PRIMARY HEALTH CARE IN INDUSTRY
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Dr Lawrence deSouza

I have chosen to talk on the Health Care of this Sector of the population working in Industry, primarily because it is vital to the economic growth of our Country or as a matter of fact to any other country, and secondly because I am closely concerned with the health of the working population of one of the largest Multinational Industrial Organisations, for over 30 years.

According to Indian Labour Statistics (1976) the total number of Urban & Rural workers are around 200 million or 33% of the population, and the total employment in both the public and private sector industries are over 200 million workers.

We are gathered here today to plan or shall I say predict the health of our people by 2000 A.D.

Dr Schilling states that futurologists are particularly concerned with 3 prime factors which determine the destiny of mankind : population, energy and food. Meddows and his colleagues predict the collapse of economic and industrial systems sometime by 2100 A.D., unless, before that, the birthrate equals the death rate and capital investment equal depreciation. However, Lord Ashby concludes in what he calls "A Second Look at Doom" that a proper Symbiosis between Man and Industry would safeguard against such a doom.

It is Man who conceives the idea and is the prime mover in establishing an Industry. In order to achieve his objective he has to engage Men who will study the feasibility and financial implications of this Industry. He will again have to engage men to design, construct and operate this Industry. Therefore, Man is the main pivot around -which industry revolves. Yet, you will agree that a great deal of attention is concentrated and crores of rupees are spent on Machines and materials, but Man who is, as I pointed out, the Key Factor in Industry is hardly cared for. Possibly because in our country, with a large unemployed population, Industrialists find it easier to replace man than Machines! Even so, an Industry can ill afford to lose a trained or skilled worker. It means slowing down or even stoppage of production, which would result in an appreciable loss to the Industry.

A trained worker is a more valuable asset than money invested in Machinery, etc., and that manpower is more important then machinery for it is upon Man that the advancement or retrogression of our industrial activity depends. Every trained worker therefore is a planned investment and his employer must preserve it for the supply and quality of products. The worker should be looked upon as a Unit which must be maintained at peak efficiency. His health must, therefore be considered vital not only for his personal happiness but for industrial efficiency and economic value.

Concern, for the Industrial worker is therefore no longer in the realm of sentimentality. It has become a vital concrete necessity even when completely divorced from its humanitarian implications.

Today, large steel plants, chemical plants, Atomic Energy establishments, and others are engaged in a frantic race for industralisation, but hardly any attention is paid to the dangers confronting the people working in these plants. Increasing members of our working population, both Urban and Rural are being exposed to physical, chemical, biological, and psychological hazards in their working environment. In addition, industrial effluents are polluting the atmosphere and our waterways. All this affects the workers health and reduces his capacity to work efficiently.

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Unfortunately, in most cases, it is only after injuries to health occur, by which time it is too late, that investigations and proper hygienic controls are instituted.

Current statistics in the U.K. indicates that every year about 1300 people die as a result of occupational accidents and diseases and at least 3,00,00 sustain serous injury whilst at work. In economic terms it has been estimated that the cost of this to the nation is in the order of £2000 million per annum. The cost to those involved, however, can never be calculated.

Statistics in our country collected from 'Indian Labour Statistics', for 1975 reveal the number of fatal accidents was 627 and non-fatal 2,09,357. ESIC report for 1978 states the accident rate was 187 per 1000 insured workers.

In 1975, compensation paid for injuries under Workmen's Compensation Act amounted to 98.16 lakhs. There are no proper statistics for the incidence of occupational diseases.

The Central Labour Institute had undertaken some surveys in various factories and detected quite a few occupational diseases like Silicosi's, coal pneumoconiosis, Byssinosis-Chrome effects, Lead poisioning and Mercury Poisioning, etc.

Several toxic chemicals are being used by our Industries, but hardly any cases of occupational diseases are reported inspite of the Factory Act Regulations, Section 89 and 90. I, had carried out two surveys to find out the incidence of occupational cancer in our country and I am sorry to say the information available was rather disappointing.

At the National Convention on Cancer, held only last week at Jabalpur, Dr Deo, a noted cancer expert from Bombay, pointed out that 1,500,000 cases of this fatal disease are reported every year. How many of these cases could have had an occupational etiology one does not know, as no detailed history is usually taken of the patients' occupation or exposure to chemical carciongens, etc.

The Magnitude of the problem may be well understood by the fact that nearly 80% of the Industrial Population belong to factories that have very poor working conditions and only depends on the ESIS for curative aid.

It is, therefore, essential that a comprehensive health programme should be planned so that all possible resources are utilised to maintain the physical and mental well-being of working people, and protect them against accidents and occupational diseases.

In this context it is relevant to recall the scope of Occupational Health as described by the joint ILO/WHO Committee at its first Session in 1950. "Occupational Health should aim at, the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting and from factors adverse to health; the placing and maintenance of the workers in the occupational environment adapted to his physiological and psychological equipments and to summerise the adaptation of work to man and of each man to his job".

The modern concept of a comprehensive Health Service is Multi-disciplinary. It cannot operate in isolation from other curative & public health services, if a man's health is to be looked after in its totality.

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The two main disciplines concerned are :-

1. Occupational Medicine
2. Industrial Hygiene and Ergonomics.

1. Occupational Medicine again includes various other disciplines e.g. Industrial Physiology, Industrial Psychology, Industrial Toxicology, etc., e.g. the physical, chemical, biological and psychological factors that may affect the health.

2. Industrial Hygiene and Ergonomics includes temperature, humidity, ventilation, exhausts, washing and clothing facilities, and enthrophology, e.g. designand adaptations of machines, equipment, etc., to be compatible to health.

The functions entrusted to Occupational Health Services vary in nature and scope depending on the nature of the Industry, its size, location and relevant legislation. Large undertakings could organise their own Occupational Health Service within their premises, while small scale industries could join together to form a group health service.

Whatever way it is set up, it should be in charge of a Physician, employed either full time or part time with the necessary space, equipment and staff. The functions of an Occupational Health Service would comprise in short as laid down by the I.L.O. :

a) Surveillance of and advising of all conditions in the undertaking, affecting health; Control Health Risks.
b) Pre-employment and placement medical examinations;
c) Periodic and special medical examinations,
d) Promotion of health and safety education.

Besides these, the Industrial Physician is also expected to provide for First-Aid Treatment for medical emergencies and accidents.

He should establish close liaison with external health agencies, e.g. Government - ESIS and other Public Health Services and Institutions of Occupational Health. Unfortunately, in our Country, the Industrial Physician devotes more time to curative treatment than to preventive or occupational medicine.

1. EMPLOYER'S ROLE :

As the direct beneficiary the employer has a legal and moral responsibility to provide occupational health services for his employees. Today, in developed countries, the Employer's philosophy of medical service in Industry is fundamentally an attempt to increase the sum total of human comforts, well-being, working capacity, productiveness and longevity. Health and safety must be an integral part of an organisation and it should be part of every manager's duty and his personal responsibility to ensure that the health and safety of his employees are not neglected. The Health and Safety specialists are comparable to other specialists, finance, personnel or technical in the organisation and their primary function is to ensure that their specialism becomes a feature of work accepted by other members of the Management team.

In India, most Industrialists develop a false sense of complacency towards Industrial Health. They consider that just because they contribute to the ESI Scheme and comply merely with the letter of the law rather than the spirit underlying it, they have fulfilled their obligation.

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Even these Industries that provide Medical Services to their employees consider it as a part of Welfare Service or an act of Philanthrophy. Unfortunately, it is well-nigh impossible for the Medical Services apart from showing reduction in losses due to accidents and absenteeism, to show any tangible results which may come from the better health and morale of workers or to calculate them in terms of money gained. Only few enlightened Industries have well organised Occupational Health Services in their organisation.

2.EMPLOYEE'S ROLE :

The average Industrial Worker, is ignorant of his health needs and of the hazards to which he is exposed in his work and therefore, falls an easy victim to disease both occupational and others. Sir Thomas Legge (1863-1932) said ' all workers should be told something of the danger of the materials with which they come in contact and not left to find out for themselves sometimes at the cost of their lives'.

It is therefore imperative that a proper Health Education programme should be organised for these workers in order to make them health-conscious and teach them the principles of hygiene, nutrition, etc., and how to protect themselves against hazards in their factories.

In Britain there has been an increasing involvement of the Unions in occupational and safety matters and they have always sought State intervention to ensure maximum standards of health and safety in Industry. They now look forward to state assistance in the positive promotion of health. The T.U.C. advocates a team approach of the Medical, safety and Hygiene personnel who co-ordinates to prevent accidents and occupational diseases. They employ an occupational health expert on their staff, to advise onmatters of occupational health and investigate and report on any factory where the workers may be exposed to occupational diseases.

In our country the Trade Unions Organisations have not so far shown a similar interest in the Health and safety of their members. The employees' Unions are more concerned with fighting for higher wages and bonuses.

3. GOVERNMENT ROLE (INDIA & U.K.)

Our Government has enacted a number of laws and regulations concerning the health and safety of workers engaged in various industries, mines, docks, etc. Factory Inspectorates operate in all States, but only 10 Medical Inspector have been appointed in some States. Consequently the implementation and enforcement of these laws and regulations have been extremely difficult due to lack of resources and personnel. Though regulation require that a factory should be visited atleast twice a year, only 60% of the factories are actually visited twice or more and about 25% are not visited at all.

The Government should take immediate steps to improve the Inspectorate services and appoint Medical Inspectors in all States in India, if it is sincere in its efforts to protect the health and safety of the working population.

The Factories Act, Section 45(4) regarding Medical Service in the factory states that "First Aid Centre or an Ambulance Room should be provided in charge of the Medical and Nursing Staff as may be prescribed". Most of the factories have a Doctor on call in case of emergencies only, because the Factories Act does not specify the functions of the Physician.

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The Act needs to be amended to give clearly in detail, the duties of Industrial Physician.

Recent legislative Acts in U.K., U.S.A., and Germany have taken care to see that details in occupational health and safety measures are incorporated in the Factories Act. Heavy penalties have been specified for breach of the Act.

The T.U.C.'s evidence to enquiry committees, the ILO/WHO reports on Occupational Health and reports of various medical and non-medical organisations etc., have all placed a strong emphasis on the Primary preventive role of occupational Medicine.

Research and Teaching Institutes like the Central Labour Institutes, National Institute of Occupational Health, Industrial Toxicology Research Centre, etc., could assist Occupational Health and Safety Services in Factories by providing technical and other allied services in Occupational Health, Hygiene and Safety.

The introduction of Employees State Health Insurance Scheme in 1952, has been mainly to provide curative services to the workers. The 1978 report states that there are 5,542,700 employed covered by this Scheme. The total expenses for Medical benefits above for 1977/78 amounted to Rs.60,02,68,367 or Rs.108 per capita.

The ESIS has however done precious little in the prevention of occupational diseases or accidents. If the ESIS could get involved in an occupational health and Safety programmes, it would help in minimizing accidents, occupational and other diseases and this in turn would reduce the high cost of medical benefits that the ESIS is faced with.

I would suggest that the ESIS could also, as an incentive, give a rebate to the Industries who provide an occupational Health and Safety Services for their employees.

A. VOLUNTARY AGENCIES

The Indian Association of Occupational Health which was founded in 1949, has been holding conferences, seminars and lectures to propogate and educate all concerned in this new science of Occupational Health. The members have undertaken a good deal of scientific research which is being published in the Journals.

At one of its conferences held in Delhi, it was suggested to the Ministries of Health and Labour to initiate, plan and implement a result-oriented programme to ensure workers' health in the interest of national prosperity.

I would here like to propose that a Health and Safety Commissions, as in U.K. should be set up both at the Central and State levels, to study and advise on all matters relating to Health and Safety of Workers, and encourage the development of In-Plant Medical Service by making it a statutory duty for employers to provide such services for their employees, whenever it should be necessary.

This Commission should comprise representatives of :

a) Ministry of Health
b) Ministry of Labour
c) Employers' Association
d) Trade Unions
e) Occupational Health Physicians.

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5.PERSONNEL & TRAINING :

A survey carried out some years ago revealed that the number of medical personnel in Industry fell far below the requirements. Generally in 110,000 factories employing nearly5,960,000 workers, there are only about 1000 full time Doctors and other part-time Doctors, whose main function has been to provide curative aid only. There are only a few progressive industries who have organised occupational health service. Even the Government, which is the largest employer, is lagging behind. Training in Occupational Health and Hygiene is indeed very limited in our Country. It is therefore necessary tointroduce both under-graduates and post-graduates training in occupational medicines in our Medical Colleges and increase the various training courses that are presently being conducted by the Central Labour Institute, Institute of Management and others.

CONCLUSION:

The World of Occupational Health as I have described is not small. It has a difficult but fascinating sphere. It must be placed on par with other Management functions and regarded as an aid to production and also a social obligation.

This means employing or having access to a team of inter-related skills including Occupational Health Doctors, Occupational Hygienists, Safety Officers, Safety Engineers and other Scientific and Technical Staff in the Health and Safety Field.

Today there has been a fundamental change in the role of Industries. "Sir Ewart Smith, a Deputy Chairman of Imperial Chemical Industries, has said " The various aspects of our Industrial Work, Technical and Commercial efficiency, Safety and Human factors, including the phychological attitude of all concerned are not separate matters, but part of an integrated whole. It is for this reason that we need to develop and apply a broad philosophy, or dynamic progress, including a full recognition of human values. Such a philosophy must recognise that the essential function of industry is to serve the social purpose of providing the goods and services which the community requires, with a minimum usage of resources".

I repeat the economic prosperity of a Country depends on increased production and this can only be effected through healthy and efficient workers and this prosperity in turn will lead to better and healthier living standards.

I therefore appeal to the Government, Employers and Employees and Occupational Health Physicians, to make a genuine and sincere effort to promote, maintain and safeguard the health of our working population so that by the year 2000 A.D. we can proudly say that our workers are not only healthy but also very happy.

And finally I would like to quote what a famous author Jhumke once said:

"That the Workmen shall live to his Labour. That his mother shall have the comfort of his arm in her old age, that his wife shall not be an umtimely widow.

That his children shall have a father and that cripples and hopeless wrecks who were once strong men shall no longer be the by products of industry. "

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SJHC (OH) FORM NO.1 23B-2

PRE-EMPLOYMENT MEDICAL EXAMINATION REPORT
(Medical Section)

NAME OF INDUSTRY: Dated:
ADDRESS:

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

NAME:

for the post of:

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1. PREVIOUS HISTORY (Of importance)
   A: Occupational
   B: Medical

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2. FAMILY HISTORY
   (Of Importance

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3. IDENTIFICATION MARKS: 1.
   2.

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4. a) Apparent Age:_____ a. Stated Age:
   b) Any Deformity
   c) Conditions of the Thyroid Lymph-nodes . Joints:
   d) Evidence of any skin disease
   e) Varicose veins or filariasis
   f) Any other apparent abnormality

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5. Height: Exp:
   Weight: Chest:
   Complexion: Insp:
   Color of eyes:

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6. ALIMENTARY SYSTEM
   a) Conditions of the Teeth, Gums & Tongue - any oral sepsis
   b) Liver and spleen
   c) Any evidence of Hemorrhoids, Fistula or any other anorectal Pathology
   d) Any other abnormality

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7. GENITO URINARY SYSTEM:
   a) Urine - Albumin..... Microscopy....
   Sugar..... ..... Specific Gravity....
   Deposits..... Reaction.....

p.to.

b) Any evidence of diseases of urinary system

c) Any evidence of Ven.Disease

d) Is Hernia present (give details)

) Is Hydrocele present (give details)

f) Any other abnormality

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8. NERVOUS SYSTEM:

a) Any evidence of Nervous disease, Chronic Headache, paralysis, Epilepsy, Wasting, Tremors etc.

b) Are the reflexes normal?

c) Any other abnormality

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9. CARDIO-VASCULAR SYSTEM

9.1 HEART: (a) Size: (b) Position: (c) Sounds:

9.2: PULSE;

(a) Rate: (b) Rhythm:

Vol: Tension:

9.3. Condition of Blood Vessels:

9.4 Blood Pressure: (a) 1st Rg: (b) 2nd Rg. (Where necessary)

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10. RESPIRATORY SYSTEM:

a) Any deformity or Abnormality of the Chest

b) Condition of the Nose, Throat & Tonsils:

c) Condition of the Lungs:

d) X-Ray Report:

e) Any other Abnormality:

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11. SPECIAL SENSE:

a) Speech:

b) Ears - Hearing: Rt: Lt:

Any disease of Abnormality: Rt: Lt:

c) Vision: 1. Actuity:

	W/O Glasses		W/Glasses	
	R	L	R	L
Distant				
Near				

2. Colour-Vision:

3. Condition of the Eyes & Lids:

b) Any other abnormality:

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12. FOR FEMALE CANDIDATES ONLY:

a) Any Menstrual disorder:

b) Condition of the Breasts:

c) Any evidence of pregnancy:

d) Any evidence of disease of the ovaries, uterus or external genitals:

e) Any other Gynaecological abnormality:

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13. Special investigations if any

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14. Consulting Medical Officer's remarks, if any:

(Signature of the Candidate)

MEDICAL EXAMINER

Left Hand:

LITTLE FINGER RING FINGER MIDDLE FINGER INDEX FINGER THUMB

23B-3

NEUROLOGY EMERGENCIES

A General:

Whenever a case is admitted as an emergency, a complete case sheet must be written, the requisite investigations carried out and the necessary treatment started immediately depending on the case. This should not take more than 30 minutes to two hours. For the above, the responsibility rests squarely on the shoulders of the Duty Doctor.
This responsibility includes writing up the case sheet and carying out investigations and treatment.

1. Non-emergency admissions must have a complete work-up by next morning.

2. Progress notes must be written every 24 hours (sometimes even more often) in all acute cases and twice a week in chronic cases.

PATIENT IS BROUGHT IN WITH A HISTORY OF FITS

A History:

1. Ask the patient or the eye witness to imitate or describe an attack. Avoid leading questions
2. Find out indirectly where the fit starts and how it spreads. Note the presence of any aura or warning symptoms which occur seconds or minutes before an attack.
3. Note the occurrence of any injury, incontinence or loss of posture. Do not accept a statement of unconsciousness uncritically.
4. Elicit indirectly the presence of any post-ictal phenomena. Avoid any leading questions.
5. It is always a good practice to allow the relatives or the patient to come out with the history in their own words before asking for details.
6. Rule out the possibility of hysterical fits (Vide infra).

B Examination:

1. IN CASE YOU OBSERVE AN ATTACK, DESCRIBE IN DETAIL THE TYPE OF ATTACK WITH SPECIAL REFERENCE TO ITS FOCAL ONSET (INCLUDING TEMPORAL LOBE), MODE OF SPREAD AND WHETHER IT BECOMES GENERALISED OR NOT. Do not forget to examine the pupils and the plantars during an attack. Look carefully for any post-ictal confusion immediately after an attack.

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2. In epilepsia partialis continua, one must always palpate the skull for any depressed fracture.

C Management:

1. If a patient has had only one or two attacks and is conscious and not confused, there is no need to admit the patient. The party can be asked to take him/her to the next out-patient day, but prescribe phenobarbitone or DFH depending on the type of attack and the age of the patient.

2. If the patient is unconscious or in post-ictal confusion he must be admitted. However, if the post-ictal confusion is one of excitement the case must be referred to the psychiatry department.

3. If a patient has cluster attacks (attacks in quick succession with retention of consciousness in between) or status epilepticus (attacks in quick succession with loss of consciousness in between) the case must be admitted.

4.

D Specific treatment:

1. Post-ictal confusional state and cluster attacks; No attaks witnessed-patient conscious:
Infants and young children Injection luminal 5 mg per kg of body weight IM in a single dose. Children aged 3 years-10 years-Injection luminal 100 mg IM in a single dose.

10 years and above-Injection luminal 200 mg IM in a single dose.

Oral anticonvulsants must be started concurrently as in D.4.

2. Cluster attacks witnessed in casualty or ward:
Infants and young children below the age of 5 years-Injection Diazepam I-V (Calmpose 0.5 mg per kg of body weight) to be given slowly without using a diluent taking full 2 minutes (120") for the entire injection. Follow up with parenteral phenobarbitone as in D.I. and repeat if necessary.

In children over the age of 5 years and adults, the dose of Diazepam is 10 mg. (2ml.) I-V and must be followed by parenteral phenobarbitone as in D.I. to be repeated, if necessary.

Oral anticonvulsants must be started concurrently as in D-4.

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3. Febrile convulsions:
This must be treated with anticonvulsants as in cluster attacks and must be combined with tablet Aspirin 150 mg. every 4 hours. Cover the child with a wet cloth except for the chest. An urgent total and differential leucocyte count must be asked for.

4. Status epilepticus with fits witnessed in casualty or history of seizures shortly before admission:
Diazepam IV-initial dose as in cluster attacks. Repeat after 30 minutes depending on the response. The dose should not ordinarily exceed within 24 hours 30 mgs. in children below 5 years and 60 mgs in others. Follow up with IM luminal as in cluster attacks to be repeated 8th hourly.

Pass a Ryle's tube and introduce phenobarbitone 30-60 mg in a single dose depending upon the weight of the patient along with DPH (Eptoin) 100 mg in those below 10 years and 200 mg in those above 10 years in a single dose.

Nursing care must be the same as for an unconscious patient.

5. If the patient has a history of status and is brought in a state of coma and has not had a fit in the previous 12 hours, it is enough if oral phenobarbitone and DPH as mentioned in D.4. are given through a Ryle's tube. Institute antiedema measures as follows: D a cut down, pass an I-V catheter and give two bottles (350 ml. each) of 20% mannitrol for adults (one bottle for children below 10 years), the first to go rapidly within 30 to 60 minutes. Start I-V dexamethasone concurrently as given in meningitis.

6. As in other patients with coma peripheral failure must be anticipated and I-V fluids started if the general condition is poor. The fluid of choice is 5% glucose.

NEVER GIVE I-V SALINE, PLAIN OR WITH GLUCOSE TO A NEUROLOGICAL/ NEUROSURGICAL PATIENT IN AN EMERGENCY.

PATIENT IN COMA

A History:

Get a good history so as to arrive at an etiological diagnosis as fast as possible. The common causes of coma are:

1. Meningitis
2. Expanding lesion
3. Head injury
4. Cerebro-vascular accidents
5. Metabolic disorders
6. Drugs and post-epileptic state
7. Cerebral malaria.

B Examination

1. Record the temperature, pulse, respiration and blood pressure. Note the condition of the pupils and the presence of bradycardia- relative or absolute with reference to the temperature.

2. Note the level of consciousness.
The following is a useful guide:

Alert and Wakeful: Immediate and appropriate response to visual, auditory and tactile stimuli.

Confusion: This is often associated with irritability, restlessness and delirium.

