moreover, properly signed exits should be provided on the central axis of the factory layout plan. Maximum travel distance for a corridor should be less than 30m. and in unconfined space 45m. Staircases should not be more than 61m. apart. Maximum number of riser should be 16. (Ahmed, 1992).

Fencing of machinery: Section 23 provides measures to be taken in case of fencing of machinery. It stipulates that each factory must fence the each moving part of a prime mover and each fly wheel connected to a prime mover, the head-race and tail-race of each water wheel and water turbine, each part of transmission machinery, each dangerous part of any machinery.

Work on or near machinery in motion: Section 24 of the factory act stipulates that if it is necessary to examine any part of machinery when the machinery is in motion. For such examination if it is necessary to carry out any mounting or shipping of belts, lubrication or other adjusting operation when the machinery is in motion, it must not allow any person other than specially trained adult male worker wearing tight-fitting dress.

Employment of young persons on dangerous machines: Section 25 provides measures to be taken in case of employment of young persons on dangerous machines. It stipulates that the factory can allow any young person at machine only when it gives adequate instruction to that person regarding the dangerous arising in connection with the machine and the precautions to be needed and that young person has been trained in work at the machine or he works under adequate supervision by a person who has thorough knowledge and experience of the machine.

Striking gear and devices for cutting off power: Section 26 of the factory act stipulates that in each factory arrangement of emergency cutting of power from running machinery must be provided and maintained in each workroom.

Self-acting machines: Section 27 of the factory act stipulates that passageways must be outside the 18n inches of the fixed installation, which is not the part of the basic self-acting machine.

Casing of new machinery: Section 28 of the factory act provides measure to be taken in case of casing of new machinery and all 5 factories complied with this provision.

Prohibition of employment of women and children near cotton -openers: Section 29 provides measures to be taken in case of employment of women and children near cotton-openers. This section applies to none of these factories.

Cranes and other lifting machinery: Section 30 provides measures to be taken in case of cranes and other lifting machinery. Like section 29 this section also applies to none of these factories because none of them have cranes and other lifting machinery.

Hoists and lift: Section 31 provides measures to be taken in case of hoists and lifts. It stipulates that each hoist and lift of the factory must be of good mechanical construction, sound material and adequate strength. It also stipulates that the maximum safe working load must be plainly marked in each hoist or lift and no more load than such load must be carried thereon.

Revolving machinery: Section 32 provides measures to be taken in case of revolving machinery. It stipulates that each factory must affix or place a written notice to or near each revolving machine stating their speed, diameter, etc and there must be measure to control their speed.

Pressure plant: Section 33 of the act provides measures to be taken in case of pressure plant. It stipulates that if any factory uses pressure plant then effective measures must be there to control its limit.

Floors, stairs and means of access: Section 34 provides measures to be taken in case of floors, stairs and means of access (Fig. 4). It stipulates that in each factory floors stairs, and means of access must be well built and maintained satisfactorily. The floor is the platform for man, machine and materials; it receives spillage of oils, chemicals etc. and is the obvious surface for dust to collect on. Properties of a good floor finish should include durability, protection of the building structure from traffic and effluents, comfort and safety of the users and good appearance.

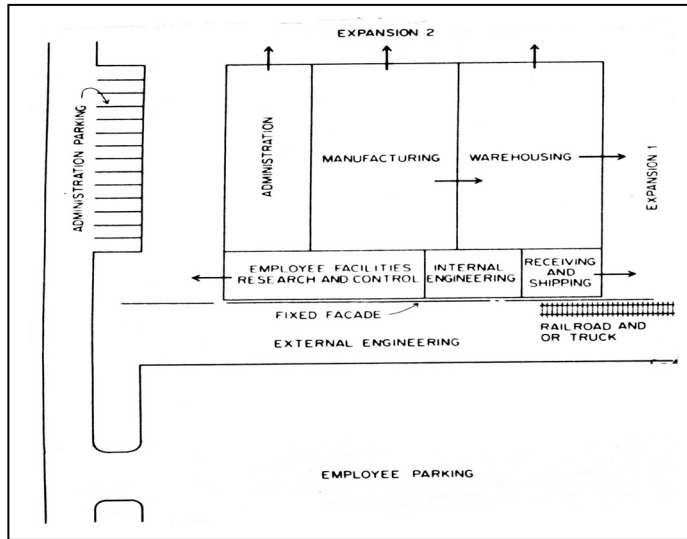


Fig. 4. A typical Architectural layout for an Ideal manufacturing industry for assuring proper accessibility to every function and flexibility of extensions.
Source: Chiara and Callender, 1990.

Pits, pumps, opening in floors etc: Section 35 stipulates that pits, pumps, opening in the grounds or in a floor, etc. which may be a source of danger shall be either securely covered or securely fenced.

Excessive weights: Section 36 stipulates that any factory must not employ any person to lift, carry or move excessive load, which may cause injury to him.

