CHAPTER - II

SUBJECTS AND METHODS

1. STUDY AREA

Ichalkaranji is town place located 30 kms away from Kolhapur city. There are about one and half lakhs of workers working in textile occupation, and about four thousand five hundred powerloom units weaving cloth in private as well as co-operative sector. In weaving process there are three types of workers i.e. Reeling workers for reeling the robbins with realing machine, jobbers for the maintainance of powerlooms and powerloom workers (weavers) for weaving cloth with the help of looms. The powerloom workers clean the looms, start and stop the loom whenever required. They draw the end of warp thread, fill the shuttle with fully wound robbin, then starts the shuttle and weave cloth. The physiological evaluation of jobs and the study of occupational stresses, these powerloom workers were selected.

In the present study attempts have been made for physiological evaluation of jobs of powerloom workers and review the overall occupational environment in powerloom sector, in order to observe occupational stresses in this sector if any.

2. SELECTION OF SUBJECTS

The present study was undertaken from thirty-six private weaving units in different areas of Ichalkaranji. Totally two hundred and fifteen male workers have been

assessed for socio-economic information by a standard questionnaire. A standard questionnaire was used to collect information of workers concern with age, experience, martial status, family size, monthly income, habits and occupational stresses. The physiological evaluation of fourty randomly selected workers were carried from different units. Most of the work in this powerloom sector is of repetative type, which is carried out in two shifts from 8 a.m. to 8 p.m. and from 8 p.m. to 8 a.m. For obtaining information and recording the results of this study spot visits were done by visiting the weaving sheds in two shifts. Control subjects were also studied.

3. METHODS

A) Work Place Study

i. Sound Measurements

Sound level at different places in weaving shed were recorded by sound level meter. The sound levels were recorded in decibel (dB) Plate III(i)

ii. Heat

Recording of thermal data such as dry bulb temperature was made in powerloom sheds during working hours. Assessment of thermal load with special reference to different physiological responses of powerloom workers was carried out.

iii. Humidity

The relative humidity in the weaving shed were evaluated by hygrometer. The humidity in different sheds were recorded.

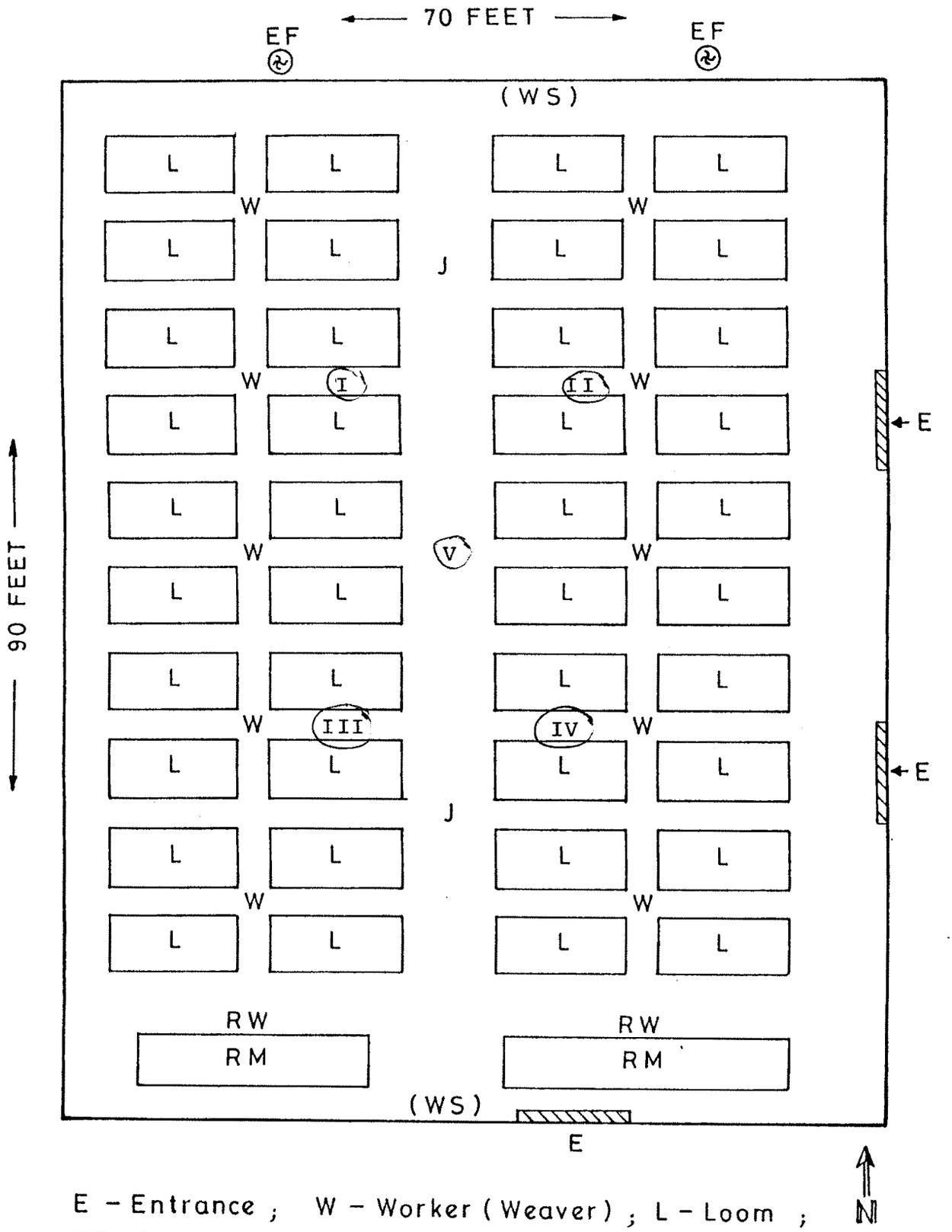
iv. Light (Illumination)