Drowsiness: Delayed or incomplete but appropriate response to visual, auditory and tactile stimuli.

Stupor: Patient lies with eyes closed and is arousable with only continuous vigorous external stimulation. The response of the patient to the stimulus is, however, purposive.

Coma: Patient responds only to deep painful stimuli and this is nonpurposive.

Deep Coma: Only decerebrate or no response whatsoever to any type of stimulus.

3. Look carefully for the following:
   1. Neck stiffness
   2. Purulent ear discharge
   3. Blood from ear or nose.
   4. CSF rhinorrhea.
   5. Size in mm of the pupils and their reaction to light.
   6. Asymmetry of palpebral fissure and of eye blink.
   7. Asymmetry in corneal reflex.
   8. Hypotonia and paralysis
   9. Deep tendon reflexes and plantar response.
   10. Careful examination of the optic disks.
   11. Palpable spleen.

4. Do not say papilloedema present or absent. Describe with special reference to physiological cup, lamina cribrosa, the veins, arteries, disk margins, colour of the disk and the presence of hemorrhages or exudates.

5. Emergency treatment for the hypertension, diabetes etc., is far more important than that of the neurological deficit.

6. All patients with coma require admission, emergency investigations and management.

C. Management:

1. In patients with suspected meningitis or an acute cerebro vascular accident, the following must be done as an emergency procedure:

   a) Lumbar puncutre is a must unless there is a contraindication like definite papilloedema or clinical suspicion of an acute abscess. CSF pressure must always be recorded with the manometer. In all cases of suspected meningitis, lumbar puncture must be repeated even if done recently out ide. If the spinal fluid is blood stained get an RBC count in the spinal fluid. Centrifuge the specimen to determine the colour of the supernatant fluid. This will be xanthrochromic if the intra cranial bleed is over 12 hours' duration. In bleeds of lesser duration the RBCs will be crenated. Always compare the spinal fluid with water before calling it opalescent or turbid. The term xanthochromia refers only to the colour and not the clarity at the spinal fluid. This is not synonymous with turbidity and the colour may vary from any shade of yellow to orange and not any other colour. Collect at least 10 ml of CSF for immediate cell count, biochemistry and VDRL.

b) If the CSF is opalescent, turbid or purulent an immediate Gram's stain must be carried out and a portion kept aside for culture. Collect 5 ml of oxalated blood simultaneously for blood sugar, creatinine, total and differential leucocyte counts, ESR and 10 ml of clotted blood for serum electrolytes.

3. Where a metabolic cause is suspected after collecting the blood sample give 50 ml of 25% glucose intravenously and note the level of consciousness. An immediate improvement clinches a diagnosis of hypoglycaemic coma.

Further management depends on the diagnosis. General management is common for any comatose patient and includes the following:

a) Nursing care in the prone or semiprone position.
b) Do not use a pillow under the head
c) Change of posture every 2 or 3 hours.
d) Maintenance of a clear air way.
e) No oral feeds. Feeds to be given through a Ryle's tube with the distal end below the cardiac sphincter.

PYOGENIC MENINGITIS

A. Diagnosis:

A clinical diagnosis of pyogenic meningitis must be confirmed within 30 minutes by appropriate biochemical and bacteriological findings in the CSF and also a total and differential counts in the peripheral blood. This is a red-hot emergency and treatment must be commenced within half to one hour of admission and on an emergency basis.

In general Gram negative organisms are common within the first one month of neonatal life, during which period Hemophilus influenzae infection is rare. However, H. influenzae infection is common between the ages of 3 months to 3 years after which it shows a sharp decline. It is an extreme rarity after the age of 10 years. The common pathogens otherwise are meningococcus and pneumococcus. Staphylococci and anaerobic streptococci are to be suspected if there is a definite focus of extra cranial infection, as for example in the lung.

B. Management:

The antibiotic concerned must be given intravenously through an indwelling polythene tube introduced to a distance of 4" to 8" into one of the peripheral veins, preferably the leg. The following are the drugs of choice:

In infants below the age of 3 years or when there is a suspected staphyloccus infection the drug of choice is ampicillin given IV. The first dose is 50 mg/kg given over a period of 30 minutes as a drip to be followed by 300 to 400 mg per kg per day in three or four divided doses. In patients over the age of 3 years Gram positive coccal infections are the commonest pathogens. The drug of choice is penicillin given intravenously. The loading dose is 8 million units given over a period of 30 minutes and subsequently 2 million units every 2 hours.

TUBERCULOUS MENINGITIS

A. Diagnosis:

In general the spinal fluid is clear or moderately opalescent to xanthochromic with moderate rise of cells and or proteins and a moderate fall in CSF sugar values. A spinal fluid sugar less than 40% of a simultaneous blood sugar level is taken as a

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reduction in the former. A normal spinal fluid does not exclude the diagnosis of TBM, especially if the clinical suspicion is high.

B. Management:

1. IM Streptomycin sulphate 0.5 Gm in children below the age of 4 years and 1 Gm in those 4 years and above.

2. Isozone Forte (INH 300 mg plus Thioacetazone 150 mg) ½ tablet in children aged below 4 years and 1 tablet in others in a single dose.

3. If the patient is in stupor or coma give steriods as follows: Children below the age of 4 years-Dexamethasone IV 4 mg stat and subsequently 4 mg every 6 hours and in those aged 4 years and above Dexamethasone IV 8 mg stat and subsequently 4 mg IV every 6 hours,

   Concurrent administration of oral prednisone must be started. In children below the age of 3 years-30 mg a day in three divided doses; in the age group of 3 to less than 6 years-45 mg a day in three divided doses and in those aged 6 years and above -60 mg a day in 3 divided doses, are recommended.

   IN SUSPECTED INTRA GRANIAL INFECTION STEROIDS SHOULD NEVER BE GIVEN WITHOUT AN APPROPRIATE ANTI MICROBIAL THERAPY.

CEREBRAL MALARIA

A Diagnosis:

1. Malaria is again rearing its head in the country. Cerebral malaria should be considered in the differential diagnosis of any coma with high fever.

2. Clinical suspicion is heightened by past history of fever with rigors and presence of a palpable spleen.

3. Examination of a peripheral blood smear for the malarial parasite is a must.

4. If the smear is positive or index of clinical suspicion high, start treatment immediately.

B. Treatment

1. Adults: Chloroquine Sulphate (Nivaquin) - 40 mg base per ml.- 600 mg base (15 ml) PLUS 8 mg Decadron (2 ml) given as IV drip with 5% Dextrose over 30-45 min. Repeat 300 mg of chloroquine base (7.5 ml) and 4 mg Decadron (1 ml) as IV drip after 6 hours.

2. Children: Chloroquine base 5 mg/kilo of body weight given in two halves of 2.5 mg/kilo by deep I.M. injection at intervals of 6 hours along with 4 mg per dose of IV Decadron.

3. Alternative Line of treatment:

   Adults: Quinine Hydrochloride 600 mg PLUS 8 mg of Decadron by I.V. drip with 5% glucose over a period of one hour, Repeat every 4 hours for 4 doses.

   Children: Quinine Hydrochloride 5 mg/kilo given in two halves of 2.5 mg/kilo along with Decadron 4 mg by I.V. drip with 5% glucose over a period of one hour, to be repeated after 12 hours.

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In general this includes those cases wherein the neurological deficit has reached its peak generally within 48 hours.

A. History:

1. Check history for previous episodes of transient ischaemic attacks.

2. Elicit history of headache, with special reference to its location and type and also vomiting.

3. Check history for known diabetes, hypertension and past cardiac disease, or in women, recent delivery.

B. Examination:

1. Check blood pressure and examine the cardiovascular system for features of left ventricular hypertrophy.

2. Look carefully for any evidence of neck stiffness, focus of infectiln (eg. ears, lungs, pelvis).

3. Note the level of alertness/consciousness.

4. Examine the pupils and the fundi, the latter if necessary after mydriasis.

5. Look for conjugate deviation of the eyes, dysphasia hemiplegia and any differential response to pin prick.

C. Investigations:

1. Lumbar Puncture:

This must be carried out within an hour of admission, if the patient is unconscious or has neck stiffness, unless there is a clear cut papilloedema without significant hypertension (a diastolic BP of 120 and above). If the fluid is blood stained collect 3 bottles of 5-6 ml each to note the uniformity of staining with blood. Generally in traumatic spinal tap the subsequent samples would tend to become clear. This alone is not sufficient. The spinal fluid must be centrifuged for evidence of xanthochromia which can be expected to be present 12 hours after an initial bleed. If the bleed is less than 12 hours old look for cremated RBC's.

Unless the spinal fluid is grossly blood stained a RBC count must be carried out in the CSF. This would enable one to make corrections for cell count and protein. For every 700 RBCs deduct 1 WBC from the total cell count. Similarly for 1000 RBCs deduct 1 mg from the total value for proteins.

Please do not forget to collect a simultaneous blood sample for estimation of sugar (3ml in an oxalated bottle).

D. Management:

If the patient has primary subarachnoid haemorrhage (i.e. bleeding directly into the subarachnoid space) and proven by lumbar puncture inform the neurosurgical senior resident immediately.

In non-haemorrhagic infarction of less than 48 hours duration, start IV Dexamethasone 8 mg initially and 4 mg IV every 6 hours.

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GUILLAIN-BARRE SYNDROME

A. History:

1. Ask the patient to take a deep breath and count slowly as much as he can in one single breath. A normal adult should be able to count up to 15 to 20. A progressive decline in this number is an ominous sign.

2. Ask the patient or the relatives for a history of choking, spluttering or nasal regurgitation while swallowing liquids.

3. Note any nasal quality in the voice.

B. Management:

1. Once a clinical diagnosis is made a lumbar puncutre must be done immediately and treatment started forthwith. For children below the age of 4 years give Dexamethasone IV 4 mg stat and repeat 4 mg IV 6th hourly. For others an initial dose of Dexamethasone IV of 8 mg with subsequent 4 mg IV 6th hourly will suffice.

2. Concurrent oral steriods in the same dosage as in TBM must be given. If there is evidence of bulbar involvement the steroids must be given only through a Ryle's tube.

3. Bulbar involvement must be looked for every two hours. If there is a slightest suspicion, the duty anesthetist must be informed and further management of the case discussed.

BELL'S PALSY

1. Admit and start on I-V and oral steriods if the duration is less than 48 hours.

HEAD INJURY

1. Information regarding the exact level of consciousness of the patient soon after the accident and any changes during transit must be obtained.

2 As soon as the patient is brought, the vital functions especially respiration, pulse and BP should be ascertained. If there is any obstructions to airway, this should be corrected immediately either by suction, introduction of endotracheal tube or tracheostomy. Surgical shock should be treated promptly.

3 Patient's level of consciousness, pulse rate, BP, size and reaction of the pupils to light must be recorded every half-hour.

4 If there has been a definite history of deterioration of level of consciousness from the time of accident. Deteriorating level of consciousness is a more important indication of an expanding lesion than pupillary dilatation.

5. If the Senior Resident suspect an extra-dural clot, he must immediately make necessary arrangements to place burrholes on the appropriate site.

6. If the examination of the skull suggests a depression in the region of the scalp laceration, it should be assumed that there is a depressed fracture and immediate x' rays of the skull taken to confirm the diagnosis. If the depressed fracture is confirmed the patient should be started on Crystalline penicillin 20 lakhs 4th hourly IM. every effort should be made to explore the wound within 4 to 5 hours of admission.

7. If the patient has been conscious from the time of accident or if there has been no deterioration in the level of consciousness from the time of accident, an accurate record of the neurological examination at the time of admission must be made. If there is indication of injury to the abdomen or chest as suggested by a rapid and thready pulse and low blood pressure, intravenous 5% glucose drip should be started and arrangements made for blood transfusion. Every unconscious patient must have an airway and his throat should be cleared of blood clot and any loose pieces of teeth and dentures removed.

8. If the patient has been fully conscious from the time of accident and has not been complaining of any headache and he lives locally or has been referred from a local hospital, he can be sent back with the advice to report if there are any further developments.

9. If the patient has become unconscious a few days after the head injury and has marked neck stiffness, the possibility of post traumatic pyogenic meningitis must be considered and appropriate steps taken.

PSYCHIATRIC EMERGENCIES

Acute Excitement:

1. Talk to the patient and see if he responds. Help him overcome his fears by telling him who you are and how you are interested only in helping him. If he has complaints against his relatives listen to him. (You do not have to agree with him) Listening to the patient reduced his excitement.

2. Sedate the patient: Before sedating, check the blood pressure. If it is normal give Inj. Chlorpromazine I.M. 100 mg. for an average weight patient. If the excitement prevents the checking of B.P. and you have some doubt about its being abnormal, give Paraldehyde 7 ml deep I.M.

3. Once the patient is sedated take a careful history from the relatives. Rule out the possibility of organic pathology as the cause of excitement. To rule out organic pathology check the following:

   (a) History of fits, fever, recent intake of alcohol, intake of psycholeptic drugs and Head injury.

   (b) History of fluctuations of consciousness and confusion.

4. Do a complete physical examination, remembering to examine the fundi.

5. Carry out a complete mental examination (Wait if the patient has slept off!)

6. Draw blood for Hb, WBC (total and differential), ESR, VDRL and random blood sugar.

7. If the history and physical examination point towards an organic pathology and/or mental examination show that his main impairment is that of cognitive functions, take the help of senior resident/consultant in deciding further course of action.

8. If the excitement appears to be due to functional psychosis further treatment should be given appropriate to the condition suspected (schizophrenia or mania). Oral medication should replace parenteral medication as soon as possible.

9. Always look for evidence of dehydration and malnutrition. Many psychotics in excitement have not had food or fluids for days before being brought into the hospital. Remeber to give the appropriate nourishment. If there is evidence of severe dehydration I-V glucose-saline drip may be started. Other electrolytes may be added to the regime after a serum electrolyte check.

HYSTERIA

A. Hysterical fits: These must be distinguished from genuine epileptic fits.

Though the hysterical symptoms can create quite a panic amongst the relatives (after all this is the aim!), it is hardly ever necessary to admit such a patient to the hospital.

The logical treatment is to make the patient realise the meaning of the symptoms, to help her face the stress and if possible remove the latter. This may take a long time. The removal of symptom is however necessary since it allays the relatives' anxiety and facilities psychotherapy.

The removal of symptoms is to be carried out through suggestion. Verbal suggestion usually suffices. However in difficult cases I-V Penthothal (250 mg in 10 cc, given slowly till the patient is drowsy) or ether (open ether with a mask) may be tried. The following points may be remembered in connection with suggestion therapy:

a. Once the treatment is started do not leave the patient till the desired objective is attained.

b. Never make a suggestion that symptoms will be removed completely in that particular session. Always say that considerable improvement would result.

ALCOHOLIC INTOXICATION

A person under alcoholic excitement does not need admission except when he is violent. Even then it is usually enough to let the person 'sleep off' the intoxication. Occasionally it is however, necessary to control the excitement by giving Inj. Diazepam 10 mg I.M. Extreme violence may require Chlorpromazine 50-100 mg I.M.

Remember to maintain the fluid balance, with the help of I-V glucose (5%) drip if necessary.

ALCOHOL WITHDRAWAL

If a person with a long history of substantial intake of alcohol is brought with symptoms of restlessness, confusion, excitement or hallucinations, think of alcohol withdrawal syndrome. The typical delirium and tremors may br many not be present. A careful history will reval that the person has missed his usual quota of alcohol in the last few days.

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Management:

1. Control the restlessness and excitement with Chlorpromazine 50-100 mg 2-3 times a day depending on the severity of the symptoms. The first dose may be given intramuscularly.

2. Maintain the fluid balance. A patient in the withdrawal state is usually dehydrated. This must be corrected with I-V glucose-saline drip if necessary.

3. Maintain the nutrition by giving I-V B_1 (Aneurin Hydrochloride 100 mg) slowly.

4. Occasionally withdrawal state is marked by occurrence of epileptic fits. Phenobarbitone 30-60 mg once a day will control these fits.

STUPOR

The functional stupor may be due to schizophrenia, depression or hysteria.

A careful history is the best way of distinguishing the three varities. History may reveal features of schizophrenic or depressive illness before the onset of stupor. A hysterical stupor is usually sudden in onset and in response to a psychological precipitant.

An examination of the patient's appearance and behaviour will also help in diagnosis.

1. Schizophrenic (catatonic) stupor is marked by rigidity of posture and waxy flexibility. Stereotyped movements may be present.

2. In depressive stupor the patient may have a depressed look or a mask like face but clear expression in the eyes.

3. In hysterical stupor the patient may resist passive movements. The patient may reflexly withdraw when presented with a sudden threatening gesture.

Management: The immediate necessity is to provide nutrition and fluids for all the three kinds of stupor. The patients usually respond to gentle presuasion and tube feeding is necessary only in exceptional cases. In catatonic and dressive stupor E.C.T. should be given as soon as possible.

SUICIDAL THREAT

The suidical threats are made by a depressive patient, a hysteric trying to attract attention or a person with no psychiatric abnormality but with a vriable degree of personality strength unable to face a social stress. A careful history will reveal the nature of pathology.

Remember to take every suididal threat seriously however much you suspect the seriousness of intention, since you can never be sure.

Keep the patient under direct vigilance. Psychotherapeutic efforts must be started immediately. Initially they consist of listening to the patient and if he is unwilling to communicate, of gradually helping him to talk. This requires patience and time, something which every resident must be willing to offer.

For a patient with depressive psychosis antidepressant treatment must be started immediately. Suicidal-intention in a depressed patient is a strong indication for E.C.T.

A situation may arise in the wards when a patient manipulates himself into a position when he can commit suicide within a moment (like getting on to the roof top or standing in a window ready to jump). Any rash attempt at apprehending him will only hasten his decision to end his life.

Start talking to the patient: Start asking him the reasons for his decision. Take him through the history of his life. Remind him of his responsibilities. Above all offer the assurance that you yourself will offer him the emotional support, the lack of which is making the patient so despondent. Keep a continuous flow of conversation and while you talk someone else should try to reach him without arousing attention.

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EMAS

Chief Employment Adviser's notes of guidance

230-4

Dust disease, chest X-rays in

Department of Employment, November 1972

1 The extent, clarity and contrast of detail that the reader requires needs a good machine and good standardized radiographic and developing technique. A full plate including both costo-phrenic angles is essential. For survey purposes panel reading is required which may involve delay. All films should be scrutinized before dispatch to detect those conditions requiring urgent action.

2 The MRC/EMAS reference panel for classification of X-rays is endeavouring to define radiological techniques necessary to obtain satisfactory films of the lungs.

Classification of radiographic appearance for survey purposes

3 The ILO U/C International Classification of Radiographs of Pneumoconioses 1971 provides a means for the systematic recording of radiographic changes produced by mineral dusts. A set of chest radiographs has been published to act as a standard for limits of normality and for the classification and quantification of radiological features. The classification may be used clinically but has special application in the study of the prevalence of radiological abnormalities in populations at risk, or for following the radiological progression in individuals or groups.

Correction for inter- and intra- observer errors has exercised considerable thought and multiple reader techniques and statistical treatment of scores are still evolving.

4 *Objects of classification.* The aim of classification is to codify the radiological appearances of the pneumoconioses in a simple, easily reproducible way. It is intended to describe the radiographic appearances of the persistent opacities associated with pneumoconiosis, not to define pathological entities, nor to take into account the question of working capacity.

5 Using the standard films for reference the reader examines and reports on chest radiographs systematically, once having decided that any of the changes in pleura or parenchyma are characteristic of pneumoconiosis. The technical quality of the film is first commented on by the reader.

6 *Small opacities*

Two types of small opacity are described; small rounded opacities and small irregular opacities.

Small rounded opacities are classified according to the approximate diameter of the predominant opacities.

p = rounded opacities up to about 1.5 mm diameter.

q (m) = rounded opacities exceeding about 1.5 and up to about 3 mm diameter.

r (n) = rounded opacities exceeding about 3 mm diameter but less than 1 cm diameter.

Small irregular opacities are classified roughly on the basis of thickness of the predominant type of small irregular opacity.

s = fine irregular or linear opacities.

t = medium irregular opacities.

u = coarse (blotchy) irregular opacities.

7 *Profusion of small opacities*

The profusion of small opacities is defined by the standard films which indicate the mid categories 1/1, 2/2 and 3/3. The scale runs from 0 - 3.

Category 0 = small opacities absent or less profuse than in category 1.

Category 1 = small opacities definitely present, but few in number. They are more commonly seen in the lower zones, but may occur in any zone, or in one lung only.

Category 2 = small opacities numerous. The normal lung markings are usually partly obscured.

Category 3 = small opacities very numerous. The normal lung markings are usually totally obscured.

Profusion is considered as a continuum ranging from a parenchyma containing no small opacities to one that is grossly abnormal.

The reader attempts to place the film within the scale. Having made the definitive classification of profusion the reader considers whether a category above or below was considered as a serious alternative and records this. Thus he would record category 2/1 for a film which he decides is definitely category 2 but where category 1 was seriously considered as an alternative. This elaboration of the categories produces the following scale:

0/-, 0/0, 0/1, 1/0, 1/1, 1/2, 2/1, 2/2, 2/3, 3/2, 3/3, 3/4.

Subcategory 0/0 is a radiograph in which there are no small opacities, or if a few are thought to be present, they are not sufficiently definite or numerous for category 1 to be considered. There may be other abnormalities present not due to pneumoconiosis. Occasionally films look exceptionally 'normal', e.g., the normal architecture is particularly well seen. These very obviously normal films are usually, though not exclusively, from young individuals. Provision for these is made by the category 0/-.

Where both types of small opacities co-exist the profusions are scored individually; but in the latest revision of the ILO U/C classification it is suggested that a combined profusion score should be made.

8 *Extent of small opacities*

The zones in which the opacities are seen are recorded - each lung being divided into three zones by horizontal lines drawn at 1/3 and 2/3 of the vertical distance between the apex of the lung and the dome of the diaphragm giving six zones in all.

9 *Large opacities*

Large opacities are differentiated into well defined and ill defined. Reference to standard films will help to make the differentiation.

A One opacity with largest diameter 1–5 cm or several each greater than 1 cm the sum of whose diameters is 5 cm or less.

B One or more opacities, larger or more numerous than A whose combined area is less than one third of one lung field.

C One or more large opacities of combined area greater than one third of one lung field.

10 *Pleural thickening*

The extent, width and site of pleural thickening are recorded separately. The costo-phrenic angle is examined for obliteration using the lower limit standard film for comparison and the site (right or left) specified. Pleural thickening affecting the chest wall is classified by *site* (right or left); *width,* in relation to measured thickness of the widest part of any pleural shadow; and *extent,* measured by total length related to the projection of the lateral chest wall.

11 *Diaphragm*

Ill defined diaphragm is recorded if more than 1/3 of a hemidiaphragm is affected. A standard film indicates the lower limit.