Protection of eyes: Section 37 stipulates that in any factory if the workers need to be exposed to such thing that may cause harm to their eyes in that case the workers must be supplied with the eye protective devices.

Precautions against dangerous fumes: Section 41 stipulates that precautions must be taken against dangerous fumes.

Explosive or inflammable dust, gas, etc: Section 42 stipulates that practicable measures must be taken in case of explosive or inflammable dust, gas, etc produced due to manufacturing process.

In light of the above discussion regarding the compliance of provisions about safety will be evident from the following table (Table 4).

Table 4. Compliance of provisions regarding safety.

SECTIONS	REQUIREMENTS	OBSERVATIONS		COMMENTS
Section	Compliance of provisions regarding safety	Measurers taken	Measures not taken	Preventive measures like: providing bold signs in hazardous areas, use of eye protectors, dress code etc. are highly neglected
Section 23	Measures taken in case of fencing of machinery	5	--	
Section 25	Employment of young persons.	5	--	
Section 26	Arrangement of emergency cutting off power	5	--	
Section 28	Measures taken in case of casing of machinery	5	--	
Section 31	Well construction, material and strength of hoists and lifts	5	--	
	Maintaining written capacity on hoists and lifts	1	4	
Section 34	Well construction of floors, stairs and means of access	5	--	
Section 35	Securely covered or fenced of pits, pumps, opening.	5	--	
Section 27	Measures for self-acting machines	4	1	
Section 36	Measures for lifting, moving or carrying excessive load.	4	1	
Section 22	Existence of fire exit	3	2	
	Marked it with red letters	1	2	
Section 32	Existence of fixed written notice near revolving machines	3	2	
Section 24	Wearing tight-fighting dress near machine	2	3	
Section 33	Control the limit of pressure plant	1	4	
Section 41	Protection against dangerous fumes	2	1	
Section 37	Protection of eyes	1	2	
Section 32	Measure for explosive or inflammable, dust, gas, fume etc.	1	2	

Workers' satisfaction and awareness regarding health and safety provisions in their factories:

It was decided that workers would be rated to have high satisfaction with the existing health and safety provisions in their factories if their average score fall between 3 and 5 and to have low satisfaction if their average score fall between 1 and 2 (Table5).

Table 5. The average score of satisfaction of the workers regarding the existing health and safety provisions in their factories.

Score	Regarding Health provisions	Regarding safety provisions
Average	1.85	2

The above scores of satisfaction of the workers regarding health and safety provisions indicate that workers are satisfied neither about health provisions nor about safety provisions because the average satisfaction score regarding health provisions was 2.1 which fall between 1and2 and the average satisfaction score regarding safety provisions was 2 which also fall between 1 and2. Workers' state of awareness regarding the existence of the factory act, 1965 and the health and safety provisions laid down in the factory act. Information obtained on the above mentioned fields through interview of 50 workers from 5 factories are presented in Tabular form (Table 6).

Table 6. Workers' state of awareness regarding the factory act and health and safety provisions laid down in the factory act.

State of awareness	Respondents	Percentage
Do not know at all	40	80
Only know there is factory act but do not know any further	10	20
Total	50	100

The table shows absolutely shocking information on the state of awareness of the workers about the existence of factory act regarding health and safety provisions. A necessary provision may be made in the factory act to have knowledge of the workers regarding health and safety provisions provided in the factory act. In that case the workers would place demand for compliance of the relevant legal provision.

Limitations of the study

Firstly, due to time and resource constraints very small size of the samples were taken for which the study becomes limited in nature. Secondly, the study has focused on a very sensitive issue. Although, it was assured that no individual identity either of the type of industry or of organization would be revealed, yet there was considerable reluctance on the part of the concerned authorities, Government agencies and as well as of the workers to provide in detail information. In this respect, the study also becomes limited in scope but definitely it is indicative of the problems present in these industries.

Conclusion

The absence of proper physical working conditions brings harm in two ways: The workers cannot show satisfactory performance and the employer has to pay for sickness and employment injury. The study has explored that none of these factories maintains all the provisions laid down in the factory act, 1965 regarding health, hygiene and safety of the workers. The law prescribes the minimum provisions only and a progressive employer must go further regarding health, hygiene and safety of the workers. The study has brought to light a very frustrating picture regarding the compliance of legal provisions about health, hygiene and safety of the workers. The study has also brought to light a pitiable picture about the satisfaction of the workers regarding the existing health and safety conditions of the workers and their state of awareness regarding the existence of the factory act, 1965 and health and safety provisions laid down in that act.

Besides it was also found from the interviews during the study that the local Government agencies related to the implementation of the factory act, 1965 (i.e. Conservancy department, KCC etc.) hardly has any access to these factories and has no systematic records of any kind in this concern. That is why the study has also put light on some guidelines, codes and standard measures to be taken by the Government agencies to ensure the compliance of legal provisions regarding health and safety laid down in the factory act, 1965. The study will help all concerned to have an insight into the health and safety conditions of the private local manufacturing industries in Khulna and to be conscious about it and ensure development in this region.

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