The illumination levels at different places inside the weaving shed were recorded by a lux meter. The illumination level recorded in lux. Plate II (i)

v. Dust Concentration

The sampling of fly dust in the inplant atmospheric air were done by a high volume sampler, at selected spots inside weaving sheds. The sampling of dust were done by following procedure.

a. First of all sampling sites were fixed as per the concentration of dust produced in certain areas (Fig. No.1).
b. Whatman's filter paper no.1 was kept in desicator for 24 hours for removing moisture, then weight of filter paper recorded and after that filter paper fixed above mesh in sample.
c. The timer was set for sampling time and sampler was started for collection of dust on the filter paper.
d. After sufficient collection of dust on filter paper;



E - Entrance ; W - Worker (Weaver) ; L - Loom ;
EF - Exhaust fan ; J - Jobber ; WS - Water sprayer ;
RM - Reeling machine , I, II, III, IV, V - Sampling Spots

FIG.NO.1 INFRA-STRUCTURE OF WEAVENG SHED .

i) INTERNAL ARRANGEMENT OF POWERLOOMS.

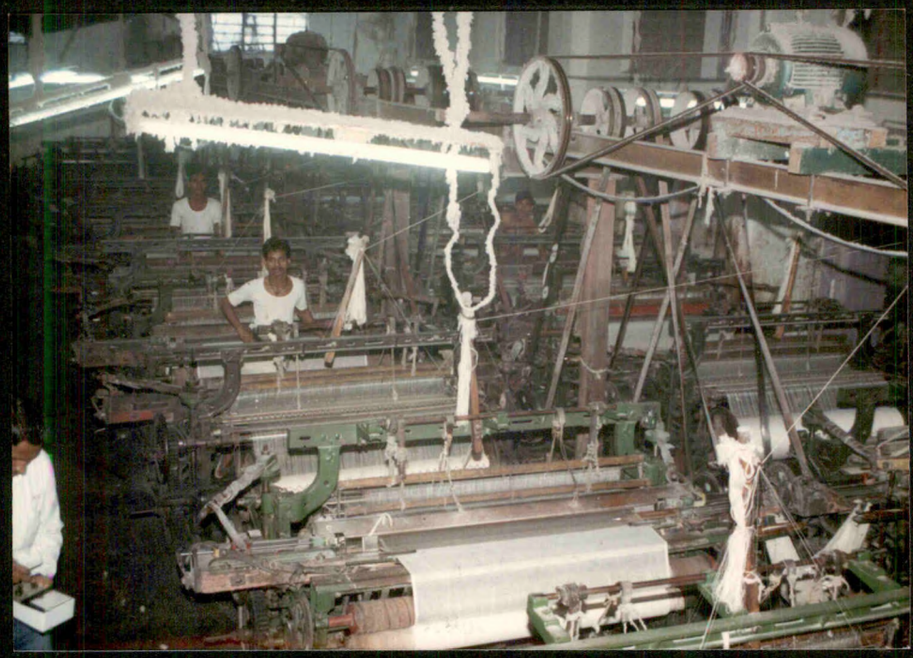
PLATE I

ii) COTTON DUST SETTLED IN SHED.

i) INADEQUATE ILLUMINATION IN SHED.

PLATE II

ii) WORKING POSTURE OF THE WORKER.



sampler was stopped and again filter paper was kept in desicator for 48 hours.

e. Then weight of filter paper with dust was recorded and amount of dust were calculated by difference.

f. The concentration of particulate matter in the inplant atmosphere were calculated by knowing the weight of particulate collected and volume of air sampled. The volume of air sampled was calculated by knowing the Suction rate and duration of sampling.

g. Above procedures were repeated for five times at different selected places inside weaving sheds and concentration of dust were calculated.

B. Physical Characteristics

The physical characteristics (Anthropometric measurements) i.e. height and weight of workers were recorded with standard techniques of occupational physiology by measuring scale and weighing machine.

C. Physical Fitness

The physical fitness of fourty selected workers were carried out by step test by following way.

HARWARD MODIFIED STEP TEST

This test is used for evaluating the physical fitness of individual for selection of job. This step test is originally developed in the Harward Fatigue laboratory

U.S.A. It is slightly modified so as to make it convenient for the short statured and aged persons.