12 *Cardiac outline*

Ill defined cardiac outline is recorded and graded according to extent, using the standard film as reference for the lower limit of Grade 1.

13 *Pleural calcification*

The *site* of pleural calcification in terms of site (right or left), chest wall, diaphragm and mediastinum is recorded, and the *extent* is graded by measuring.

Additional symbols

14 Twenty additional symbols have been obligatory, it being assumed that the phrases 'suspect', 'changes suggestive of' and 'opacities suggestive of' precede these symbols (e.g.):

ca Suspect cancer of the lung

es Eggshell calcification of lymph nodes

od Other significant diseases

tba Opacities suggestive of active tuberculosis

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Lloyd Davies, T.A. (1971) Respiratory Disease in Foundrymen: Report of a Survey. Department of Employment. HMSO London.

236-5

Noise from industrial plant is less significant than that from motor vehicles, rail traffic and aircraft as a source of discomfort in the community, but it is of some importance and nowadays rightly receives considerable attention.

The evaluation on the effect of noise on people is a sociological and medical task, the measurement and control of noise as a whole scientific and engineering task.

To decide what noise limit is appropriate in any particular case, the engineer should consider the question under the two headings of legal requirements and public acceptance.

I The legal position:

In Britain, there is no specific legal limit to community noise. The permissible noise level in any locality is determined by public tolerance, communal and individual and by the opinion of local authority or courts as to what noise is appropriate to the locality. This has to be considered under Statute Law and Common Law.

(i) Noise Abatement Act:

The local authority can take action under the Noise Abatement Act on its own initiative or at the request of local residents. Similarly, these residents can institute proceedings through the local magistrate.

It is unlikely that action would be taken under the Act unless there is evidence of fairly widespread discontent or of irresponsibility on the part of the works management.

(ii) Common Law:

Any local resident can take action under common law, and if the court finds that a nuisance exists it will grant damages or an injunction or both. To constitute "nuisance" the noise must interfere materially with comfort or with enjoyment of property. The plea that the noise is unavoidable is not available as a defence.

II The role of public relations:

Common Law requires that a works must avoid material interference with comfort or enjoyment or property. In this it is acting to some extent as an instrument of social conscience and thus legal and public relations considerations are closely linked. Public relation activity can also make a more specific contribution towards the setting of design standards by the thorough investigation of complaints.

III Response to Community Noise:

The basic problem in setting a standard is that criteria of acceptability must be based on subjective response. One assumes that if a significant number of people in a community are suffering appreciable discomfort, then some at least of these people will complain.

IV The next step is to use this criterion of acceptability to define limits:

The British Standard Method

The British Standard B.S. 4142 represents an accumulation of such experience The procedure set out for rating noise is:-

(i) A "corrected criterion" is determined. This is based on such factors as the type of neighbourhood, whether the works is well established so as to be in keeping with the neighbourhood, and the time of day when noise will occur.

(ii) If it is possible to measure the background noise alone, this should be done.

(iii) The level of noise from the works is measured, and corrected for factors such as noise character.

(iv) The corrected criterion, together with the background noise, if available, is compared with the corrected noise level. From this comparison the likelihood of complaints can be determined.

The standard indicates that if the corrected noise level equals the corrected criterion then complaints are possible but not likely.

The British Standard does not set out to recommend either criteria of acceptability or limits; it is designed to enable the noise to be assessed and the likelihood of complaints to be forecast. Experience in the oil companies International Study Group for conservation of clean air and water - Western Europe (CONCAWE) and in the oil companies Materials Association (OCMA) indicates that B.S. is a reliable guide.

Predicted and actual response level:

According to B.S.4142 complaints are to be expected if the noise level is 10 dBA above the corrected criterion, but they are definitely not to be expected if the noise level is 10 dBA below the criterion. It is therefore reasonable to take the corrected criterion as the complaint threshold.

Corrected noise criteria:

	Rural	Urban
Basic criterion	50 dBA	50 dBA
Type of installation	+ 5	+ 5
Type of district	- 5	+ 5
Time of day (night)	- 5	- 5
[illegible]	45	55

I.S.O. method:

In I.S.O. method the basic criterion is given as 35-45 dBA against the B.S. figure of 50 dBA. It does not give a specific complaint threshold.

N.B. (a) B.S.4142 does not cater for variation in noise level which is steady.

(b) It is important to recognise that a spot reading of neighbourhood noise at any location is of limited value and may be grossly misleading.

To summarize an engineer's task falls into three stages:-

Firstly, he must have a criterion of acceptability of neighbourhood noise, and must define the actual noise level which will satisfy this criterion.

Secondly, he must adopt a suitable design specification. The CCMA specification is the most comprehensive plant noise - specification yet published.

Thirdly, he must see that the necessary noise reduction measures are included in the plant design.

Fan Noise

Source of noise:

(1) Some new plants employ banks of these coolers in both elevated and ground positions in such a way as to combine separate relatively small sources of sound power into considerable noise generators.

(2) Use of higher speeds and powers has led to aggravation of the problem compared with earlier installations.

Measurement of sound power level:

Sound power level from the fans can be calculated as follows:

$$L_W = Lp + 10 \log_{10} 2$$

where L_W = maximum octave band sound power level.

Lp = maximum octave band sound pressure level at boundary.

V = distance from source to boundary in meters.

The total sound power in a given direction from n fans, each of horse power h, is given by the expression

$$90 + 10 \log \frac{nh}{2}$$

Community reaction due to Fan noise:

A bank of coolers having three fans was the cause of vigorous complaint by local residents whose houses were only 150 feet distant. Measurement showed that the noise level produced by the fans at the nearest house was in fact just within the acceptable level as predicted by the method given in BS 4142. The main cause of complaint was the low frequency hum at about 40 HZ i.e. the blade passage frequency using both inertia and absorption silencers to cope with the frequencies eventually a reduction of 6 dBA was achieved at the houses. In spite of the fact that the noise level was then well below the B.S.4142 figure, occasional complaints were received because a slight 40 HZ hum was still discernable.

This experience reinforces our belief that where problems of nuisance arise due to a noise containing discrete tones, the 5 dBA allowance suggested in BS 4142 is insufficient. In such cases an allowance of 10 dBA is usually made.

The Siting of Industry under the Town and Country Planning Acts

The use of land is controlled by making development subject to permission. Planning authorities may grant permission either unconditionally or subject to such conditions as they think fit. An appeal lies to the Minister of Housing and Local Government or the secretary of State for Scotland against a refusal of permission or against particular conditions attached to a permission.

If despite all the case exercised by the planning authority a new factory turns out to be a noisy neighbour, action would fall to be taken by the public health authority under the Noise Abatement Act and not by the planning Authority.

Rules for assessing community reactions to Industrial Noise

(1) Annoyance from industrial noise, as from other types of noise, is a subjective phenomenon affected by many factors.

(2) Rules for assessing public reaction to noise which are being considered by the I.S.O. and those of Stevens, Rosenblith and Bolt for American conditions are also appropriate here.

(3) The procedure devised by Building Research Station enable a correct forecast to be made in 9 cases out of 10.

(4) If planning permission is given for a new factory which subsequently proves to be a noisy neighbour, any action taken by a local authority under the Noise Abatement Act, 1960, would be taken by the Public Health authority and not by the planning authority and planning authorities should, therefore, consult the public health authority when considering applications for planning permission for new factories.

Procedure for assessing reaction to Industrial Noise in mixed residential and Industrial areas

In this procedure for assessment, a basic noise level is first identified and then allowances are added to or subtracted from it in accordance with a set of rules.

Measuring apparatus: The measurements are made with a sound level meter which complies with BS 3489 : 1962, British Standard for industrial grade sound level Meters and which is fitted with an "A" weighting network and capable of measurements in the range 30 to 90 dBA at least.

Measuring Technique:

(a) The noise levels are to be measured using a sound level meter (B.S. 3489) which has had its acoustic calibration checked within the previous week.

(b) All measurements are to be made out of doors approximately 12 feet from the side of the nearest inhibited building which faces the noise source and with the microphone of the sound level meter at 4 ft above the ground level: it is intended that this measurement should be representative of the noise at the outside of the building from which complaints have occurred or might be expected.

Rules for determining the basic level and allowances

I Basic level

(a) A basic level of 50 dBA is to be taken for either

(i) new factories

or (ii) existing factories in which structural alterations are being made such as are likely to increase the noise transmission to the outside; for example, a change from a solid wall to one of light frame construction or the provision of new ventilation openings.

or (iii) existing factories in which a new process likely to cause noise is being installed.

(b) A basic figure of 55 dBA is to be taken for factories which have been established for a few years but which are not typical of the area in which they are situated; or are in districts where such factories would not normally be expected; i.e. they do not obviously fall

Rules for determining the basic level and allowances (continued)

I Basic level (continued)

(c) A basic figure of 60 dBA is to be taken for old established factories which are completely in character with the area in which they are situated (e.g. B.S.C. in Teesside and Shipbuilding in Clyde).

II Allowances

(1) If the noise has a definite distinguishable continuous note (whine, hiss, screech, squeal, noticeable humming noise), subtract 5 dBA.

(2) If there are any bangs, clanks, thumps, hammering, rivetting or other significant impulsive irregularities in the noise, also if the noise is irregular enough continually to attract attention, subtract 5 dBA.

(3) If the noise occurs on:

Weekdays only 8 a.m. - 6 p.m.	- Add 5dBA	) Lowest
Evening up to 10 p.m.	- Add 0dBA	) appropriate
Weekends	- Add 0dBA	) one should
Nighttime 10 p.m. - 7 a.m.	- Subtract 5 dBA	) be applied.

(4) Type of district:

(a) Rural (residential)	Subtract	5 dBA	) Select one only
(b) Suburban or urban, no road traffic	Add	0 dBA	)
(c) Residential urban	Add	5 dBA	)
(d) Urban with light industry or main roads	Add	10 dBA	)
(e) General Industrial area	Add	15 dBA	)
(f) Heavy Industrial area	Add	20 dBA	)

(5) In some cases the noise from the process is not constant, but significantly louder noise occurs at intervals, say for less than half the time. When these louder noises occur during the day the following allowances may also be made to determine an intermittent limiting level:

Noise occuring about 15 minutes per hour	add 5 dBA
Noise occuring about 5 minutes per hour	add 10 dBA
Noise occurring about 1 minute per hour	add 15 dBA
Noise occurring about 1 minute per half day	add 20 dBA

Assessment - If the measured noise level in dBA exceeds the limiting level given by the rules as the sum of a basic level and appropriate allowances, then complaints from an ordinary reasonable person may be expected.

Conclusions - The various allowances proposed in the rules are those which appear to be most appropriate in this country. Experience may show that the other factors may be relevant. For instance in some of the more complex procedures an allowance of 0 for Winter and -5 for Summer conditions is sought to be appropriate, since in the Summer both the factory and the residents may have more windows open for ventilation thus giving higher noise levels in the dwelling.

Buildings of light cladding construction offering less resistance to the passage of the sound, should also be considered.

ITI Ltd.,

Form No. W-829 (Mod. I)

PRE-EMPLOYMENT MEDICAL EXAMINATION REPORT

238-6

Name of the Person : _____ Father's Name :

COMMUNITY HEALTH CELL
47/1, (First Floor), St. Marks Rd
BANGALORE - 560 001

Post for which applied : _____ Category : _____

1. PERMANENT ADDRESS	2. MARITAL STATUS	3. AGE AND DATE OF BIRTH			
		Stated	Age	Date of Birth	Apparent Age

4. FAMILY HISTORY		FATHER	MOTHER	Do you know any of these Diseases in your family			
	Alive or Dead			Tuberculosis		H B P	
	Cause of Death			Leprosy		Cancer	
	Age at Death			Diabetes		Mental Disease	

5. PERSONAL HISTORY	(a) Previous Occupation	(b) Previous Diseases			
		TB	Asthma	Fits	Leprosy

	(c) Surgical operation :	(d) Accidents :			
	(e) Vaccination	Small Pox	Polio	Tetanus	Any other

6. FINGER IMPRESSION OF THE CANDIDATE		Thumb	Index Finger	Middle Finger	Ring Finger	Little Finger
	Left Hand					
	Right Hand					

Date : / / 19 .

Signature of the Candidate

7. GENERAL	Identification Marks	Weight	Height	CHEST	
				Expiration	Inspiration

8. ALIMENTARY SYSTEM	Gums.	Teeth & Tongue	Throat	Liver and spleen	Any evidence of Peptic Ulcer	Anorectal Exam. (in suspected cases)

9. CARDIO – VASCULAR SYSTEM	Heart	Size	Rhythm	Pulse & Condition of the Blood vessels	Rate	Rhythm	Blood Pr.

10. RESPIRATORY SYSTEM	Any deformity of the chest	Lungs

PTO

11. X-RAY REPORT	

12. NERVOUS SYSTEM	Gait & Speech	Muscular Co-ordination	Wasting	Tremors	Reflexes	Sensations	Any evidence of Paralysis or Epilepsy.

13. GENITO URINARY SYSTEM	ANY PRESENCE OF		ANY EVIDENCE OF		URINE ANALYSIS		
	Hernia	Hydrocele	V. D.	Disease in urinary system	Sp. Cr.	Alb.	Sugar

14. EXTREMITIES	Deformity	Varicosity	Oedema

15 OTHER DISEASES	Lymphnodes	Thyroid	Spine	Skin

16. SPECIAL SENSES						
(i) Ears.	Disease		Abnormality		Hearing Right	Hearing Left
(ii) Vision :	(a) Accuity				(b) Colour Vision	(c) Any other Abnormality
		RE without Glass LE		RE With Glass LE		
	Distant					
	Near					

17. FOR FEMALE CANDIDATES ONLY	Any Menstrual Disease	Condition of Breasts.	Any evidence of Pregnancy.
	Any evidence of Disease of Ovaries	Any evidence of Disease of Uterus or Genitals	Any other Gynaecological abnormality

18. SPECIAL INVESTIGA — TIONS IF ANY	
19. REMARKS	
20. CERTIFIED	FIT / TEMPORARILY UNFIT / UNFIT

Date :_____

_____

Signature of the Medical Officer.

Chemical laboratory:

Precision balance
Refrigerator
Deioniser
Spectrophotometer (visible range)
Electrical hot plate
Muffle furnace
Platinum ware
Laboratory oven
Multi-gas detector kit
Fume cupboard
pH meter
Ultraviolet lamp
Controlled-temperature water bath
Laboratory scales
Centrifuge
Polyethylene aspirators
Specimen bottles, etc.
Laboratory glassware (borosilicate)
Miscellaneous apparatus such as bunsen burners, etc.

Physics laboratory - thermal and ventilation equipment:

Kata thermometers (all ranges)
Whirling hygrometer
Globe thermometers
Surface-temperature thermometer (electronic)
Velometer
Vane anemometer
Pilot static tube
Smoke generators
Precision barometer

Physics laboratory - acoustic equipment:

Precision sound level meter
Precision octave-band analyser
Calibration device
Impact-noise meter
One third octave band analyser
Tape recorder
Oscilloscope
White noise generator
Vibration meter

Physics laboratory - illumination equipment:

Lightmeter calibrated in lux and fitted with cosine-corrected photocell

Dust laboratory:

Size-selective personal samplers
Total (non-selective) personal samplers
Size-selective static samplers (Hexhlets)
Membrane-filter sampling head and filters (useful for asbestos evaluations)
High-resolution micrope for evaluation of dustsamples (phase contrast is desirable)
Precision balance
Consideration could be given to the additional use of a konimeter for rapid semiquantitative assessments of dusty situations

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Medical examination room - the final selection will be the task of the service medical officer but the following items are suggested:

Scales (weight and height)
Haemoglobinometer
Haematocrit centrifuge (packed-cell volume determinations)
Respirometer
Lung function test apparatus
Visual acuity screening instrument and colour vision screening equipment

General sampling equipment:

Air sampling pumps
Air flow meters
Fume sampling heads
Gas-washing flasks
Glass fibre, polystyrene and cellulose filters
Gas sampling bags

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HYGIENE STANDARDS FOR COTTON DUST

BRITISH OCCUPATIONAL HYGIENE SOCIETY COMMITTEE ON HYGIENE STANDARDS
SUB-COMMITTEE ON VEGETABLE TEXTILE DUSTS

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SUMMARY AND RECOMMENDATION

1. As long as there is any airborne cotton dust in the work environment there may be some small risk to health. Nevertheless, exposure up to certain limits can be tolerated for a lifetime without incurring undue risks.

2. The sub-committee believes that a proper and reasonable objective would be to reduce the prevalence of grade II byssinosis due to airborne dust to less than 4 in 100 (4 per cent) among those who work in the dustiest conditions. It is well-established that grade II byssinosis is relatable to dust concentration and length of exposure and that permanent disability resulting from dust exposure usually occurs only among those who have reached this stage of the disease. However, the evidence of the relationship between byssinosis grades and permanent disability is not conclusive. In the meantime it is necessary for the industry to have realistic dust levels at which to aim in order to reduce the risk of contracting the least demonstrable permanent effects to as low a level as possible. The values below are the best that can be derived from existing data.

3. It is recommended that exposures which lie in certain ranges of dustiness be categorized according to the following scheme:

Category	Dust concentration, less fly averaged over 8 hr (mg/m³)
Low	0·5 or less
Moderate	More than 0·5 and less than 1·0
Excessive	1·0 or more

The concentration, less fly, is the weight of dust, in milligrams per cubic metre of air, excluding particles which would be caught by a 2 mm wire mesh gauze, wire diameter 0·2 mm, 1·8 mm square aperture.

4. The sub-committee believes that there are good reasons for introducing pre-employment and periodic examinations for cotton workers, but that the value of such examinations should be re-assessed after a period of 5 years. On engagement they should be questioned on their medical history and be given tests of respiratory function with the object of identifying those with chronic bronchitis or other respiratory disability which might be exacerbated by exposure to cotton dust, and placing those so identified in work away from undue exposure. Periodic examinations are recommended thereafter, at intervals of not more than three years, and if the dust exposure is "excessive" the interval should be one year.

These examinations should include an occupational history, a questionnaire on respiratory symptoms and tests of the ventilatory capacity of the lungs.

It is recommended that alternative employment be sought for any employee whose symptoms are worsening and causing disability or whose $FEV_{1\cdot0}$ repeatedly falls by 0·20 litres or more during a shift or whose $FEV_{1\cdot0}$ is (for males) more than 1 litre below that expected, or, for females, 0·8 litres below that expected.

It is further recommended that in any workroom where the concentration of dust in air is less than 0·5 mg/m³, but in which the employees have a prevalence of byssinosis (grade 1/2) exceeding 4 per cent or an average fall in $FEV_{1\cdot0}$ over a shift exceeding 0·06 litres the exposure be re-classified to the "moderate" dust category.

5. When it is necessary to work for short periods in an environment where airborne dust concentrations are very high respiratory protection should be provided. An orinasal dust respirator fitted with an encapsulated high efficiency dust filter and meeting BS:2091 (1968) is suitable in dust concentrations up to 10 mg/m³. Should the concentration exceed or be likely to exceed this level a higher standard of respiratory protection should be provided.

6. The discharged air from an air cleaner in a ventilation system exhausting air from a workroom might contain fine particles in suspension. It is recommended as a precautionary measure that this air should not be recirculated unless it is effectively filtered, or is mixed with fresh air to such an extent that each cubic metre of the combined air contains less than 0·1 mg of dust.

7. The standards are, in our opinion, the best that can be drawn up from existing knowledge. They should be reviewed over the next 5 years as more information accumulates.

The data on which they are based come primarily from experience in cotton spinning mills, covering the preparatory stages up to and including winding rooms. The precise agent or agents responsible for byssinosis are not known with certainty and the relative importance of the finest particles has not yet been completely elucidated. Due caution should, therefore, be exercised in applying these standards to other cotton processes and other vegetable fibres.

BACKGROUND

Introduction

The Committee on Hygiene Standards of the British Occupational Society reviewed the standards suggested by ROACH and SCHILLING (1960) from their studies in the British cotton industry and the documentation of the 'Threshold Limit Value (TLV)' for cotton dust (raw) recommended by the AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) (1970) which was primarily based on the British work.

In the fifteen years which have elapsed since the original work was done in Lancashire, the British cotton industry has continued to contract and to concentrate production in fewer mills. This has been accompanied by an increasing use of artificial fibres, modifications to processes, considerable increases in the speed and throughput of processing machines including winding machines and the introduction of the "Crosrol", a process which gives rise to much dust. Enclosure and exhaust extraction have become commonplace on dusty carding engines. Further, byssinosis has been the subject of much research in recent years using a variety of techniques to assess the prevalence of the disease, the severity of the condition and the dustiness of the atmosphere. Also, the disease has been found in processing flax and soft hemp (*Cannabis sativa*). Accordingly, the Sub-Committee on Vegetable Textile Dusts was appointed to review hygiene standards for cotton and other textile dusts and, where necessary, make recommendations for new standards.

The terms of reference of the sub-committee were:

1. To recommend hygiene standards for vegetable textile dusts in air.
2. To recommend sampling instruments, sampling procedures and analytical techniques for testing compliance with the standards.
3. To indicate the degree of protection associated with the recommended standards.

In this report, the sub-committee has restricted its attention to dust arising from the processing of cotton. Most of the available data on the relationship between airborne vegetable textile dust and respiratory disease come from studies in the cotton industry.

The sub-committee interpreted the terms of reference to include discussion of medical examinations done in association with dust control.

COTTON

Cotton is the downy cellulose fibre which covers the seeds of the cotton plant (genus *Gossypium*, family *Malvaceae*). Cotton plants grow in warm, dry climates to a height of 2–4 ft. The cotton and seed inside it make up the cotton boll which is picked by hand or machine when fully mature. The bract and pericarp at the base of the boll and occasionally a short length of twig are broken off with the boll in hand picking. In mechanical picking more of the plant, including the leaves and stem, may be picked. The bolls are passed through a ginning process to separate the seed and other materials

from the cotton, which is then packed and compressed into bales for shipment to the spinning mills. At the mills, different grades are opened and mixed together by machine. The cotton is mechanically cleaned, drafted and spun, and then wound into finished yarn in successive stages in spinning mills.

Cotton mills can be classified according to the quality of raw cotton which they spin and the fineness of the yarn which they produce.

Coarse mills normally process cotton of low grade and short fibre length, whereas fine mills normally process cotton of high grade and long fibre.

The staple length is a major criterion of cotton quality and is a measure of the length of the cotton fibres.

The grade of cotton depends upon the colour and "trash" content which can be assessed visually, e.g. "good middling" (high grade) to "strict good ordinary" (low grade).

"Trash" is the plant debris and soil from the parent plant. Trash content is expressed as a percentage of the total weight of the raw cotton. The natural colour ranges from white to brown.

"Fly" is the cotton and very large airborne particles seen by the naked eye in cotton mills. It consists mostly of broken cotton fibres up to an inch in length, and pieces of plant debris too large to enter the lungs.

The relative fineness of the spun yarn is expressed in terms of length per unit weight. Several different units are in use. The English system is based on the "count" or number of hanks of yarn which make up one pound weight. A hank is 840 yards in length. Thus, for example, medium cotton of count 20 has 20×840 yards of yarn per pound weight. The higher the count the finer the yarn. The grade and staple length of the raw cotton commonly used and the range of count produced in each type of mill are shown below:

Classification	Count of yarn spun	Staple length of cotton (in.)	Trash content of cotton (%)
Coarse	6–12	Less than 1	4–15
Medium	12–44	1–1⅛	1·5–5
Fine	40–120	1–1½	2·0 approx

BYSSINOSIS

Byssinosis is a respiratory disease occurring among cotton, flax and soft hemp workers exposed to dust during the cleaning and processing of fibres. It was first officially recognized as an occupational disease when a compensation scheme was introduced in 1942 for cotton workers in mixing, blow and card rooms in Lancashire (HOME OFFICE, 1939). Recent investigations have shown that the disease may also occur during the earlier processes of ginning and bale pressing and in the later processes of spinning and winding (EL BATAWI, 1962; BELIN, BOUHUYS, HOEKSTRA, JOHANSSON, LINDEL and POOL, 1965; MEKKY, ROACH and SCHILLING, 1967; SCHILLING, VIGLIANI, LAMMERS, VALIC and GILSON, 1963; BRITISH MEDICAL JOURNAL, 1962). There is also evidence indicating that cigarette smoking and atmospheric pollutants outside the factory may exacerbate the effects of cotton dust (MCKERROW and SCHILLING, 1961; LAMMERS, SCHILLING and WALFORD, 1964; SCHILLING, 1964).

The characteristic symptoms of byssinosis occur on the first day back at work after a break. There may be cough, chest tightness or difficulty in breathing. The affected worker may first notice symptoms after annual holidays but later on they usually occur after weekends. Early effects may be noticed during the first year of exposure to dust and at this stage the first and only complaint may be cough or chest tightness after the work shift immediately following the weekend break (Mondays in Western countries). The cough, the feeling of chest tightness, or difficulty in breathing may disappear shortly after leaving the workplace. On Tuesdays there are no symptoms. As the disease progresses, the symptoms worsen and are accompanied by breathlessness. They extend to Tuesdays and then to other days, although at this stage of the disease there is still improvement as the week goes on. Eventually, the worker may become severely affected on every working day with chronic cough and sputum and permanent breathlessness which does not materially diminish, even on leaving the cotton industry. At this stage, the effects of cotton dust cannot be distinguished from chronic bronchitis, except that the past history of chest symptoms, characteristically worse at the beginning of the week, may suggest the aetiology.

Chest radiographs and pathology

No changes have been found either in chest radiographs or in the pathology of the lungs which are specific to byssinosis.

Ventilatory function tests

Exposure to the dusts of cotton, flax and soft hemp causes both temporary and permanent changes in ventilatory capacity. The most commonly used measurement is the Forced Expiratory Volume measured over 1·0 sec ($FEV_{1\cdot0}$). A temporary fall in ventilatory capacity may be revealed by measuring the $FEV_{1\cdot0}$ at the beginning and end of the work shift. Such a change is usually more marked in workers with symptoms of byssinosis than in those without symptoms. Nevertheless, there may be some workers who have a substantial fall in $FEV_{1\cdot0}$ during the shift but no symptoms of byssinosis.

An abnormally low $FEV_{1\cdot0}$ measured while the subject has been absent from work for 2 days or more may denote a permanent effect of dust exposure on ventilatory capacity. Epidemiological surveys have shown that workers with symptoms of byssinosis have significantly lower ventilatory capacities than those without symptoms. In older subjects the reduction in $FEV_{1\cdot0}$ may be considerable and associated with severe disability.

Grading of byssinosis

The symptoms of byssinosis (SCHILLING *et al.*, 1963) may be graded as follows:

Grade 0	No symptoms of byssinosis.
Grade ½	Occasional chest tightness or difficulty in breathing on the first day of the working week.
Grade I	Chest tightness or difficulty in breathing on the first day of every working week.
Grade II	Chest tightness or difficulty in breathing on the first and other days of the working week.
Grade III	Grade II symptoms accompanied by evidence of permanent incapacity from diminished effort tolerance or reduced ventilatory capacity.

A grading of acute and permanent changes in ventilatory capacity is as follows (BOUHUYS, GILSON and SCHILLING, 1970):

F 0 No demonstrable acute effect of the dust on ventilatory capacity; no evidence of chronic ventilatory impairment.
F ½ Slight acute effect of dust on ventilatory capacity; no evidence of chronic ventilatory impairment.
F 1 Definite acute effect of dust on ventilatory capacity; no evidence of chronic ventilatory impairment.
F 2 Evidence of a slight to moderate irreversible impairment of ventilatory capacity.
F 3 Evidence of a moderate to severe irreversible impairment of ventilatory capacity.

The acute effect is measured by the fall in $FEV_{1\cdot0}$ from the beginning to the end of the work shift on the first working day of the week, and is classified thus:

Less than 0·06 litres—no acute effect.
0·06–0·20 litres—slight acute effect.
Over 0·20 litres—definite acute effect.

Chronic ventilatory impairment may be measured by the $FEV_{1\cdot0}$ in the absence of exposure for 2 days or more in relation to the $FEV_{1\cdot0}$ expected for a normal person of the same race, age and height (COTES, 1968).

The results may be classified as follows:

Over 80 per cent of predicted—no chronic ventilatory impairment.
60–80 per cent of predicted—slight to moderate chronic ventilatory impairment.
Less than 60 per cent of predicted—moderate to severe chronic ventilatory impairment.

Methods of measuring the ventilatory capacity and allowances to be made for sex, age, height and ethnic origin are described in Appendix 2.

Derivation of a hygiene standard

The Committee considers that it is not only necessary to prevent permanent ill effects, but also where possible, to limit temporary effects to the minimum consistent with practicable control procedures.

There is no exposure which can be guaranteed to be absolutely free of any possibility of adverse effects on the most sensitive people. There is no single threshold concentration of dust in air, common to everyone. The achievement of an air quality standard does not, by itself, guarantee completely safe conditions of work, but has to be supported by other protective measures. The application of engineering control procedures will limit and control the dustiness, but it is unrealistic to suppose that the dustiness can be reduced to zero. A recommended standard of air cleanliness should, to be accepted, be both technically feasible and within the means of the industry. Completely enclosing a process and exhausting the enclosure is least demanding of air volume flow-rate and can be applied where the operation of the machine is entirely automatic. Mixing and blowing processes may be enclosed and carding machines very nearly so, but it becomes increasingly difficult to conceive of practicable enclosure of later processes. The high air volume flow-rates required on partial enclosures or by general dilution ventilation are costly, not only in themselves but also because of the necessary conditioning of make-up air. The recirculation of exhausted air can only be contemplated at the expense of exceptionally good air cleaning units with fail-safe features.

Several investigations into the relationship between the prevalence of byssinosis and dust concentrations have been made during the last 10 years or so. Unfortunately, there have been differences in the dust sampling techniques employed and in the methods of grading symptoms which make it difficult to combine the results of one investigation with another.

TABLE 1. PREVALENCE OF BYSSINOSIS (ALL GRADES) AND TOTAL DUST CONCENTRATIONS BASED ON DATA FROM 8 INVESTIGATIONS

Total dust (mg/m³)	Prevalence of byssinosis (all grades) (%)	No. of people examined
0	1·5	212
0·5 –	2·8	108
1·0 –	9·9	1259
2·0 –	8·5	1226
3·0 –	34·0	465
4·0 –	55·0	245
5·0 +	27·5	92
	Total	3607

Nevertheless, data from eight investigations (Table 1) show a direct relationship between total airborne dust measured in mg/m³ and the prevalence of byssinosis all grades. (MCKERROW, MCDERMOTT, GILSON and SCHILLING, 1958; ROACH and SCHILLING, 1960; WOOD and ROACH, 1964; LAMMERS *et al.*, 1964; EL BATAWI, SCHILLING, VALIC and WALFORD, 1964; BIELIN *et al.*, 1965; MEKKY *et al.*, 1967; ZUSKIN, WOLFSON, HARPEL, WELBORN and BOUHUYS, 1969).

The relationship is irregular but indicates that the prevalence of byssinosis was less than 3 per cent in workrooms where concentrations were less than 1·0 mg/m³ and as high as 55 per cent in concentrations above 4 mg/m³. Only 47 (18·5 per cent) of the 255 workers classified according to grade of byssinosis, had Grade II symptoms (Table 2).

SCHILLING and ROACH (1961) and MOLYNEUX and TOMBLESON (1970) showed that the effects of differences in duration of exposure were small in comparison with the effects of differences in concentration. Extrapolating from the data in Tables 1 and 2, it would appear that at dust levels of 1 mg/m³ the risk of developing Grade II byssinosis would be negligible.

However, total dust measurements are unlikely to provide a universal index of risk because of the variable amounts of fly and finer dust fractions, both in different processes in the same mill and the same processes in different mills.

The effect of variation in the fly component can be seen by dividing the data in Table 1 where this is possible, into two groups in Table 3, as follows:

Group A Producing less fly, i.e. coarse processes up to and including cardrooms, medium and fine processes up to and including blow rooms.

Group B Producing more fly, i.e. coarse processes, spinning and winding rooms, medium and fine processes card, spinning and winding rooms.

TABLE 2. NUMBER OF BYSSINOTIC WORKERS WITH GRADE 1/2 SYMPTOMS AT VARIOUS LEVELS OF DUST CONCENTRATION

Total dust (mg/m³)	No. of workers with byssinosis		References
	All grades	Grade 1/2	
1·5	9	0	ROACH and SCHILLING, 1960
1·6	8	1	MEKKY *et al.*, 1967
1·7	13	3	ROACH and SCHILLING, 1960
1·7	27	7	ZUSKIN *et al.*, 1969
2·2	23	2	MEKKY *et al.*, 1967
2·8	6	0	MEKKY *et al.*, 1967
3·5	22	5	MEKKY *et al.*, 1967
4·0	142	29	ROACH and SCHILLING, 1960
6·0	5	0	MEKKY *et al.*, 1967
Total	255	47 (18·5 per cent)	

TABLE 3. PREVALENCE OF BYSSINOSIS AND TOTAL DUST CONCENTRATION IN ROOMS CHARACTERIZED ACCORDING TO CONTENT OF FLY IN DUST (SEE TEXT)

Total dust (mg/m³)	Group A process		Group B process	
	Prevalence (%)	No. of people examined	Prevalence (%)	No. of people examined
1·0—	10	10	6·3	684
2·0—	29	145	6·7	579
3·0—	47	240	20	225
4·0—	55	199	50	46
5·0+	36	39	21	53

This comparison shows that for similar total dust concentrations workrooms with less fly had higher prevalences of byssinosis than those with more fly.

The sub-committee recommends that the hygiene standards should be based on dust measurements which exclude fly.

In the recent prospective study of 772 female and 234 male cotton workers by MOLYNEUX and TOMBLESON (1970) dust concentrations were measured by a method which excluded fly. Comparison of their figures with those of ROACH and SCHILLING (1960) on whose data the previous ACGIH TLV was based, shows, as expected, a higher prevalence of byssinosis for similar dust levels (Fig. 1). The prevalences of byssinosis (Grade 1/2) on Molyneux and Tombleson's investigation, were respectively 6·2 and 6·5 per cent at dust levels (less fly) of 0·34 and 0·58 mg/m³. In Roach and Schilling's investigation no cases of byssinosis Grade 1/2 were recorded at these dust levels. Apart from the exclusion of fly, there are a number of other reasons why

prevalence rates found by Molyneux and Tombleson are higher for equivalent dust concentrations than those in Roach and Schilling's investigations:

1. Roach and Schilling's study, unlike that of Molyneux and Tombleson, included spinners who, for similar dust exposures, have a lower prevalence than card-room workers.
2. In all mills spinning coarse grades of cotton included in Molyneux and Tombleson's study, local exhaust ventilation systems had been fitted to carding engines. These are likely to have reduced the larger and less noxious dust particles preferentially as demonstrated by WOOD and ROACH (1964) in a previous investigation.

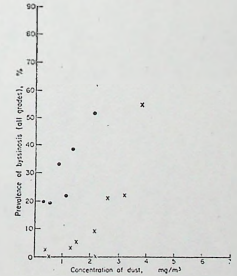

FIG. 1. Prevalence of byssinosis (all grades). (a) Plotted against total dust less fly—• MOLYNEUX *et al.* 1968. (b) Plotted against total dust—× ROACH and SCHILLING (1960).

3. While the prevalence of byssinosis depends mainly on the present dust concentration it also depends on past levels of exposure. There is also likely to be a disparity in the dose of dust required to initiate byssinosis and to produce symptoms once initiated. Thus, although reduction in dust concentration will be accompanied by a reduced risk of getting byssinosis improvement in those already affected may be limited.

A relatively low prevalence is found in all processes of fine mills and this is also true of spinning rooms which are physically separated from cardrooms in medium and coarse mills. Relatively higher prevalences may be found in all processes up to and including winding in medium and coarse mills. Because of these differences it would be unrealistic to attempt to derive hygiene standards which have overall application but standards can be derived from evidence which relates collectively to

potentially high risk processes (MOLYNEUX and BERRY, 1968; MOLYNEUX and TOMBLESON, 1970; TOMBLESON and WILKIE, 1970).

The length of time a person has worked in a cotton mill is an important factor in determining risk. The prevalence of byssinosis usually increases up to exposures of 20 years and then may remain stationary probably because of the selective withdrawal from employment of subjects with byssinosis. Examination of the data on 772 women in the survey by Molyneux and Tombleson shows clearly the increasing prevalence of byssinosis for both increasing dust concentrations and duration of exposure (Fig. 3).

At concentrations of less than 0·75 mg/m³ no byssinosis grades I and II was found during the first 10 years of exposure. The prevalences for dust concentrations around the recommended standard of 0·5 mg/m³ (less fly) are not markedly different for workers with 10–19 years and more than 20 years exposure (BERRY *et al.*, 1971).

The recommended standards are based upon the following conclusions:

1. The concentration of dust, less fly, is directly related to the prevalence of byssinosis of all grades and the relationship is similar for processes involving medium and coarse cotton.
2. Dust levels (less fly) below 0·5 mg/m³ are associated with the occurrence of byssinosis symptoms of less than 20 per cent (see Fig. 1). The data from Table 2 suggest that this prevalence would be associated with a prevalence of grade II symptoms less than 4 per cent. The reasons for the higher prevalence of grade II symptoms found by Molyneux and Tombleson have already been discussed. Since it is unlikely that all workers with grade II symptoms will be permanently affected, a maximum average dust concentration of 0·5 mg/m³ less fly, should achieve the objective of reducing the risk of permanent effects to a very low level. At this dust level byssinosis occurs only in workers with more than 10 years exposure (see Fig. 2).

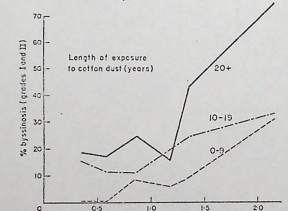

FIG. 2. Byssinosis prospective study. Female workers.

3. Dust levels in excess of 1·0 mg/m³ may produce much higher prevalence of byssinosis and the disease may occur in susceptible individuals within the first 4 years of exposure.
4. Waste operations should be considered to carry a potentially high risk as should spinning operations if they are not physically separated from the card-room.

It is evident that the risk of disease in any operation may increase or decrease depending on variation in the toxicity of airborne dust and its particle size distribution, the daily period of exposure and technical change of process and ventilation. Fine cotton processes and spinning operations in medium and coarse mills may give rise to hazardous conditions in isolated instances. This necessitates the use of a system of periodic medical examinations based on prevalence of symptoms and acute change in ventilatory capacity which enables the appropriate areas to be classified in terms of equivalent dust concentration.

MEDICAL SUPERVISION

The composition of the substances in the dust responsible for byssinosis has not yet been established. An immunologically active agent has been identified by TAYLOR, MASSOUD and LUCAS (1971). Bouhuys and his colleagues (NICHOLLS, NICHOLLS and BOUHUYS, 1966; HITCHCOCK, PISCITELLI and BOUHUYS, 1971) have shown that the bracts of the cotton plant contain an agent causing narrowing of the bronchi from the non-antigenic release of histamine. There is ample evidence that the proportion of the active principle or principles in the dust may be variable since the prevalence of byssinosis in environments with similar dustiness varies by more than might be expected by chance alone; indeed there may be local environments in which 1·0 mg/m³ less fly is not exceeded but the risk of byssinosis is excessive.

There is also a large variation in individual susceptibility to byssinosis. Among those exposed to concentrations of less than 0·5 mg/m³ less fly some workers especially sensitive to the dust may be adversely affected.

Thus, medical supervision has two possible functions. Firstly, it may be used as a monitoring device supplementary to dust sampling, indicating a need for better control of dust exposures. Secondly, it may be used as a means of detecting workers especially sensitive to dust. The diagnosis of early symptoms which are progressive provides an opportunity of recommending a change of employment and thus may prevent the disease developing to a state where there is a risk of permanent disability.

Although byssinosis has long been recognized as an occupational hazard among cotton workers in Lancashire, pre-employment and periodic examinations of those at risk have not been statutory requirements. For this reason, there has been no accumulation of experience in Britain by which the value of medical supervision of cotton workers may be assessed. Nor is there any published evidence from other countries on its use in the control of byssinosis. Nevertheless, the sub-committee believes that there are good reasons for introducing pre-employment and periodic examinations for cotton workers, although their value should be re-assessed after a trial period of 5 years. Where the pre-employment examination is not feasible an early examination should be done as soon as practicable. The purpose of a pre-employment examination would be to exclude from processes which carry a risk of byssinosis, persons suffering from chronic bronchitis or any other respiratory disability which may be exacerbated

by exposure to cotton dust. The chest X-ray is of no value in diagnosing byssinosis, but in some countries where tuberculosis is prevalent, chest X-rays will be needed, particularly in the pre-employment examination.

Such pre-employment and periodic examinations should include an occupational history, questionnaire on respiratory symptoms and ventilatory function tests.

These examinations could be carried out by trained persons, who are not medically qualified, provided they are under the general direction of a physician, who alone should advise about change of employment on medical grounds.

The questionnaire is a modified version of the British Medical Research Council's questionnaire on respiratory symptoms (see Appendix 1). Its object is primarily to assist in diagnosing bronchitis and byssinosis and in detecting changes in symptomatology during the years of employment. It is suggested that an appropriate level of bronchitis at which subjects should be excluded from the industry is shown by positive answers to Questions 4, 5 and 6, or Questions 4, 15, 16 and 17 in the Questionnaire.

Ventilatory function tests (see Appendix 2) can be used to measure the performance of an individual compared with that expected for someone of the same sex, age and height, to compare the individual with himself in the past, or to measure acute changes in function during dust exposure over a day or shift. The first use requires normal values. Those by COTES (1968) are adequate for the purpose and given in Tables B and C in Appendix 2. If in the male the forced expiratory volume in 1 sec ($FEV_{1\cdot0}$) is under 60 per cent of the predicted value, i.e. usually more than 1 litre below that expected, or in the female 0·8 litre below, the individual has a significant amount of ventilatory impairment. It is suggested that no-one with this or greater degree of impairment, together with simple bronchitis shown by a positive answer to question 4 should be selected to work in a cotton dust environment more dusty than that designated "low". Figures for the forced vital capacity (FVC) should also be obtained as these will be of value in assessing any changes in function during a person's employment.

All persons employed in processes up to and including winding rooms should be included, especially in coarse and medium mills, unless the concentration of airborne dust has been shown to be less than 0·5 mg/m³ less fly. The periodic examination should be carried out at least every 3 years. The interval between examinations should depend on the severity of the risk, and in certain circumstances, for example, where the risk is high, the interval should be reduced to 1 year.

When possible these examinations should also be done on return from a period of absence of 3 weeks or more due to a respiratory illness.

The measurements of changes in FEV during the shift should be made after the weekend break or absence from work, and confined to workers whose dust exposure is excessive or who are for any reason thought to be susceptible to dust.

A worker is advised to leave his work for health reasons only after carefully considering the social and clinical consequences of making a change of this kind. Such advice should usually be given when symptoms are getting progressively worse, and are accompanied by some disability, or where the $FEV_{1\cdot0}$ repeatedly falls 0·20 litres or more during a shift, or the $FEV_{1\cdot0}$ for males is more than 1 litre below that expected and for females 0·8 litres below that expected.

AIRBORNE DUST SAMPLING TECHNIQUES

The amount of dust suspended in the air of a workroom is measured by drawing a known volume of air through a dust collector, assessing the amount of dust so collected and expressing the results in terms of the amount of dust in unit volume of air.

There are two main classes of dust sampler: those in which a sample of particles is weighed (mass concentration) and those in which the sample is counted (number concentration).

By design, or through imperfections in the instruments, particles of different sizes are collected with different efficiencies and in particle counting there is usually further selection of the particles, which are counted according to their size and shape. Consequently, no two methods or types of instrument render identical results and their relationship may differ in different dust environments.

When the purpose of dust sampling is to provide results comparable with a hygiene standard, it has to be borne in mind that the standard is based upon work with specific instruments. The original data were obtained from a gravimetric sampler of 100 litres per min flow rate and having a rudimentary method of separating fly consisting of wire mesh gauze with 1·8 × 1·8 mm square holes over the intake to the sampler. A similar procedure was used by MOLYNEUX and TOMLESON (1970), sampling at a height of 5 ft. Fly was retained on a 7 cm diameter disc of wire mesh gauze with 1·8 × 1·8 mm square holes and the dust, less fly, was collected on a glass fibre disc (Whatman GF/B) of a similar diameter. Fly was removed from the gauze at hourly intervals at dust concentrations of up to 1 mg/m³ but more frequently at higher levels to prevent prefiltration of the finer particles.

It is recommended that the measured concentration of dust clouds produced in cotton processing operations should exclude the contribution of the "fly" to the total dust concentration, where the "fly" is defined as that component of the cloud which fails to penetrate a 2 mm square mesh gauze made of 0·2 mm diameter wire (1·8 mm square aperture) mounted at the entrance of the sampler.

The basic elements of a suitable dust sampling apparatus would be:

1. A suction pump with flow control to draw air through an adequate filter at a known steady rate of at least 10 litres/min.
2. A robust filter holder with facilities for mounting a 2 mm square mesh gauze made of 0·2 mm diameter wire over the entrance.
3. A device to remove the fly from the gauze at frequent intervals to prevent any significant change in the filtration properties of the gauze.
4. A supporting stand to hold the sampling head approximately 1·5 m above the floor.