While carrying out the test, the workers without shoes or chappels stepped up and down on stool of 45 cms height (the height of stool in Harward test is 51 cms approximately) at the rate of 30 complete steps per minute, for a maximum period of 5 minutes or earlier in case of difficulty or upto their capacity. The time was counted by stop watch when worker started stepping continuously. The duration of time noted in second. The rate of stepping is regulated by a metronome.

Immediately after the exercise is over, the worker were seated on arm chair and his pulse rate were recorded from carotid pulse for period between 1 min. to 1½ min. after exercise. The fitness score is calculated by following formula,

$$\text{Score} = \frac{\text{Duration of stepping in seconds X 100 X 0.8}}{\text{5.5 X (half min. recovery pulse count recorded.)}}$$

Grading of score is :

Below 50 - Poor

50 to 65 - Low average

65 to 80 - High average

80 to 90 - Good

Above 90 - Excellent

All the workers were evaluated within uncontrolled laboratory condition in office room of weaving shed at Ichalkaranji.

D) Grip Strength Study — why this method was used?

The Grip Dynamometer is an instrument used for assessment of grip strength of an individual. The same fourty selected workers for physical fitness were studied for grip strength by Grip Dynamometer. The grip strength of right hand and left hand were recorded.

E) Physiological Responses

The physiological responses of an individual changes with the work and working conditions of the workers. Fourty selected workers from different weaving units studied for physiological responses before shift and after shift on any working day and first working day after weekly off (Saturday).

i. Pulse rate

The pulse rate/min. of subjects were recorded from carotid pulse, before shift and after shift on any working day and first working day after weekly off (Saturday).

ii. Blood pressure

The blood pressure of subjects were recorded by sphygmomanometer, before shift and after shift on any

working day and first working day after weekly off by following way.

Sphygmomanometer consist of an inflated cuff attached to mercury manometer and tube connected with rubber bulb with screw to decrease pressure in the cuff. For recording blood pressure; cuff was wrapped around the left arm and stethascope was placed on branchial artery at a middle of elbow. Pressure in cuff was raised above systolic pressure and the column of mercury was raised rapidly above the point of systolic pressure; then air pressure in cuff was slowly decreased with screw, equal or slightly less than systolic blood pressure. The blood from branchial artary was released during systolic and first 'click' sound heared in artery by the stethascope, then reading on mercury manometer noted as "systolic blood pressure". Again screw was loosened slowly, as cuff pressure reduced the sound became louder and finally disappeared. As sound was disappeared reading on mercury manometer noted as "diastolic blood pressure".

Not necessary

iii. Body temperature

The axial temperature of subjects were recorded before shift and after shift on any working day and first working day after weekly off. The body temperature were recorded by clinical thermameter.

iv. *Lung function tests*

a) Peak expiratory flow rate (PEFR)

The peak expiratory flow rate of fourty selected workers were recorded before shift and after shift on any working day and first working day after weekly off. The PEFR values were recorded with Wright Peak Flow Meter. Plate III(ii)

b) Spirometry

The lung volumes and lung capacities of twenty six selected subjects from different weaving units were recorded before shift and after shift on any working day. The lung volumes like Tidal volume (TV), Inspiratory reserve volume (IRV), Expiratory reserve volume (ERV) and lung capacities like vital capacities (VC), Total lung capacities (TLC), Functional residual capacities (FRC), Forced vital capacities (FVC) and Forced expiratory volume in one second (FEV_1) values were recorded by Spirometer by following way.

i. Normal Expirograph

The spirometer was setted in the office of weaving shed. The worker were seated on arm chair comfortably. The ncseclip applied on nose to tightly close the nose. The mouth of worker apply on mouth piece. For recording tidal valume worker suggested for normal breathing, then for inspiratory reserve volume worker was suggested to take large amount of air to fill up lungs

i) NOISE LEVEL MEASUREMENT IN SHED.

PLATE III

ii) PEAK FLOW METER STUDY OF THE WORKER.

and then to blow forcefully from lungs for expiratory reserve volume, the graph obtained on graph paper called normal expirograph. This experiment were repeated three times and normal excellent graph studied for lung volume and lung capacities.

ii. Forced Vital Capacity (FVC)

After taking normal expirograph, the worker was suggested to take air in lungs and expire forcefully into mouth piece. The graph obtained on graph paper show forced vital capacity of lungs. This procedure repeated three times and bigger graph was selected for calculating FVC values. Then from graph of FVC, the amount of air expired in one second (FEV_1) was calculated.

v. Clinical examination

For studying clinical feature of lungs exposed to cotton dust, a chest X-ray P.A. were carried out from some selected workers at Ichalkaranji X-ray clinic, Ichalkaranji.

For the purpose of management of occupational stresses the study was carried out by evaluating physiological effects of wearing industrial protective equipments such as face mask, ear muff and ear plugs. Fifteen workers from different weaving units were selected. The experiments with protective equipments were carried out,

Plate iv (1 & ii)

i) WORKER WITH EAR MUFF.

PLATE IV

ii) WORKER WITH MASK.

extending the period of work from 8 a.m. to 12 p.m. and from 1 p.m. to 8 p.m. and working without protective equipment at the first spell and then with the protective equipments at the second spell of work. The heart rate and blood pressure response was observed during experimental period with and without protective equipments.