An apparatus used in one of the investigations leading to the presently recommended standard is shown schematically (Fig. 3). The elutriator of a 50 litres/min Hexhlet sampler (Casella Ltd) was replaced by a 9 cm disc of wire gauze (1·8 mm square aperture). The gauze was kept clear during sampling by wiping with a thin nylon brush, with bristles approximately 1 cm long (e.g. draught excluder), mounted on the shaft of a 1/50 hp, 4·5 rev/min motor. Dust passing through the gauze was collected on a 7 cm glass-fibre filter (Whatman GF/A). Preconditioning of these

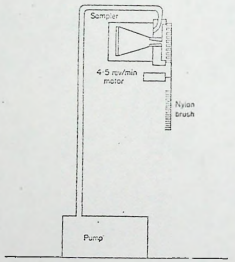

FIG. 3. An apparatus for sampling airborne cotton dust.

filters before weighing is unnecessary when sampling under conditions of relative humidity less than 90 per cent.

Different authorities favour different instruments, according to the purpose of the dust sampling and the importance given to the theoretical, practical, scientific, medical and economic advantages of the sampling system and to the availability of the instruments. Instruments which are suitable for measuring number concentrations have been little used for cotton dust and have limited application. The relative importance to health of number, area and shape of the different sizes of cotton dust particles is not known in detail. Nevertheless, those long fibres which are readily deposited in the nose and upper respiratory tract are less likely to be important than others which deposit in the lower respiratory tract.

The specification of one sampling technique alone would be unnecessarily restrictive. In recent years automatic particle counters have become available as also have other "respirable" dust samplers such as the Conicycle and systems which include an elutriator or a cyclone to remove the coarse particles.

The active agent(s) may be only a small proportion of the dust and there is no simple, specific test for this. At least some of the active agent is water soluble since aqueous extracts of the dust sprayed in air and inhaled give rise to characteristic responses in individuals. Further, only a proportion of the dust will be sufficiently fine to penetrate to the alveolated airways of the lung. On the other hand, the prime purpose of the dust sampling is to indicate as quickly as possible whether the existing degree of air cleanliness is inadequate so that engineering control procedures may be properly applied. The simplest of dust sampling techniques has real advantages for this. Although the sub-committee recommends a hygiene standard based on dust less fly, the total dust concentration may be used as a guide.

Obviously, if the total dust concentration is less than a certain value, any fraction

of it will also be less than this same value. Thus, lack of specialized equipment, analytical techniques or great expertise in dust measurement need not necessarily be a bar to proceeding with dust control in an orderly and effective manner. In many cases, the simplest of measurements will suffice. In others, dust control may be difficult and expensive, and a more sensitive and precise method of measurement is justified.

It is suggested that a workplace be defined in terms of the area in which people work on one or a group of identical or similar machines. It is further suggested that a workplace is assigned its dust category according to the time-weighted average concentration. This should be determined by sampling continuously or at representative intervals during working hours over one week. The sampling should have been carried out at a minimum of 5 locations or at a minimum of 5 different locations on successive shifts in the area, each location being selected to provide a representative sample of air to which one-fifth of the workers are exposed or exposed for a fifth of their time.

It is recognized that in a workplace where the weekly average exposure lies in a particular category, an occasional shift average may exceed the upper limit of that category. Accordingly, provided no more than one shift exposure exceeds the upper limit and the average for the week does not exceed the upper limit the workplace is classified in that category.

A workplace where the air concentration is less than 0·5 mg/m³ at a time of maximum dustiness need not be investigated further.

Respirators

In preventing adverse effects from inhaling cotton dust the first objective is to prevent the air from becoming contaminated. This is accomplished as far as possible by process design and engineering control methods. However, to be realistic, there may always be some processes in which these procedures are not economical, applicable, practicable or completely effective. Protective respirators are needed in these situations to supplement the primary control measures or to provide protection while these are being installed, maintained or repaired.

When it is necessary to work for short periods in an environment where dust concentrations are very high, respiratory protection should be provided. An orinasal dust respirator, fitted with an encapsulated, high efficiency dust filter and meeting BS:2091 (1968), is suitable for up to 10 mg/m³. Should the concentration exceed or be likely to exceed this level a higher standard of respiratory protection should be provided.

The choice of a particular respirator should be based, firstly, on a thorough appraisal of the dust conditions. The limitations of the respirator have also to be considered including filter efficiency, fit, flow resistance, ease of maintenance and repair. A frame holding a piece of gauze or sponge may be effective for large nuisance particles but is inefficient for fine dust.

Where there is more than one suitable type of respirator available the user should be allowed to choose the one that he finds most comfortable when fitted. However it should not be overlooked that an employee selecting a respirator will generally choose one having a low resistance, regardless of other important factors, such as leakage due to poor fit, open valves, inefficient filters, and worn or punctured parts.

Maintenance is an important part of any control programme and this is especially true for respirators. Inspection, cleaning, replacement or repair of worn or deteriorated parts and storage should be done at a centralized cleaning station if possible and supervised by a responsible person with a thorough knowledge of the device.

Recirculation of exhaust air

If large amounts of air are exhausted from a workroom to remove the airborne dust, an equivalent amount of fresh tempered air should be supplied to the room. The supplied air must be heated in cold weather; heating costs may be large if sizeable amounts of air are handled. Attempts are sometimes made to reduce such heating costs by cleaning the exhausted air with subsequent recirculation of air into the room.

The discharge air from an air cleaner in a ventilation system exhausting air from a workroom may contain fine particles in suspension. It is recommended as a precautionary measure that this air should not be recirculated unless it is effectively filtered or is mixed with fresh air to such an extent that each cubic metre of the combined air contains less than 0·1 mg of dust.

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APPENDIX I

QUESTIONNAIRE ON RESPIRATORY SYMPTOMS

General

The questionnaire on respiratory symptoms is a modified version of that approved by the MRC Committee on Research into Chronic Bronchitis, instructions for which can be obtained from W. H. Hofman Ltd., Dawlish, Devon.

Its object is to provide information biased as little as possible either by the questioner or the respondent. The actual wording of each question is laid out and this should be followed precisely. It is easy to see that one might get a different answer to a question phrased "Do you smoke" to one "You don't smoke, do you"; but from this extreme example even the intonation of the voice may influence a person in his answers and one should try to ask the questions in as matter-of-fact way as possible. They should be put fairly quickly so that the replies are those which immediately come to the subject's mind. As far as possible he should be discouraged from trying to amplify or qualify his answers, although occasionally a question will not be fully understood and some explanation is needed. When, after a brief explanation, doubt still remains as to whether the answer should be "Yes" or "No", it should be recorded as "No".

Although the questionnaire may look formidable at first sight, it seldom takes more than four minutes to complete and usually less than two.

Comments on individual items

1. In questions 1 and 3 the word "usually" implies five or more days each week. In questions 2 and 4 three months refer to consecutive months in the winter. When night shift workers are interviewed, the words "on getting up" should be used instead of "first thing in the morning" in questions 1 and 3.

2. In the questions on smoking, allowance should be made in calculating the average number of cigarettes smoked for differences at the weekend. As a rule, people smoke more at weekends than when working.

3. The check list on occupation is useful in jogging the respondent's memory about short periods of work in an industry which might be relevant.

QUESTIONNAIRE ON RESPIRATORY SYMPTOMS

WORK PLACE: .....

Day Month Year

NAME..... Date of Interview [ ][ ][ ]

(Surname)

..... Date of Birth [ ][ ][ ]

(First Names)

M F

Age ☐ Sex [ ]

Address..... Civil State [ ]

..... Race [ ]

NATIONAL (SOCIAL) INS. No.:..... Standing height [ ]

CLOCK No.:..... Weight [ ]

Interviewer [ ]

Use actual wording of each question. Put x in appropriate square after each question. When in doubt, record "NO"

	YES	NO
Have you ever worked in a cotton factory?	☐	☐

COUGH

	YES	NO
1. Do you usually cough first thing in the morning (on getting up)? (Count: a cough with first smoke or on "first going out of doors". Exclude clearing throat or a single cough.	☐	☐

If "Yes" to question 1:	YES	NO	N/A
2. Do you cough like this on most days for as much as three months each year?	☐	☐	☐

PHLEGM (or alternative word to suit local custom).

	YES	NO
3. Do you usually bring up any phlegm from your chest first thing in the morning (on getting up)? (Count phlegm with the first smoke or on "first going out of doors". Exclude phlegm from the nose. Count swallowed phlegm.)	☐	☐

If "Yes" to question 3:		
4. Do you bring up phlegm like this on most days for as much as three months each year?	☐	☐
5. In the past three years, have you had a period of (increased) cough and phlegm lasting for three weeks or more? (For subjects who usually have phlegm)	☐	☐
6. Have you had more than one such period?	☐	☐

TIGHTNESS

	YES	NO
7. Does your chest ever feel tight or your breathing become difficult?	☐	☐
8. Do you get this apart from colds?	☐	☐
If yes: When?.....		
9. Is your chest tight or your breathing difficult on any particular days?	☐	☐
If "Yes"—specify: First day back at work only	☐	☐
Other day(s) also	☐	☐

If "No" to 9 ask 10:

10. Has your chest ever been tight or your breathing difficult on any particular days?	☐	☐
If "Yes"—specify: First day back at work only	☐	☐
Other day(s) also	☐	☐

BREATHLESSNESS

If disabled from walking by any condition other than heart or lung disease put "X" here and leave questions 11–14 unasked ☐

At the weekends:—	YES	NO
11. Are you troubled by shortness of breath, when hurrying on the level or walking up a slight hill? (If "No", grade is 1. If "Yes", proceed to next question)	☐	☐
12. Do you get short of breath walking with other people of your own age on level ground? (If "No", grade is 2. If "Yes", proceed to next question)	☐	☐
13. Do you have to stop for breath when walking at your own pace on level ground? (If "No", grade is 3)	☐	☐
14. Is your breathlessness worse on any particular day? If yes, specify:	☐	☐

CHEST ILLNESSES

	YES	NO
15. During the past 3 years have you had any chest illness which has kept you off work or from your usual activities for as much as a week?	☐	☐
16. Did you bring up more phlegm than usual in any of these illnesses?	☐	☐
17. Have you had more than one illness like this with phlegm in the last 3 years?	☐	☐
18. Have you ever had: Bronchitis?	☐	☐
19. Bronchial Asthma?	☐	☐
20. Other chest illness?	☐	☐

If "Yes" to 20 specify: .....

.....

TOBACCO SMOKING

	YES	NO
21. Do you smoke? (Record "Yes" if regular smoker up to 1 month ago) If "No" to 21:	☐	☐

22. Have you ever smoked? ☐ ☐
(Record "No" if subject has never smoked as much as one cigarette a day, or 1 oz. of tobacco a month, for as long as 1 year)
Age when stopped:.....

If "Yes" to 21 or 22: Fill in figures below:

	Amount smoked	
	Now	Before stopping
Cigarettes/day (average including weekends)	.....	.....
Oz. tobacco/week (handrolled)	.....	.....
Oz. tobacco/week (pipe)	.....	.....
Cigars/week (large or small)	.....	.....

SPACE FOR ADDITIONAL QUESTIONS:

OCCUPATION

(Record on dotted lines number of years in which subject has worked in any of these industries)

	YES	NO
23. Have you ever worked in a dusty job?	☐	☐
24. At a coalmine.....	☐	☐
25. In any other mine.....	☐	☐
26. In a quarry.....	☐	☐
27. In a foundry.....	☐	☐
28. In a pottery.....	☐	☐
29. In a cotton, flax or hemp mill.....	☐	☐
30. With asbestos.....	☐	☐
31. In any other dusty job.....	☐	☐
If "Yes", specify		
.....		
32. Have you ever been exposed regularly to irritating gas or chemical fumes?	☐	☐
If "Yes" give details of nature and duration:		
.....		
.....		

Space for additional questions on special risks or exposures

FULL RECORD OF OCCUPATIONAL AND RESIDENTIAL HISTORY
(*optional*)

Work systematically from birth forwards for residence and from leaving school for occupation, checking that no periods are omitted. Record actual years of job and residence started and stopped. Under "residence" record actual towns lived in (put "outskirts" if this applies). For villages and rural areas record county as well as village; in the case of residence abroad record only the country. For seamen put "at sea".

Give full details of any periods of work in coal or other mines, foundries or potteries, with cotton, flax/hemp or asbestos or in other dusty jobs and of any exposure to irritating gas or chemical fumes.

Dates or ages	Industry and job (state actual occupation)	Residence

APPENDIX 2

MEASUREMENT OF VENTILATORY CAPACITY

Instruments

Either the McDermott dry spirometer or the Vitalograph can be used. The forced expiratory volume (FEV_1) is that amount of air which a subject can breathe out with maximum effort in 1 sec having taken a full breath. The forced vital capacity (FVC) is the total amount of air that he can breath out.

Method

The tests should be explained to the subject in simple terms. Usually the statement "I want to measure how hard you can blow", though not quite accurate, is readily understood. He should remove his overcoat and loosen any tight clothing, such as a waistcoat, and either sit upright but comfortably in front of the apparatus, or stand. On any subsequent measurement the same posture should be used. The height of the flexible tube between the apparatus and mouthpiece should be adjusted so that it can be comfortably taken in one or both hands. There is normally no need for a nose clip. He should be asked to take unhurriedly *as full a breath as possible*, to insert the mouthpiece between the teeth, and close the lips around it, and then to blow out as hard as possible for as long as he can. It is well worthwhile giving him a demonstration using an unattached mouthpiece. The following sequence of testing is recommended:

1. The subject makes two practice measurements. During this time he is observed and any errors corrected, but a completely full expiration need not be insisted upon at this stage.
2. Three further similar blows are made but each is continued until *no more air can be exhaled* to obtain the FEV and FVC. Towards the end of the breath the subject must be encouraged to go on exhaling for as long as he can. Allow

TABLE A. CORRECTIONS OF FEV AND FVC FOR TEMPERATURE

(For use with spirometers having no temperature correction in the scale.)

Spirometer reading (litres)	Corrected reading (l) 16°C	18°C	20°C	22°C	24°C	26°C	28°C
1·0	1·12	1·11	1·10	1·09	1·08	1·07	1·06
1·1	1·24	1·22	1·21	1·20	1·19	1·18	1·16
1·2	1·35	1·34	1·32	1·31	1·30	1·28	1·27
1·3	1·46	1·45	1·43	1·42	1·40	1·39	1·37
1·4	1·57	1·56	1·54	1·53	1·51	1·50	1·48
1·5	1·69	1·67	1·65	1·64	1·62	1·60	1·59
1·6	1·80	1·78	1·76	1·75	1·73	1·71	1·69
1·7	1·91	1·89	1·87	1·86	1·84	1·82	1·80
1·8	2·02	2·00	1·98	1·96	1·94	1·92	1·90
1·9	2·13	2·12	2·09	2·07	2·05	2·03	2·01
2·0	2·25	2·23	2·20	2·18	2·16	2·14	2·11
2·1	2·36	2·34	2·31	2·29	2·27	2·25	2·22
2·2	2·47	2·45	2·42	2·40	2·38	2·35	2·33
2·3	2·58	2·56	2·54	2·51	2·48	2·46	2·43
2·4	2·70	2·67	2·65	2·62	2·59	2·57	2·54
2·5	2·81	2·78	2·76	2·73	2·70	2·67	2·64
2·6	2·92	2·89	2·87	2·84	2·81	2·78	2·75
2·7	3·03	3·01	2·98	2·95	2·92	2·89	2·85
2·8	3·14	3·12	3·09	3·06	3·02	2·99	2·96
2·9	3·26	3·23	3·20	3·16	3·13	3·10	3·07
3·0	3·37	3·34	3·31	3·27	3·24	3·21	3·17
3·1	3·48	3·45	3·42	3·38	3·35	3·31	3·28
3·2	3·59	3·56	3·53	3·49	3·46	3·42	3·38
3·3	3·71	3·67	3·64	3·60	3·56	3·53	3·49
3·4	3·82	3·78	3·75	3·71	3·67	3·64	3·59
3·5	3·93	3·90	3·86	3·82	3·78	3·74	3·70
3·6	4·04	4·01	3·97	3·93	3·89	3·85	3·81
3·7	4·16	4·12	4·08	4·04	4·00	3·96	3·91
3·8	4·27	4·23	4·19	4·15	4·10	4·06	4·02
3·9	4·38	4·34	4·30	4·26	4·21	4·17	4·12
4·0	4·49	4·45	4·41	4·36	4·32	4·28	4·23
4·1	4·60	4·56	4·52	4·47	4·43	4·38	4·33
4·2	4·72	4·68	4·63	4·58	4·54	4·49	4·44
4·3	4·83	4·79	4·74	4·69	4·64	4·60	4·55
4·4	4·94	4·90	4·85	4·80	4·75	4·70	4·65
4·5	5·05	5·01	4·96	4·91	4·86	4·81	4·76
4·6	5·17	5·12	5·07	5·02	4·97	4·92	4·86
4·7	5·28	5·23	5·18	5·13	5·08	5·02	4·97
4·8	5·39	5·34	5·29	5·24	5·18	5·13	5·07
4·9	5·50	5·45	5·40	5·35	5·29	5·24	5·18
5·0	5·62	5·57	5·51	5·46	5·40	5·35	5·29
5·1	5·73	5·68	5·62	5·56	5·51	5·45	5·39
5·2	5·84	5·79	5·73	5·67	5·62	5·56	5·50
5·3	5·95	5·90	5·84	5·78	5·72	5·67	5·60
5·4	6·06	6·01	5·95	5·89	5·83	5·77	5·71

(continued over)

TABLE A (*continued*)

Spirometer reading (litres)	Corrected reading (l) 16°C	18°C	20°C	22°C	24°C	26°C	28°C
5·5	6·18	6·12	6·06	6·00	5·94	5·88	5·81
5·6	6·29	6·23	6·17	6·11	6·05	5·99	5·92
5·7	6·40	6·34	6·28	6·22	6·16	6·09	6·03
5·8	6·51	6·46	6·39	6·33	6·26	6·20	6·12
5·9	6·63	6·57	6·50	6·44	6·37	6·31	6·24
6·0	6·74	6·68	6·61	6·55	6·48	6·41	6·34
6·1	6·85	6·79	6·72	6·66	6·59	6·52	6·45
6·2	6·96	6·90	6·83	6·76	6·70	6·63	6·55
6·3	7·07	7·01	6·94	6·87	6·80	6·73	6·66
6·4	7·19	7·12	7·05	6·98	6·91	6·84	6·76

at least 30 sec between each of these breaths. If during any of these three attempts it can be seen that the performance is incorrect, the measurement should be rejected and repeated, the reason for the rejection being noted. A result should not be rejected, however, simply because it is unexpectedly low.

Some common errors in measuring the FEV$_1$ and FVC

During practice breaths, the observer should watch particularly for five faults:

1. The height of the mouthpiece may be incorrect causing an uncomfortable posture.
2. The subject may not take a full inspiration. It is essential that a full breath is taken before the test starts.
3. He may hesitate at the beginning of the expiration. Once started the breath must continue rapidly without any pause.
4. The mouthpiece may be incorrectly inserted and the lips not closed round it.
5. The subject may fail to continue his expiration to the end and so produce a low forced vital capacity (FVC).

Recording results

It is necessary to record the temperature of the spirometer as this will influence the answer obtained. Instructions for temperature correction are given in the accompanying Table A, but it is advisable to keep the room temperature as near constant as possible for all tests, i.e. keep it cool in summer and warm in winter. Table A gives the full correction for change in gas volume from spirometer temperature to body temperature (BTPS) and is to be used only with those spirometers with which there is no temperature correction provided in their scale, e.g. the Vitalograph.

To use Table A, find the spirometer reading in the left-hand column and read off the corrected value on the same line in the column nearest to the spirometer temperature, e.g. if the spirometer reading is 2·4 litres and the temperature 22°C, then the corrected reading is 2·62 litres. The results may depend both on the time of day and on the length of time the individual has had on the shift. Therefore, in follow-up

TABLE B. EUROPEAN MALES: TABLE FOR PREDICTION OF EXPECTED NORMAL VALUES OF $FEV_{1\cdot0}$ IN LITRES FROM AGE AND HEIGHT

Age (years)	Height (feet and inches) 5′ 0″	5′ 1″	5′ 2″	5′ 3″	5′ 4″	5′ 5″	5′ 6″	5′ 7″	5′ 8″	5′ 9″	5′ 10″	5′ 11″	6′ 0″	6′ 1″	6′ 2″	6′ 3″
18–20	3·49	3·58	3·67	3·76	3·85	3·95	4·04	4·13	4·22	4·32	4·41	4·50	4·59	4·68	4·77	4·87
21	3·46	3·55	3·64	3·73	3·82	3·92	4·01	4·10	4·19	4·28	4·38	4·47	4·56	4·65	4·74	4·84
22	3·43	3·52	3·61	3·70	3·79	3·89	3·98	4·07	4·16	4·25	4·35	4·44	4·53	4·62	4·71	4·80
23	3·39	3·49	3·58	3·67	3·76	3·85	3·95	4·04	4·13	4·22	4·31	4·41	4·50	4·59	4·68	4·77
24	3·36	3·46	3·55	3·64	3·73	3·82	3·92	4·01	4·10	4·19	4·28	4·37	4·47	4·56	4·65	4·74
25	3·33	3·42	3·52	3·61	3·70	3·79	3·88	3·98	4·07	4·16	4·25	4·34	4·44	4·53	4·62	4·71
26	3·30	3·39	3·49	3·58	3·67	3·76	3·85	3·95	4·04	4·13	4·22	4·31	4·40	4·50	4·59	4·68
27	3·27	3·36	3·45	3·56	3·64	3·73	3·82	3·92	4·01	4·10	4·19	4·28	4·37	4·47	4·56	4·65
28	3·24	3·33	3·42	3·52	3·61	3·70	3·79	3·88	3·98	4·07	4·16	4·25	4·34	4·43	4·53	4·62
29	3·21	3·30	3·39	3·48	3·58	3·67	3·76	3·85	3·95	4·04	4·13	4·22	4·31	4·40	4·50	4·59
30	3·18	3·27	3·36	3·45	3·55	3·64	3·73	3·82	3·91	4·01	4·10	4·19	4·28	4·37	4·46	4·56
31	3·15	3·24	3·33	3·42	3·51	3·61	3·70	3·79	3·88	3·97	4·07	4·16	4·25	4·34	4·43	4·53
32	3·12	3·21	3·30	3·39	3·48	3·58	3·67	3·76	3·85	3·94	4·04	4·13	4·22	4·31	4·40	4·49
33	3·08	3·18	3·27	3·36	3·45	3·54	3·64	3·73	3·82	3·91	4·00	4·10	4·19	4·28	4·37	4·46
34	3·05	3·15	3·24	3·33	3·42	3·51	3·61	3·70	3·79	3·88	3·97	4·07	4·16	4·25	4·34	4·43
35	3·02	3·11	3·21	3·30	3·39	3·48	3·57	3·67	3·76	3·85	3·94	4·03	4·13	4·22	4·31	4·40
36	2·99	3·08	3·18	3·27	3·36	3·45	3·54	3·64	3·73	3·82	3·91	4·00	4·09	4·19	4·28	4·37
37	2·96	3·05	3·15	3·24	3·33	3·42	3·51	3·60	3·70	3·79	3·88	3·97	4·06	4·16	4·25	4·34
38	2·93	3·02	3·12	3·21	3·30	3·39	3·48	3·57	3·67	3·76	3·85	3·94	4·03	4·12	4·22	4·31
39	2·90	2·99	3·08	3·18	3·27	3·36	3·45	3·54	3·63	3·73	3·82	3·91	4·00	4·09	4·19	4·28
40	2·87	2·96	3·05	3·14	3·24	3·33	3·42	3·51	3·60	3·70	3·80	3·89	3·97	4·06	4·15	4·25
41	2·84	2·93	3·02	3·11	3·20	3·30	3·39	3·48	3·57	3·66	3·76	3·85	3·94	4·03	4·12	4·22
42	2·81	2·90	2·99	3·08	3·17	3·27	3·36	3·45	3·54	3·63	3·73	3·82	3·91	4·00	4·09	4·18
43	2·77	2·87	2·96	3·05	3·14	3·23	3·33	3·42	3·51	3·60	3·69	3·79	3·88	3·97	4·06	4·15
44	2·74	2·84	2·93	3·02	3·11	3·20	3·29	3·39	3·48	3·57	3·66	3·75	3·85	3·94	4·03	4·12
45	2·71	2·80	2·90	2·99	3·08	3·17	3·26	3·36	3·45	3·54	3·63	3·72	3·82	3·91	4·00	4·09
46	2·68	2·77	2·87	2·96	3·05	3·14	3·23	3·33	3·42	3·51	3·60	3·69	3·78	3·88	3·97	4·06
47	2·65	2·74	2·83	2·93	3·02	3·11	3·20	3·29	3·39	3·48	3·57	3·66	3·75	3·85	3·94	4·03
48	2·62	2·71	2·80	2·90	2·99	3·08	3·17	3·26	3·36	3·45	3·54	3·63	3·72	3·82	3·91	4·00
49	2·59	2·68	2·77	2·86	2·95	3·05	3·14	3·23	3·32	3·42	3·51	3·60	3·69	3·78	3·88	3·97
50	2·56	2·64	2·74	2·83	2·93	3·02	3·11	3·20	3·29	3·39	3·48	3·57	3·66	3·75	3·84	3·94
51	2·53	2·62	2·71	2·80	2·89	2·99	3·08	3·17	3·26	3·35	3·45	3·54	3·63	3·72	3·81	3·91
52	2·50	2·59	2·68	2·77	2·86	2·96	3·05	3·14	3·23	3·32	3·42	3·51	3·60	3·69	3·78	3·87
53	2·46	2·56	2·65	2·74	2·83	2·92	3·02	3·11	3·20	3·29	3·39	3·48	3·57	3·66	3·75	3·84
54	2·43	2·53	2·62	2·71	2·80	2·89	2·99	3·08	3·17	3·26	3·35	3·44	3·54	3·63	3·72	3·81
55	2·40	2·49	2·59	2·68	2·77	2·86	2·95	3·05	3·14	3·23	3·32	3·41	3·51	3·60	3·69	3·78
56	2·37	2·46	2·56	2·65	2·74	2·83	2·92	3·02	3·11	3·20	3·29	3·38	3·47	3·57	3·66	3·75
57	2·34	2·43	2·52	2·62	2·71	2·80	2·89	2·98	3·08	3·17	3·26	3·35	3·44	3·54	3·63	3·72
58	2·31	2·40	2·49	2·59	2·68	2·77	2·86	2·95	3·05	3·14	3·23	3·32	3·41	3·50	3·60	3·69
59	2·28	2·37	2·46	2·55	2·65	2·75	2·83	2·92	3·01	3·11	3·20	3·29	3·38	3·47	3·57	3·66
60	2·25	2·34	2·43	2·52	2·62	2·71	2·80	2·89	2·98	3·08	3·17	3·26	3·35	3·44	3·53	3·63
61	2·22	2·31	2·40	2·49	2·58	2·68	2·77	2·86	2·95	3·04	3·14	3·23	3·32	3·41	3·50	3·60
62	2·19	2·28	2·37	2·46	2·55	2·65	2·74	2·83	2·92	3·01	3·11	3·20	3·29	3·38	3·47	3·56
63	2·15	2·25	2·34	2·43	2·52	2·61	2·71	2·80	2·89	2·98	3·07	3·17	3·26	3·35	3·44	3·53
64	2·12	2·22	2·31	2·40	2·49	2·58	2·68	2·77	2·86	2·95	3·04	3·13	3·23	3·32	3·41	3·50
65	2·09	2·18	2·28	2·37	2·46	2·55	2·64	2·74	2·83	2·92	3·01	3·10	3·20	3·29	3·38	3·47

The expected normal values of men of African or Asian descent are 0·45 litres lower throughout.

TABLE C. EUROPEAN FEMALES: TABLE FOR PREDICTION OF EXPECTED NORMAL VALUES OF $FEV_{1\cdot0}$ IN LITRES FROM AGE AND HEIGHT

Age (years)	Height (feet and inches) 4′ 7″	4′ 8″	4′ 9″	4′ 10″	4′ 11″	5′ 0″	5′ 1″	5′ 2″	5′ 3″	5′ 4″	5′ 5″	5′ 6″	5′ 7″	5′ 8″	5′ 9″	5′ 10″	5′ 11″
18–20	2·43	2·50	2·56	2·62	2·69	2·75	2·81	2·88	2·94	3·00	3·07	3·13	3·20	3·26	3·33	3·39	3·45
21	2·41	2·47	2·53	2·60	2·67	2·73	2·79	2·86	2·92	2·98	3·05	3·11	3·18	3·24	3·30	3·37	3·43
22	2·39	2·45	2·51	2·58	2·64	2·70	2·77	2·83	2·89	2·96	3·02	3·09	3·15	3·21	3·28	3·34	3·41
23	2·38	2·43	2·49	2·56	2·62	2·68	2·74	2·81	2·88	2·94	3·00	3·07	3·13	3·19	3·26	3·32	3·38
24	2·36	2·42	2·48	2·54	2·60	2·66	2·73	2·79	2·85	2·92	2·98	3·04	3·11	3·17	3·23	3·30	3·36
25	2·35	2·40	2·46	2·52	2·58	2·64	2·70	2·77	2·83	2·89	2·96	3·02	3·09	3·15	3·21	3·28	3·34
26	2·33	2·39	2·45	2·51	2·57	2·63	2·69	2·76	2·82	2·88	2·95	3·01	3·08	3·14	3·20	3·27	3·33
27	2·32	2·38	2·44	2·50	2·56	2·62	2·68	2·75	2·81	2·87	2·94	3·00	3·07	3·13	3·19	3·26	3·32
28	2·31	2·37	2·43	2·49	2·55	2·61	2·67	2·74	2·80	2·86	2·93	3·00	3·06	3·12	3·19	3·25	3·31
29	2·30	2·36	2·42	2·48	2·54	2·60	2·66	2·73	2·79	2·85	2·92	2·98	3·04	3·11	3·17	3·23	3·30
30	2·28	2·34	2·40	2·47	2·53	2·59	2·66	2·72	2·78	2·85	2·91	2·98	3·01	3·10	3·17	3·23	3·21
31	2·27	2·33	2·39	2·45	2·51	2·57	2·64	2·70	2·76	2·83	2·89	2·96	3·02	3·08	3·14	3·21	3·27
32	2·26	2·32	2·38	2·44	2·50	2·56	2·62	2·68	2·74	2·80	2·87	2·93	3·00	3·06	3·12	3·19	3·25
33	2·25	2·31	2·37	2·43	2·49	2·55	2·61	2·67	2·73	2·80	2·86	2·92	2·99	3·05	3·11	3·18	3·24
34	2·24	2·30	2·36	2·42	2·48	2·54	2·60	2·66	2·72	2·78	2·85	2·91	2·98	3·04	3·10	3·17	3·23
35	2·23	2·29	2·35	2·41	2·47	2·53	2·59	2·65	2·71	2·77	2·84	2·90	2·96	3·03	3·09	3·15	3·21
36	2·22	2·28	2·34	2·40	2·46	2·52	2·58	2·64	2·70	2·77	2·83	2·89	2·95	3·02	3·08	3·14	3·20
37	2·21	2·27	2·33	2·39	2·45	2·51	2·57	2·63	2·69	2·76	2·82	2·88	2·94	3·01	3·07	3·13	3·19
38	2·20	2·26	2·32	2·38	2·44	2·50	2·56	2·62	2·68	2·75	2·81	2·87	2·93	3·00	3·06	3·12	3·18
39	2·19	2·25	2·31	2·37	2·43	2·49	2·55	2·61	2·67	2·74	2·80	2·86	2·92	2·99	3·05	3·11	3·17
40	1·99	2·06	2·12	2·18	2·25	2·31	2·37	2·44	2·50	2·56	2·63	2·69	2·76	2·82	2·88	2·95	3·01
41	1·97	2·01	2·10	2·16	2·23	2·29	2·35	2·42	2·48	2·54	2·61	2·67	2·73	2·80	2·86	2·92	2·98
42	1·95	2·01	2·08	2·14	2·20	2·27	2·33	2·39	2·46	2·52	2·58	2·65	2·71	2·77	2·84	2·90	2·96
43	1·93	1·99	2·05	2·12	2·18	2·24	2·31	2·37	2·43	2·50	2·56	2·62	2·69	2·75	2·81	2·88	2·94
44	1·91	1·97	2·03	2·10	2·16	2·22	2·28	2·35	2·41	2·47	2·54	2·60	2·67	2·73	2·79	2·86	2·92
45	1·89	1·95	2·01	2·08	2·14	2·20	2·26	2·33	2·39	2·45	2·52	2·58	2·65	2·71	2·77	2·84	2·90
46	1·86	1·92	1·99	2·05	2·12	2·18	2·24	2·31	2·37	2·43	2·50	2·56	2·63	2·69	2·75	2·81	2·88
47	1·84	1·90	1·97	2·03	2·10	2·16	2·22	2·29	2·35	2·41	2·48	2·54	2·61	2·67	2·73	2·80	2·86
48	1·82	1·88	1·95	2·01	2·07	2·13	2·20	2·26	2·33	2·39	2·45	2·52	2·58	2·64	2·71	2·77	2·83
49	1·80	1·86	1·92	1·99	2·05	2·11	2·18	2·24	2·31	2·37	2·43	2·49	2·56	2·62	2·68	2·75	2·81

(continued over)

TABLE C (*continued*)

Age (years)	Height (feet and inches) 4′ 7″	4′ 8″	4′ 9″	4′ 10″	4′ 11″	5′ 0″	5′ 1″	5′ 2″	5′ 3″	5′ 4″	5′ 5″	5′ 6″	5′ 7″	5′ 8″	5′ 9″	5′ 10″	5′ 11″
50	1·77	1·84	1·90	1·96	2·03	2·09	2·15	2·22	2·28	2·34	2·41	2·47	2·54	2·60	2·66	2·73	2·79
51	1·75	1·81	1·88	1·94	2·01	2·07	2·13	2·20	2·26	2·32	2·39	2·45	2·51	2·58	2·64	2·70	2·77
52	1·73	1·79	1·86	1·92	1·98	2·05	2·11	2·17	2·24	2·30	2·36	2·43	2·49	2·55	2·62	2·68	2·75
53	1·71	1·77	1·84	1·90	1·96	2·02	2·08	2·15	2·22	2·28	2·34	2·41	2·47	2·53	2·60	2·66	2·72
54	1·69	1·75	1·81	1·88	1·94	2·00	2·06	2·13	2·20	2·26	2·32	2·38	2·45	2·51	2·57	2·64	2·70
55	1·66	1·73	1·79	1·85	1·92	1·98	2·04	2·11	2·17	2·23	2·30	2·36	2·43	2·49	2·55	2·62	2·68
56	1·64	1·70	1·77	1·83	1·90	1·96	2·02	2·09	2·15	2·21	2·28	2·34	2·40	2·47	2·53	2·59	2·66
57	1·62	1·68	1·75	1·81	1·87	1·94	2·00	2·06	2·13	2·19	2·25	2·32	2·38	2·44	2·51	2·57	2·64
58	1·60	1·66	1·72	1·79	1·85	1·91	1·98	2·04	2·11	2·17	2·23	2·30	2·36	2·42	2·49	2·55	2·61
59	1·58	1·64	1·70	1·77	1·83	1·89	1·95	2·02	2·08	2·15	2·21	2·27	2·34	2·40	2·46	2·53	2·59
60	1·55	1·62	1·68	1·74	1·81	1·87	1·93	2·00	2·06	2·12	2·19	2·25	2·32	2·38	2·44	2·51	2·57
61	1·53	1·59	1·66	1·72	1·79	1·85	1·91	1·98	2·04	2·10	2·17	2·23	2·29	2·36	2·42	2·48	2·55
62	1·51	1·57	1·64	1·70	1·76	1·83	1·89	1·92	2·02	2·08	2·14	2·21	2·27	2·33	2·40	2·46	2·53
63	1·49	1·55	1·61	1·68	1·74	1·80	1·87	1·93	2·00	2·06	2·12	2·19	2·25	2·31	2·38	2·44	2·50
64	1·47	1·53	1·59	1·66	1·72	1·78	1·85	1·91	1·97	2·04	2·10	2·17	2·23	2·29	2·35	2·42	2·48
65	1·44	1·51	1·57	1·63	1·70	1·76	1·82	1·89	1·95	2·01	2·08	2·14	2·21	2·27	2·33	2·40	2·46

The expected normal values of women of African or Asian descent are 0·41 litres lower throughout.

tests the measurements should be made, if possible, at the same time in the same shift. All results and other relevant data are recorded on the form below.

Prediction of expected normal values

As expected normal values for respiratory function tests depend on the sex, age, height and ethnic origin of the individual; allowances for these have to be made in attempting to ascertain whether values for an individual are within the normal range. Tables B and C give expected values of the $FEV_{1\cdot0}$ for European males and females respectively and are derived from COTES (1968). They enable one to read off for males or females of any particular age and height the expected values of the $FEV_{1\cdot0}$.

It should be noted that the expected values of men of African or Asian descent are 0·45 litre lower throughout the Table and the corresponding figure for women is 0·41 litre. Therefore, in estimating the normal value for a person of these ethnic origins, look up first the appropriate European value and then subtract from the result the amounts quoted above.

RECORD OF VENTILATORY CAPACITY TESTS

NAME OF SUBJECT: INSTRUMENT:
(If other than regular factory instrument)
M or F: MAKE:
DATE: NUMBER:
TIME:
NAME OF OBSERVER: TEMPERATURE °C:

TESTS OF VENTILATORY CAPACITY

1. Forced Expiratory Volume in *ONE SECOND*—($FEV_{1\cdot0}$) (litres)
2. Forced Vital Capacity - (FVC) (litres)

INSTRUMENT READINGS

No.	$FEV_{1\cdot0}$	FVC
(1)	....	....
(2)	....	....
3.	....	....
4.	....	....
5.	....	....

3+4+5 = [ ] (A) 3+4+5 = [ ] (B)

MEAN OF 3+4+5 = $\frac{A}{3}$ = [ ] = $\frac{B}{3}$ = [ ]

MEAN—Corrected for temperature (see table A)	= ☐ (C)	= ☐ (D)
	$FEV_{1\cdot0}$	FVC
EXPECTED "NORMAL" VALUE (From Table B or C)	= ☐ (X)	= ☐ (Y)*
OBSERVED VALUE	= ☐ (C)	= ☐ (D)
DIFFERENCE		
+ = C−X or − = X−C	☐	+ = D−Y or − = Y−D ☐

* If required, expected normal value can be obtained from COTES (1968).

EMAS
Chief Employment Medical Adviser's notes of guidance

Cancer Occupational

Department of Employment, November 1972

1 Persons engaged in some trades may be exposed to known carcinogens. Occupational cancer is associated with:

2	Asbestos	Bronchial carcinoma, mesothelioma.
3	Nickel refining by nickel carbonyl process	Cancer of the ethmoid and paranasal sinuses (since the process of refining nickel was improved in 1924 no case has been attributable). Bronchial cancer.
4	Hexavalent chromates	Bronchial carcinoma: in smelting of chrome ores to produce bichromates. Trivalent salts of chrome used in chrome plating are not carcinogenic, as far as is known at present.
5	Iso-propyl oil	Nose, exposure to oily residues left behind after distilling iso-propyl alcohol (which itself is not carcinogenic).
6	Wood dust, especially hard woods	Adeno-carcinoma of mucous membrane covering middle ethmoid: first noticed in the High Wycombe furniture manufacturers who are exposed to dust of hard woods, especially beech, oak and mahogany. May also (but to less extent) be associated with exposure to dust of soft wood.
7	Leather dust	Adeno-carcinoma of boot and shoe manufacturing virtually limited to operatives in press and finishing departments.
8	Benzene	Leukaemia, aleukaemia: erythroleukaemia.
9	Arsenic	Skin, bronchial cancer in manufacturers of sheep dips.
10	Ionising radiations	Blood, bone, lung, skin.
11	β-Naphthylamine α-Naphthylamine benzidine, dichlorbenzidine, orthotolidine, dianisidine, 4-amiodiphenyl, 4-nitrodiphenyl.	Cancer of bladder and renal tract. The latent period varies considerably but the peak incidence is from 11-18 years.
12	Polycyclic hydrocarbons	
	Benzpyrene/benzanthracene types	Bronchial carcinoma — air contamination in vertical retort houses, coke ovens etc.
	Tar, pitch, bitumen	Cancer of skin.
	Mineral oil	Cancer of skin, especially of scrotum.
13	Cadmium	Cancer of prostate in makers of nickel-cadmium batteries.

14 Heat (repeated exposures)	Cancer of skin (rare in United Kingdom).	

15 The following subjects are dealt with under their appropriate classifications; where notification is indicated as appropriate.

Arsenic – 3	Chromium	Mineral Oil – 39
Asbestos – 4	(Electroplating) – 22	Nickel and Nickel
Benzene – 6	Coal Tar distillation – 27	Carbonyl – 40
Cadmium – 10	Ionising Radiations – 29	Renal Tract Carcinogens – 50

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EMAS

Chief Employment Medical Adviser's notes of guidance

Renal tract carcinogens

Department of Employment, November 1972

Properties

1 *Definition:* The group of chemicals (See Appendix 2) identified as renal tract carcinogens and specified in the Carcinogenic Substances Regulations 1967 are:

Prohibited substances: Beta-naphthylamine, benzidine, 4-amino-diphenyl, 4-nitro-diphenyl, and their salts and substances containing any of those compounds other than in very small concentrations.

Controlled substances: Alpha-naphthylamine, ortho-tolidine, dianisidine, dichlorbenzidine and their salts. Auramine and magenta are controlled substances as regards their manufacture.

2 The substances listed belong to the general class of aromatic amines. Some of this group of chemicals are carcinogenic including those defined in the regulations but many other aromatic amines do not have this hazard. For example, aniline, the simplest aromatic amine, is not carcinogenic despite the early term for occupational bladder cancer, 'aniline cancer'. Aromatic amines in general, however, are acutely toxic causing 'anilism' characterised by methaemoglobinaemia resulting in cyanosis of a distinctive type: bluish grey colour of the skin and mucous membranes. Massive or prolonged exposure may produce anaemia secondary to haemolysis. Chronic hepatic toxic effects are rare in workers although liver damage and hepatic tumours (benign and malignant) can be induced by many aromatic amines in many different species of animal. Toluidines and chlorotoluidines may induce chemical cystitis with pain, frequency and haematuria, but do not cause vesical cancer; this effect is uncommon in modern plant conditions.

Threshold limit values

3 Not established.

Sources of exposure

4 The industries in which exposures have occurred more frequently are:

Dyestuffs. In the dyestuffs section of the chemical industry as well as in textile dyeing and printing, where dye may be produced on the cloth by reaction of chemicals applied to it by dip or print methods.

Rubber and cable-making. In these industries the substances have been used as antioxidants.

5 Lesser exposures have occurred in:

The manufacture and printing of security paper: the compounds serve here as anti-forgery agents.

The manufacture of organic chemicals including organic pigments for paints.

Rodent extermination. ANTU, i.e. alpha-naphthylthiourea containing traces of naphthylamines.

Gas industry. Traces of beta-naphthylamine may be present in the air in retort houses.

Laboratories. Although their use is relatively trivial, these compounds may be used in hospital and analytical laboratories as test reagents, e.g. use of ortho-tolidine in water testing.

Metabolism

6 Absorption of aromatic amines is by inhalation of either the dust or vapour. Absorption through the skin and ingestion also occur.

7 They produce their carcinogenic effect after conversion in the liver to metabolites (ortho-amino-phenols and/or aryl hydroxylamines) which are conjugated with glucuronate. Enzymatic hydrolysis, however, in the urine releases the proximate carcinogen to exert effect on the urinary tract epithelium, notably in the bladder. Differences in metabolic systems between man and experimental animals complicate the investigation of the carcinogenic activities of these compounds.

Biological and clinical effects

8 *Induction periods.* The disease manifests itself at differing times after the first exposure. Extremes are under 5 years and over 50 years but the most common time is between 15 and 20 years. Consequence of this long induction time is the necessity for medical supervision throughout the remainder of their lives of workers who have been exposed to risk.

9 *Pathology.* Occupational tumours of the bladder may be benign or malignant papillomata, single or multiple or recrudescent.

Diagnosis

10 *Medical examination.* Symptoms due to tumours of the urinary tract may arise early or late in the progress of the tumour: frequently symptoms do not occur until the tumour has progressed to the invasive stage. The purpose of medical examination is to ensure detection of the condition, if it arises in a worker, at the earliest possible stage, before invasion has occurred so that treatment holds a reasonable chance of cure. The only practicable way to offer the chance of earliest pre-symptomatic diagnosis is by exfoliative cytological examination of the urine (see below). As in any medical examination, a careful history should be taken as part of a continuous sequence of supervision of that worker. The degree of exposure to the specified chemicals should be precisely recorded. Any renal or urinary symptoms should be noted and an account should be taken of illness whether causing absence from work or not. These records may be of value at a later date, should a tumour arise.

11 *Exfoliative cytology.* Cells exfoliated from a tumour, whether papilloma or cancer, can be detected in the urine at an early stage. Clearly, if tumours are left until a late stage, cytology is likely to be positive. Serial cytology will, in the majority of cases, show malignant or suspicious cells at an early and pre-symptomatic stage of the disease, and occasionally before a tumour can be seen easily by cystoscopy. Much more needs to be known about the success rate of treatment at the earliest stage, but on general priniciples, early treatment of malignant conditions is highly desirable.

12 Every medical examination made under the Regulations must include such a cytological examination of the urine. Facilities have been set up at designated hospitals by the Department of Health and Social Security and the Scottish Home and Health Department; a list of these laboratories is appended. Details of these facilities were notified to general medical practitioners by the DHSS on 6th April, 1965 (Circular ML 3/65) and by the SHHD on 20th April, 1965 (Circular HOS/17/18/2), both documents entitled 'Presymptomatic diagnosis of cancer of the bladder by exfoliative cytology'. Specimen bottles containing preservatives are available on demand from the pathology department. About 4–6 oz. of urine should be collected and sent forthwith to the chosen laboratory for examination.

Advice should be obtained from the laboratory as to the type of specimen required; some laboratories prefer a specimen of urine taken when the patient is active, i.e. not an early-morning sample.

13 In the laboratory, smears are prepared by a special technique (the Papanicolaou method) and examined microscopically. The interpretation of the smears is difficult and requires skilled assessment, not only in differentiating the criteria of malignancy but also in identifying the numerous variations from the normal due to non-neoplastic conditions. The results of assessment of cytological characteristics of exfoliated cells may be expressed according to a classification laid down in the particular laboratory; the method of expressing these results should be ascertained from the laboratory where the tests are to be carried out. A typical convention for expression of results is as follows:

Class I	normal	negative
Class II	atypical	negative
Class III		suspicious
Class IV	probably malignant	positive
Class V	definitely malignant	positive

Action

14 *On results of exfoliative cytology.* A positive result is considered an indication for cystoscopy. Suspicious smears (Class III) are regarded as positive if exposure has been heavy or if blood is also present. The urine is, of course, also examined for the presence of red cells, which may not be visible on ordinary observation (microscopic haematuria). In other cases repeated samples are examined until a decision can be reached. A carefully taken occupational history is of value.

15 In all cases designated as positive or allocated to a positive class on further enquiry, immediate steps must be taken to secure treatment for the patient. The worker should be referred to his general practitioner, to whom full clinical information should be made available. While explanations of the test results and descriptions of treatment should be left to the general practitioner, it may on occasion be necessary to provide sufficient information to the worker to ensure that he appreciates the need to attend for consultation with his own general practitioner.

Records

Under regulation 8 (5) the following records must be kept:

Register of Medical Examinations (F2282). To be kept in the factory, in which there shall be entered in the case of each person medically examined for the purposes of these regulations his name, address, date of birth, national insurance number, the dates of the periods of his employment in the factory in manufacturing process or work connected with the controlled substances and the dates when he was so medically examined.

Cautionary Card (F2257). A copy of the approved cautionary card relating to controlled substances must be given free of charge on the termination of his employment in that factory to every person who has been employed on work connected with controlled substances; the duty to ensure that such workers do receive the warning card falls on the occupier of the factory.

16 Positive results of cytological investigation or other evidence of development of tumour in a worker who is examined under the provisions of the Carcinogenic Substances Regulations are not required statutorily to be notified. Nevertheless, information about positive reports of cytology and

of cases of cancer of the renal tract in workers manufacturing or using carcinogens should be carefully preserved.

Legal requirements

17 The relevant regulations are the Carcinogenic Substances Regulations 1967 (SI 1967 No. 879) and the Carcinogenic Substances (Prohibition of Importation) Order 1967 (SI 1967 No. 1675).

The Carcinogenic Substances Regulations 1967

18 These Regulations prohibit, subject to the power of the Chief Inspector of Factories to grant exemptions in certain cases, the presence and use, and the employment of persons in connection with the making, in factories and in other premises and places to which the Factories Act 1961 applies, of certain carcinogenic compounds, namely beta-naphthylamine, benzidine, 4-aminodiphenyl, 4-nitrodiphenyl and their salts, and substances containing any of those compounds other than in very small concentrations.

The Regulations also control the employment of persons in connection with the making, in factories and other premises and places to which the said Act of 1961 applies, of alpha-naphthylamine, ortho-tolidine, dianisidine, dichlorbenzidine and their salts and auramine and magenta, and (except in the case of the last two substances mentioned) control the use of the said substances in such factories and places, so as to make provision for the safety and health of the persons employed. Provision is also made for the medical examination of persons employed in such factories and places in connection with the making or use of any of the said substances or who have been so employed.

The Carcinogenic Substances (Prohibition of Importation) Order 1967

19 This Order prohibits the importation into the United Kingdom of the following chemical compounds, namely, beta-naphthylamine, benzidine, 4-aminodiphenyl, 4-nitrodiphenyl and their salts and any substance or article containing any of the said compounds. The prohibition does not apply in the case of substances or articles in which the said compounds are present in less than specified concentrations. The Order provides for the granting by the Chief Inspector of Factories in specified circumstances of exemptions from the prohibition on importation where material is to be used for the purpose of or in the course of medical or scientific research, where benzidine monohydrochloride or benzidine dihydrochloride is to be used in any process of manufacture carried out in a totally enclosed system, and where material is to be brought into a dock, wharf or quay in the United Kingdom for the sole purpose of re-export.

20 *Medical examinations.* It is the duty of persons so employed to submit themselves for medical examination and to provide samples of their urine as required. *These examinations will take place within six months of first employment and will be repeated at intervals of not more than six months so long as employment in the factory continues.* On leaving this employment the worker must be issued with a warning card, advising him of the need to continue to have the urine test and instructing him in the way to arrange this and the facilities available. During employment the medical examinations will take place at the factory unless other arrangements have been approved by the District Inspector of Factories; the Regulations impose a duty on the occupier of the factory to provide suitable accommodation and facilities.

Voluntary medical examinations

21 *Voluntary medical examinations.* Cytodiagnostic facilities were provided by the major chemical manufacturers and by the British Rubber Manufacturers' Association Health Unit for present and past employees. Many firms were not covered by these arrangements although the hazardous

chemicals had been used. Arrangements were made for the distribution by such employers to exposed persons of warning cards supplied by the Department. Cytodiagnostic facilities are available nationally through laboratories designated by the DHSS and SHHD (See Appendix I). Workers at risk now are covered by the provisions of the Regulations. Past workers who have received the warning card from their former employer should be referred through their own general practitioner for regular cytological screening of the urine. Any worker referred on account of haematuria or cancer of the renal tract should have a full occupational history recorded and be advised to consult his general practitioner immediately.

22 *Prescribed disease No.39.* There are relevant provisions under the National Insurance (Industrial Injuries) Act 1965, first prescribed on December 1st, 1953 under old National Insurance (Industrial Injuries) Act 1946. Primary neoplasm of the epithelial lining of the urinary bladder (papilloma of the bladder) or of the epithelial lining of the renal pelvis or of the epithelial lining of the ureter. Extended on July 7th 1958 to ensure that exposures to all compounds recognised as carcinogenic were covered but many other nitro and amino compounds not suspected were still excluded. Benefits for proven cases arising from exposures prior to 1948 are assured by the Industrial Injuries and Diseases (Old Cases) Act 1967.

Prevention

23 See references covering technical methods either for substitution of the carcinogenic substance of sophisticated design of plant.

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APPENDIX I

List of hospitals and centres with pathology laboratories undertaking exfoliative cytology.

ENGLAND AND WALES

Newcastle Region

Newcastle General Hospital, Westgate Road, Newcastle-upon-Tyne.
Royal Infirmary, Durham Road, Sunderland, Co. Durham.
Cumberland Infirmary, Carlisle Cumberland.
General Hospital, Hartlepool, Co. Durham.

Leeds Region

Royal Infirmary, Lindley, Huddersfield, Yorkshire.
Castle Hill Hospital, Castle Road, Cottingham, East Yorkshire.
Hospital for Women at Leeds, Coventry Place, Leeds, 2.

Sheffield Region

Nottingham City Hospital, Hucknall Road, Nottingham.
Derbyshire Royal Infirmary, London Road, Derby.

East Anglia Region

University Department of Pathology, Tennis Court Road, Cambridge.

North West Metropolitan Region

Lister Hospital, Hitchin, Herts.
Barnet General Hospital, Wellhouse Lane, Barnet, Herts.
Watford Peace Memorial Hospital, Rickmansworth Road, Watford, Herts.
Ashford Hospital, London Road, Ashford, Middx.
Mount Vernon Hospital, Northwood, Middx.
Hillingdon Hospital, Hillingdon, Nr. Uxbridge, Middx.
King Edward Memorial Hospital, Mattock Lane, Ealing, London, W.13.
Central Middlesex Hospital, Acton Lane, London N.W.10.
Royal Northern Hospital, Holloway Road, London, N.7.
Whittington Hospital, Archway Road, London, N.19.

North East Metropolitan Region

Mile End Hospital, Bancroft Road, London, E.1.
Forest Gate Hospital, Forest Lane, Forest Gate, London, E.7.
Chase Farm Hospital, The Ridgeway, Enfield, Middx.
Herts and Essex General Hospital, Bishop's Stortford, Herts.
Chelmsford and Essex Hospital, London Road, Chelmsford, Essex.
Essex County Hospital, Lexden Road, Colchester, Essex.
General Hospital, Prittlewell Chase, Southend-on-Sea, Essex.
Oldchurch Hospital, Oldchurch Road, Romford, Essex.

South East Metropolitan Region

Lewisham Hospital, High Street, Lewisham, London, S.E.13.
Kent and Canterbury Hospital, Ethelbert Road, Canterbury, Kent.
Royal Sussex County Hospital, Eastern Road, Brighton, 7, Sussex.
Brook General Hospital, Shooters Hill, London, S.E.18.

South West Metropolitan Region

St. Stephen's Hospital, Fulham Road, S.W.10.
St. Helier Hospital, Wrythe Lane, Carshalton, Surrey.
Kingston Hospital, 37, Coombe Road, Kingston-upon-Thames, Surrey.
Farnham Hospital, Hale Road, Farnham, Surrey.

Wessex Region

Southampton General Hospital, Tremona Road, Shirley Warren, Southampton.
Portsmouth and Isle of Wight Area Pathological Service, Central Laboratory, Milton Road, Portsmouth.

Oxford Region

Churchill Hospital, Headington, Oxford.
Northampton General Hospital, Billing Road, Northampton.
Kettering and District General Hospital, Rothwell Road, Kettering, Northants.
Royal Berkshire Hospital, London Road, Reading, Berks.
Stoke Mandeville Hospital, Mandeville Road, Aylesbury, Bucks.
Princess Margaret Hospital, Swindon, Wilts.
Wycombe General Hospital, High Wycombe, Bucks.
Horton General Hospital, Oxford Road, Banbury, Oxon.

South Western Region

Gloucester Royal Hospital, Great Western Road, Gloucester.
Southmead Hospital, Westbury-on-Trym, Bristol.
Manor Hospital, Combe Park, Bath, Somerset.

Welsh Region

Institute of Pathology, Welsh National School of Medicine, Cardiff Royal Infirmary, Cardiff, Glamorganshire.
Royal Gwent Hospital, Cardiff Road, Newport, Monmouthshire.
Beck Laboratory, Swansea Hospital, St. Helen's Road, Swansea, Glam.
Royal Alexandra Hospital, Marine Drive, Rhyl, Flintshire.

Birmingham Region

Selly Oak Hospital, Birmingham, 29.
North Staffordshire Royal Infirmary, Hartshill, Stoke-on-Trent, Staffs.
Warwick Hospital, Lakin Road, Warwick.

Manchester Region

Preston Royal Infirmary, Deepdale Road, Preston, Lancs.
Bolton Royal Infirmary, Bolton, Lancs.
Crumpsall Hospital, Delaunays Road, Manchester, 8.
Withington Hospital, West Didsbury, Manchester, 20.
Royal Infirmary, Oxford Road, Manchester, 13.
General Hospital, Ashton-under-Lyne, Lancs.

Liverpool Region

Whiston Hospital, Whiston, Prescot, Lancs.
Ormskirk and District General Hospital, Wigan Road, Ormskirk, Lancs.
General Hospital, Lovely Lane, Warrington, Lancs.
Royal Southern Hospital, Caryl Street, Liverpool, 8.
Sefton General Hospital, Smithdown Road, Liverpool, 13.
Broadgreen Hospital, Edge Lane Drive, Liverpool, 14.
St. Catherine's Hospital, Church Road, Birkenhead, Cheshire.
Clatterbridge Hospital, Bebington, Cheshire.
Chester Royal Infirmary, St. Martins Fields, Chester.

SCOTLAND

Northern Region

The Royal Northern Infirmary, Inverness.

North Eastern Region

University Department of Pathology, Foresterhill, Aberdeen.

Eastern Region

Maryfield Hospital, Dundee.
Royal Infirmary, Perth.

South Eastern Region

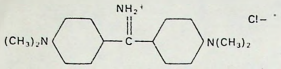
University Department of Pathology, Edinburgh.
Royal Infirmary, Edinburgh.
Victoria Hospital, Kirkcaldy.
Bangour Hospital, West Lothian.
Peel Hospital, Galashiels.

Western Region

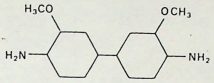
Western Infirmary, Glasgow.
Royal Infirmary, Glasgow.
Victoria Infirmary, Glasgow.
Stobhill Hospital, Glasgow.
Southern General Hospital, Glasgow.
Royal Infirmary Dumfries.
Royal Infirmary, Falkirk.
Royal Alexandria Infirmary, Paisley.
Vale of Leven Hospital, Alexandria.
Ballochmyle Hospital, Ayrshire.

(Continued)

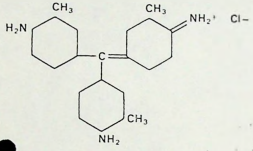
APPENDIX 2



Auramine

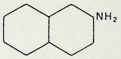


Dianisidine

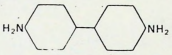


Magenta

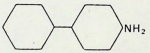
Alpha-naphthylamine



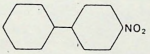
Beta-naphthylamine



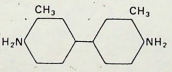
Benzidine



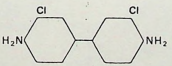
4-Amino-diphenyl
(Xenylamine)



4-Nitro-diphenyl



Ortho-tolidine



Dichlor benzidine

DEPARTMENT OF EMPLOYMENT

153/09/03/-

MEDICAL SERVICES DIVISION

CMA's NOTES OF GUIDANCE

NOISE

NOISE

1. Definition Noise has been described as "sound without musical quality", "sound I don't want to hear", and so on. It is best defined in the ordinary sense as unwanted sound.

2. The Physics of Sound When a surface vibrates in an elastic medium such as air, the immediately surrounding air is alternately compressed then rarefied, so that small fluctuations above and below atmospheric pressure are propagated outwards as a sound wave which has three primary properties:

Frequency. This determines the pitch or note of the sound; high frequencies give rise to the sensation of high-pitch notes on the musical scale. An octave is the rise in pitch brought about by doubling the frequency, and the frequencies within that range are known as an octave band, which are generally specified by their geometric centre frequency.

The average normal young ear receives as sound frequencies between 20 and 20000 cycles per second (cps or Hertz), that is a range of ten octaves; in marked contrast, the receptive mechanism of the eye is sensitive to visible light of wavelength 3500-8000 AU - just over one octave.

Intensity. This determines volume or loudness. Sound intensity is a measure of the flow of sound energy per unit area of cross-section in one direction along the wave, and is therefore easier to deal with than the alternating quantity of sound pressure - intensity being a function of the square of pressure.

The range in magnitude of audible sound intensity is so enormous that it becomes convenient to express relative pressures and intensities on a logarithmic scale. A barely audible sound (at 1000 Hz) is taken as a standard (0 dB) and thereafter every step of 10 dB represents a tenfold increase of intensity. It happens that every such step of 10 dB doubles the subjective impression of loudness. The human ear normally receives as sound intensities from around 0 dB to the threshold of feeling or pain at about 130 dB.

Wave Form. The shape of the sound wave determines the quality or timbre of the sound. Sine-waves from a vibrating source in harmonic motion give rise to pure tones, and harmonically related composite-waves produce musical notes; but most industrial noises have waves of irregular complexity and when most frequencies are present more or less equally it is known as 'white noise'.

3. Much of industrial noise is continuous, steady, and consists of a broad band of frequencies.

4. The noise level probably exceeds 90 dB if it is necessary to shout to be heard at a distance of less than 1 ft. The Factory Inspectors have simple noise level meters which incorporate three electrical circuits known as weighting networks, A, B, and C. The C-weighting produces a fairly uniform response over the whole frequency range, whereas the A-and B-weightings reduce the instrument's sensitivity to the lower frequencies to simulate the human ear (at higher and lower intensities respectively). Recent work has shown that for continuous exposure to steady broad band noise the A-weighted measurement, expressed in dBA, provides a satisfactory measure of the hazard for routine purposes. Some examples are:

	Noise-level in dB
Jet motor at 75 ft.	130
Rivetting, crimping, tack-making	110-125
Planers, routers, circular-saws	110-115
Weaving sheds, air drills	90-110
Automatics, milling machines etc.	80-95

These should be compared with:

Average radio or street	60-80
Noisy home, average conversation	40-60
Very quiet home, whisper at 5 ft.	20-40

5. For continuous noises which contain much of their energy concentrated in narrow bands of frequency, the Engineering Branch use a more complex frequency analysing instrument, and the hazard has to be assessed accordingly. Damage risk criteria are usually expressed in terms of octave intensity levels, with lower levels allowed for the speech frequencies, for example 80 dB for the four octaves 250 - 500 - 1000 - 2000 - 4000 Hz, and rising by 5 dB for each octave outside this range; such criteria aim to preserve normal speech perception for the majority over a (near) lifetime of exposure for 40 hours each week. In any octave an additional 3 dB is allowed for each halving of the exposure time. When the exposure is intermittent or the noise is impulsive, or much of the energy is concentrated in narrow bands of frequency, the hazard is less easy to predict and measurements require more complex apparatus, but there are several organisations which will undertake full investigation of noise problems and make recommendations, including the Department of Trade and Industry and the Advisory Services based on the Universities of Durham, Manchester, Southampton and Dundee.

BIOLOGICAL AND CLINICAL EFFECTS

6. The effects of noise are generally considered under the following headings:

Psychological Effects. These depend very much on the pre-existing mental attitude - the significance attached to that noise by the individual; psychological response is further influenced by the time and circumstances under which it is heard. The characteristics of the sound itself are of secondary importance, but in general more psychological disturbance or nuisance is created by noises which are high-pitched rather than low-pitched, musical rather than discordant, interrupted rather than continuous, and loud rather than soft. Industrial workers rarely complain of the noise of their own trade, but do so occasionally when changes in processes or layout subject them to unaccustomed noise. There is some evidence of improved output and accuracy of work when a high noise level is reduced.

Physiological Effects. There have been reports that very loud noises cause faster metabolism, perspiring palms and soles, etc., but how far these are the accentuation or result of the psychological effects it is difficult to say.

Interference with communication. The noisy industrial environment in which warning signals or verbal instructions become masked plainly deprives workers of a vital human defence mechanism.

Temporary Deafness. Loud noise may cause temporary deafness lasting up to 16 hours or more, extending from the end of one shift to the beginning of the next, so that only at weekends or holidays can normal hearing return, and only on Monday mornings can hearing losses expected to be permanent be measured.

Permanent Deafness. Permanent partial deafness of occupational origin was recognised by Ramazzini (1713); from 1830 it has been described in many groups of workers, including blacksmiths, sheet metal workers, boilermakers, riveters, fettlers and grinders, textile weavers, and more recently engine-testers, particularly of jets.

Noise-induced deafness is insidious in its onset; the worker is frequently unaware that anything is wrong until irreversible damage has been sustained. The first subjective indication is the inability to carry on a conversation in which several take part or against a noisy background - the so-called "society deafness".

7. Broadly speaking, the form of the deafness corresponds with that of the noise that has caused it, and the degree of deafness is determined by the 'loudness' of the causative noise and the duration of exposure; but for reasons not fully understood the middle frequencies are particularly susceptible to damage, so that noise-induced hearing losses nearly always start and tend to be maximal at 4000 Hertz. Speech sounds usually lie mainly within the frequency range 300-3000 Hertz; but the raised voice is higher pitched and the sound frequency shift to the right then impinges upon the 4000 cycle deficiency. With continued exposure, the '4000 cycle dip' in the audiogram deepens and spreads to involve neighbouring frequencies, notably in the speech range.

8. The variations in individual susceptibility to noise-induced hearing loss have been high-lighted by the recent investigations of Burns and Robinson. The early detection of the extra-susceptibles (and those others who have not worn their ear defenders) is the primary justification for pre-employment and periodic audiometric examination. The new entrant should be tested to pure tones over a wide frequency range 250-8000 Hz and at regular intervals decided by the medical officer some form of screening audiometry performed. Audiometry is simple in principle but difficult to perform reliably in practice; portable equipment is now reasonably cheap, but if audiometry cannot be performed by the company's medical officer it may be possible to make arrangements through a specialist agency.

9. The hearing losses to be expected in an average population with otherwise normal hearing can be seen from the following table drawn from the Burns and Robinson Report. These authors showed that for whole time continuous exposure to steady broad band noise there is one index of noise exposure for the various combinations of noise level and time (in years). The total energy (E) is the product of noise intensity and years, that is E = I x T. Since intensity is usually expressed in the logarithmic decibels, 10 $\log_{10}$ E = dB + 10 $\log_{10}$ T; when the sound intensity is measured on the A-weighted scale the logarithmic expression of E is called E_A

E_A for one years exposure = dBA

E_A for three years exposure = dBA + 5

E_A for ten years exposure = dBA + 10

E_A for 30 years exposure = dBA + 15

10. The quantitative relationship between noise exposure, hearing losses, and individual susceptibility is as follows:

Years Exposure				E_A	HEARING LOSSES (Average at 0.5/1/2 kHz) in dB								
30	10	3	1		Resistant ears			MEDIAN	Sensitive ears			H.L.	'Disability'
dBA					2%	10%	25%		25%	10%	2%		
		85	90	90	-12	-8	-3	1	5	9	14	15	0
	85	90	95	95	-12	-8	-3	1	6	10	16		
	90	95	100	100	-12	-8	-3	2	7	12	18		
90	95	100	105	105	-12	-7	-2	3	8	16	23	25	15%
95	100	105	110	110	-11	-6	-1	5	12	20	30	35	30%
100	105	110	115	115	-10	-4	2	8	17	28	39	45	45%
105	110	115	120	120	-8	-2	5	15	25	36	48	55	60%
110	115	120	125	125	-5	3	12	23	35	46	56		
115	120	125	130	130	0	10	20	32	43	52	60		
120	125	130	135	135	8	18	30	40	49	57	63	65	75%

11. The hearing losses shown are the average of the hearing losses in decibels at 500, 1000 and 2000 Hz. The average hearing loss at these pure tone frequencies is an index of difficulty in speech perception. It is usually assumed that such disability commences at 15 dB loss and becomes total at 82 dB loss. Thus for any decibel loss shown in the table it is necessary to deduct 15 and then multiply the remainder by 1½ to arrive at a percentage disability for speech perception.

12. From the table, 30 years exposure to 90 dB (E_A 105) will cause no speech disability in 50 per cent of workers but 2 per cent will likely suffer a 12 per cent disability. At E_A 120 the median subject will only be at the fringe of suffering disability whereas 2 per cent of workers are likely to suffer 90 per cent disability.

PREVENTION

13. The noise problem should be considered at the factory planning stage, in the choice of site, disposition of departments, specification of building structure and materials, and the selection of processes. In the existing factory the Factory Inspector may offer advice along the same general principles as are applied to the suppression of dust or fume, for example:

Substitution - e.g. welding for rivetting, grinding for chipping, belt driven for gears.

Reduction at Source Good maintenance of machinery, including lubrication; rubber linings of chutes; fitting of exhaust silencers and baffles.

Segregation and enclosure - of machines from people and vice versa.

Reduction of transmission Through the floor by resilient mountings, through the air by partitions or baffles, and by reflection from walls and ceilings by lining with absorptive materials.

Personal Rotation Noise damage is proportional to the product of intensity and time.

14. Medical Supervision: Wherever noise remains above safe levels workers should be protected by ear defenders. There are now many ear protectors available commercially.

Cotton Wool Plugs Ineffective and usually unhygienic.

Glass-down Wool Easily formed into well-fitting plugs to provide an attenuation of 15 to 25 dB. It is a method generally acceptable to workers and management; glass-down does not irritate as might be expected, but it is probably contra-indicated by perforation or discharge.

Moulded Ear Plugs. These are often unhygienic and must be well fitted individually to get a maximum attenuation of 15 to 25 dB.

Ear Muffs These are expensive and obvious, but the better models with fluid-filled muffs can attain attenuations of 35 to 45 dB over a wide frequency range.

15. The provision of ear defenders should be related to the ear-damage susceptibility of the individual, otherwise adequate protection for all will mean the over-protection of the majority with attendant discomfort and the dangers of diminished hearing acuity.

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OCCUPATIONAL DEAFNESS.

The Industrial Injuries Advisory Council in their report on Occupational Deafness (HMSO Cmnd. 5461 - October, 1973) concluded that occupational deafness can satisfy the conditions laid down by Section 56 (2) of the Industrial Injuries Act, provided that (a) the deafness from occupational noise is substantial; (b) diagnostic tests are carried out in existing hospital ENT departments under the supervision of a consultant otologist and (c) the occupational cover is defined by reference to particular processes and a minimum period of employment in them.

They recommended prescription and a scheme on the following lines:-

(1) the disease to be defined in terms of deafness which is substantially permanent and of the sensorineural type, and which is due to, or results from, exposure to noise in the course of employment;

(2) the occupational cover to be limited initially to drop forging and to the use of pneumatic tools in the metal manufacturing and the shipbuilding and repairing industries;

(3) a minimum period of 20 years employment to be required in the prescribed occupation;

(4) claims to be allowable only if made within one year of the date of last employment in the prescribed occupations;

(5) the degree of disablement to be assessed by reference to the results of pure-tone audiometry;

(6) benefit to be awarded only where the hearing loss in the better ear is 50 dB or more, averaged over the 1,000, 2,000 and 3,000 Hz frequencies.

(7) the date of development of the disease to be taken as the date of a successful claim;

(8) a presumption of occupational origin to be given;

continued....

Noise

1. Impact – continuous
2. Type of Noise ✓
2. Noise spectrum
3. Energy output
4. Duration of exposure
5. Individual susceptibility

—

Conservation of Hearing

Ref Govt's (HMSO) Code of Practice

1. Measure & reduce noise
2. Avoid the new sources of noise
3. Health educate all ~~new~~ employee
4. Provide appropriate ear protection.
5. Monitor – environment
   – employee

– Measurement:

– Preventive measures

1. Prevent vibration ?
2. Isolate or enclose ∈ sound insulation
3. Enclose operator.
4. Minimum standards of acceptability to new machinery.
5. Health education.

—

H·E

1. Leaflets] of limited
2. Poster] value
3. Hearing conservation committees - very beneficial.
4. Films.
5. Protective measures - condition of employment.
   i) Anti-noise wool — useful upto dBA-110
   ii) Ear plug
   iii) Ear muffs – esp. if dBA above 110

(9) a presbyacusis correction to be made by means of a 0.5 per cent deduction from the assessment at age 65 with a further deduction of 0.5 per cent for each year over 65.

(10) no regard to be had to the use of hearing aids or the ability to lipread;

(11) the assessment should not be reviewed for a period of 5 years from the date of an award; a similar limitation to apply to repeat claims by unsuccessful claimants, unless in the circumstances of the case the medical board consider that a shorter period would be justified.

Sir Keith Joseph, the Secretary of State for Social Services has accepted the council's recommendations for this compensation scheme (limited because of the need to maintain existing ENT Services), but has not revealed the precise form or timing for its introduction. It is anticipated that it will be introduced in 1974.

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PLP/JW.

Measurement 1. Centre in Factory
2. Special centre
3. Mobile units

↓ Hearing

1. Words heard differently e.g

Spoken	Heard
FIG	FIN
HAT	HAS
BUD	BUT
SHOP	CHOP
TEETH	SEEN

2. Lip-reading done by patient

Audiometry

Adv 1. Enables to identify hearing loss
i) extent and whether operable.
2. Effective Health Education. - pt. appreciates hazard.
3. Helps to evaluate effect of health conservation measures. - ? population improving or deteriorating
4. Helps to pick up hypersensitive individuals.
5. Effect on pts who do not use protective measures - C
6. By determining threshold levels at entry and exit from industry - may help in subsequent litigation.

EMAS
Chief Employment Medical Adviser's
notes of guidance

'Organic dust' surveys

Department of Employment, November 1972

Introduction

1 The term 'organic dust' as used in the context of this paper applies to any material of an organic nature that is immunogenic (i.e. initiates an immunological process) and allergenic (i.e. elicits a clinical response subsequently). Substances with such propensities include polysaccharides, lipids and proteins which may be of bacterial or mycological origin such as cells, spores, hyphae, or derived from higher plant and animal sources with, in addition, relatively simple organic substances such as anhydrides of maleic and phthalic acids. It should be noted that certain inorganic materials also cause comparable respiratory disease e.g. compounds of beryllium, nickel, chromium and platinum.

Allergic effects of organic dusts on the respiratory system

2 The principal effects are:

(1) Nasal: obstruction, rhinorrhoea, sneezing, bleeding
(2) Pharyngeal: soreness, dryness, cough
(3) Tracheo-bronchial: cough, wheeze, tightness, soreness, dyspnoea
(4) Lung parenchyma: fever, cough, dyspnoea

} with measurable impairment of lung function

3 Systemic allergic effects may also occur with possibly weight loss, fever and generalised malaise as well as such specific local non-respiratory effects as conjunctivitis and dermatitis. The particular clinical picture varies with the immunogenic and allergenic qualities of the material, its particle size, the dose rate and immunological status of the subject.

Components of a survey

4 The principles of investigation set out below should be supplemented by 'Statistics as a Service to Employment Medical Advisers'* and CEMA's Notes of Guidance 'Lung Function' – 33 and 'Skin Tests in Dermatitis and Occupational Chest Diseases' – 54.

5 (1) General

A survey may follow complaints from workers engaged in a process or determine if there is an adverse effect, even in the absence of overt disease, where a potential hazard is thought to exist. In addition to determining the precise effect of the exposure it may be necessary to discover the identity of the substance or substances responsible and at what atmospheric levels these effects are observed. Subsequently after the institution of hygienic precautions to abate the hazard a repeat survey may be used to evaluate these precautions.

(2) Medical studies

(a) Symptomatic enquiry

This entails the careful administration of a questionary such as the MRC (1960) questionary on respiratory symptoms, perhaps

*EMA's Code Index – Section O

supplemented by questions related to the specific hazard. In addition the natural history of the 'disease' may require to be gone into.

(b) Physical examination

Inspection and auscultation will reveal obvious dyspnoea, wheezing as the result of airway obstruction, crepitations as the result of parenchymal and alveolar pathology or nothing.

(c) Lung function

Ventilatory capacity measurements will be routine, supplemented as occasion demands by more subtle tests of respiratory mechanics and gas exchange.

(d) Radiological

A PA film carefully taken may be instrumental in detecting transient inflammatory infiltration or permanent interstitial fibrosis. The reading and scoring of films may be on a simple 'clinical' basis or utilise an epidemiological technique such as the ILO U/C scheme (CEMA's Notes of Guidance 'Dust Disease, Chest X-rays in' – 20)

(e) Immunological

Careful history taking. Skin testing with common allergens to determine atopic status. Skin testing with suspected allergens to detect Type I reagin mediated phenomena primarily and perhaps to detect delayed type response (see CEMA's Notes of Guidance 'Skin Tests in Dermatitis and Occupational Chest Disease' – 54). Testing of sera for circulating precipitating antibody is routine where Type III (IgG mediated) mechanism is implied or suspected. Experimental methods exist for measuring other immunoglobulins. Where the history is equivocal and a specific diagnosis for therapeutic purposes is essential, then the patient may need a 'challenge' test with the suspect material under careful control in hospital.

(3) Environmental studies

These may require the conjoint services of chemists, mycopathologists, bacteriologists, industrial hygienists and immunologists to decide on potential hazards, identify the most serious hazards, prepare reagents for skin and laboratory testing and to measure the amount of allergen present in the atmosphere under various circumstances.

(4) Statistical studies

The frequency of symptoms in a group of exposed individuals can be compared with that of a control population matched for age, sex, geography and smoking habit. Radiographic and physiological signs can also be studied in relation to controls. Skin testing and serological testing also require careful statistical control. The survey can be a 'one off' exercise or form a series where the 'progress' of symptomatology, immunological response, lung function and radiographic signs can be studied both for individuals and groups and related to the exposure history in terms of time and concentrations of dust.

Apart from the mathematical significance of departures of indices from the 'predicted', it may be necessary to carry out long term surveillance to study morbidity and mortality.

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ASBESTOS : THE DUST THAT KILLS

The killer fibre had penetrated the very essence of his being. His cough was more painful than ever. Each successive breath was a harsher rasp than the previous one. "Death's clutch", asbestosis had gripped yet another victim. This time it was S. Rajagopal, who joined Hindustan Ferado Limited (HFL), as an operator in the dust-prone breaklining and clutch facing department in 1961. Ten years later the disease struck.

The diagonisis pronounced by the Employees State Insurance (E.S.I.) medical team and private practioners was asthama or bronchitis. But a few months later another verdict was delivered by the Sion Hospital authorities - asbestosis.

His pleas to the management for a thorough medical examination went unheeded for a long time. Finally the management decided to refer him to Dr. G.G.Dave, medical inspector of factories, (Maharashtra). Dave's diagnosis was "acute bronchitis."

Unsure of Dave's conclusion, he filed a petition to the Chairman of Turner and Newall (the transnational corporation link in Britain), for a proper medical screening. In the meanwhile, his health deteriorated and the Sion Hospital authorities adviced immediate treatment. But he resigned from HFL, to collect his gratuity. Why? His wife was ill.

Rajagopal left the company but continued to fight. He filed a writ petition with the Bombay High Court, to set up an ESI medical board to examine him. The ESI board was constituted and the High Court suspended the writ petition.

In a preliminary medical interview with Rajagopal, the newly formed ESI medical board (Coimbatore) consisting of the Dean of the Coimbatore Medical College, the superintendent of the ESI hospital and a cardiac thereby specialist flatly ruled out even the remotest possibility of asthama or bronchitis. There was no mention on their part of the nature of his ailment. Rajagopal goes on to say that he even signed the papers they presented to him ruling out asthama or bronchitis.

The examination consisting of a chest Xray and a blood and urine test was completed in September 1982, and Rajagopal watched and waited anxiously for the results. To his utter amazement, the medical board's diagnosis was "chronic bronchitis" and not "asbestosis."

Finding the results suspect and believing his ailment to be asbestosis, Rajagopal has filed a case before the ESI Court Bombay under section 75 of the ESI Act. He has questioned the credentials of the ESI Medical Board and de-

manded an examination by experts in occupational diseases, unless it is proved that the constituents of the ESI Medical Board were experts in occupational disease. He also demanded a submission of all his papers (case history/ medical reports and certificates) by the Coimbatore ESI hospital to the ESIC court. If after a careful consideration of the case, the Court can prove that the medical board did not consist of experts in occupational diseases, Rajagopal is adamant that it should direct the ESI authorities to get him examined by experts in occupational diseases and grant him the consequential relief.

The hearing of the case came up on the 28th of April 1983, after which the Corporation appealed for time upto the 28th July 1983, to file in its written statement.

A long arduous protracted struggle already begun, will continue: the respondant - the ESI medical board (Coimbatore) the petitioner - a dying Rajagopal, trying to keep alive the last flicker of hope, that his success will not only vindicate him but also pave the way for thousands of similarly afflicted workers.

* * * * *

What is this monster called asbestos ? Where is it found? How does it endanger a worker's health ? What is asbestosis ? How does it affect a worker? What are the laws and controls for the regulation of the use of asbestos? How are they implemented? The following piece entitled, "Asbestos: The dust that kills", attempts to explore the answers to the above questions.

Asbestos derives its name from a Greek word meaning "unquenchable" an adjective that could well describe both the properties of the substance, as much as the thirst for profit that drives those who organize both men and asbestos for their commercial use. The Roman slaves who mined it in the Italian Alps 2000 years ago probably suffered from the same diseases as do workers in modern factories today. The technology may have changed but the conflict between health and profits remain.

Asbestos is a hydrous mineral silicate containing magnesium, aluminium, iron, sodium and calcium.

There are about six varieties of asbestos which can be broadly classified into 2 main groups:

- the serpentines: These are hydrous silicates containing magnesium. The white variety of asbestos called Chrysotile belongs to this group.

- the amphiboles: These are hydrous silicates chiefly containing iron and aluminium. They also contain calcium, sodium and magnesium. Crocidolite or blue asbestos which is perhaps the most dangerous variety, falls into this category.

Kinds of Asbestos

a) Chrysotile: The most commercially used variety of asbestos is a white, fine, silky, flexible, serpentine variety called chrysotile (white asbestos). It has the longest and strongest fibres and can be spun. It is primarily responsible for asbestosis.

b) Anthophyllite: Anthophyllite like chrysotile is white and contains magnesium. It is brittle.

c) Crocidolite: It is also called blue asbestos, because of its colour. It mainly consists of iron. Even a short exposure of a few months, can give rise, upto 20 years later, to mesothelioma of pleura (cancer of the membranous lining of the lungs).

d) Amosite: Amosite is a straight brittle fibre ranging from light grey to pale brown in colour.

e) Actinolite and (f) Tremolite : They consist mainly of calcium, and are used in filters, papers, etc.

The minerals exist in several forms and differ in their physical properties and chemical composition, but they are similar in their fibrous nature and flexibility. Asbestos is a very versatile material. It is fire resistant, insoluble in water, resists corrosion by a large number of chemicals, has high tensile strength, is abundantly available, and is very cheap.

USES OF ASBESTOS

Asbestos has over 3000 commercial applications and is used for both domestic and industrial purposes - as pipes, insulation boards, protective clothing, rope production, heat and sound insulation for plant and building structures, mattresses, roof sheeting, brakelinings, clutch facings and several other articles of daily use. It is effectively integrated as a filler, binder and as a reinforcing substance with other materials like cement and rubber.

We therefore encounter asbestos on an increasing scale in several places (see box 1) and it is not surprising that industrial interests insist that there is no adequate substitute.

Box 1.

The industries using asbestos.

1. Docks and transport - handling sacks & balls.
2. Asbestos factories - milling, weaving, turning, - manufacturing asbestos cement sheets and pipes.
3. Power stations - lagging and delagging.
4. Iron and Steel works and other heavy engineering industries - boiler furnace insulation.
5. Locomotives and rail carriage building - heat and sound insulation.
6. Ship building and repairing - asbestos insulation, lagging and delagging.
7. Paper making - filter papers.
8. Manufacture of floor tiles, mats & roofs - linoleum and asbestos sheets.
9. Adhesive and plastic manufacture - used as fillers for strengthening.
10. Automobile industry - brake shoes linings, and clutch facings, insulated under the body of cars.
11. Light engineering - gesket washers etc.
12. Packaging manufacture.
13. Construction - laying of pipes and fitting of sheets on insulation boards, asbestos spraying on walls.
14. Electrical engineering industry - insulation.
15. Insulation mattress manufacture.
16. Asbestos textile manufacture - safety clothes.
17. Chemical plants and heat treatments shops-linings of furnaces, boilers & chimneys.

(Source: Asbestosis: A Killer disease: Audyogik Jeevan Manch)

HOW ASBESTOS IS PROCESSED

Before asbestos appears as an everyday commodity it is processed by human labour - an operation which consumes both the raw materials, labour and the labourer. There are basically two processes involved in the manufacture of asbestos -- the wet and the dry. In the former, water is added to a dry mixture of asbestos and cement. A slurry is formed. This is moulded and extruded with heat and pressure. In the dry process, the asbestos fibres are fluffed and combed. For instance, in the textile industry the fluff is mixed with cotton before carding; and the later is spun and woven, in a dry state. Both processes expose workers and the environment to asbestos dust, fumes, and heat. It is chiefly the dust which enters the worker's lungs that leads to the depreciation of the labourer's health and life, but a "depreciation", that never enters into the calculation of cost.

The handling and use of asbestos therefore raises two problems:

1. The problem of protecting asbestos workers from a number of asbestos-related diseases like asbestosis and cancer.

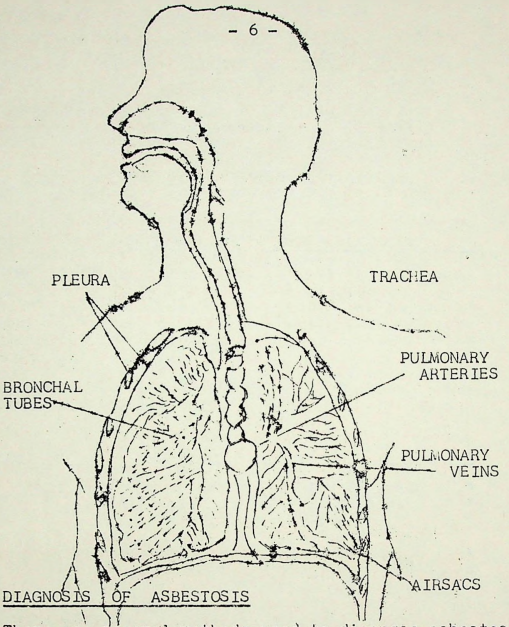
2. Protecting the environment from pollution and the risk of cancer for the population.

HOW ASBESTOS AFFECTS THE WORKER

Asbestos fibres enter a worker's body insiduously. The most dangerous fibres are those which cannot be seen by the naked eye (less than 2 microns thick). They are able to pass through the natural filter system of the nostrils and the mucous lining of the airtubes, and accumulate in the airsacs of the lungs, turning the elastic tissue of the airsacs into rigid fibrous tissues. This is called asbestosis. This condition obstructs the free exchange of gases in the lungs and thus impairs the lung function.

SIGNS AND SYMPTOMS OF ASBESTOSIS

* Difficulty in breathing.
* Crackling sound during breathing.
* Breathlessness on exertion.
* A Dry cough.
* Weight loss.
* 'Finger clubbing' - (thickening around the base of the nails.)



DIAGNOSIS OF ASBESTOSIS

There are several methods used to diagnose asbestosis.

1. The sputum test: A person inhaling asbestos fibres will will show asbestos bodies in the sputum. These bodies consist of asbestos fibres surrounded by various proteins and iron particles and can be identified under a microscope. This test employed in isolation does not conclusively lead to a diagnosis of asbestosis, because people in industrial communities may have asbestos fibres in their lungs which are otherwise normal. The presence of asbestos bodies in the sputum, however, confirms exposure to asbestos.

2. Asbestos bodies in the lungs at biopsy: (severing a lung section for examination).

   In asbestosis, a lung-biopsy reveals a large number of asbestos bodies in the lung. They appear in smears of fluid scraped from the lung surface.

   But this is a random method of diagnosis as the severed lung section may not contain any fibres.

3. Radiographic appearance: (Xray findings)

   Fibrosis (rigid fibrous lung tissue) in asbestosis occurs as a fine network in the lungs. The network resembles ground glass or fine cobweb.

4. Respiratory Functions tests.

These are tests to check the respiratory function of the lungs but are of little value in diagnosing asbestosis in its infancy. A series of readings over the previous years must be obtained. Loss of elasticity and rigidity of lung tissue, and a decreased capacity for gas exchange signify an impaired lung function.

A combined usage of these tests, together with symptom detection will lead to a more accurate diagnosis of asbestosis. In fact, the Pneumoconosis Medical Board of the U.K. has clearly laid down that any worker suffering from even two of the symptoms, of asbestosis, and has been exposed to asbestos at work, is immediately certified as suffering from asbestosis. (This is in sharp contrast to the situation in India, as indicated in the Rajagopal case).

Asbestosis, which is time and dose related, appears two to thirty-five years after the first exposure. Once the disease sets in, it progresses even after the worker is prevented from further exposure. It even paves the way for lung cancer. The risk of contracting asbestosis is minimal below certain exposure levels. Smoking increases the risk of contracting the disease extensively.

INCIDENCE OF ASBESTOSIS

Recent studies from different parts of the country indicate a high incidence of asbestosis :

1. In a survey of an asbestos cement unit in Faridabad, a Central Labour Institute (CLI) researcher found, that out of 850 workers, 58 suffered from asbestosis and 58% experienced changes in the functioning of the lungs.

2. A similar study of 800 workers of Asbestos Cement Ltd. Bombay, conducted by the National Institute of Occupational Health, (Ahmedabad) revealed that out of 800 workers, 224 suffered from more advanced stages of asbestosis. While the management flatly denied these figures, the study also noted that another 128 workers had contracted the disease as well, although it had not reached the later stages.

The widespread and as yet under-reported incidence of asbestosis is perhaps best summed up by Dr. S.R.Kamat, head of the faculty of thoracic medicine, G.S. Medical college, Bombay, who notes, "There is no doubt that one third of the workers in asbestos factories are suffering from asbestosis."

Besides asbestosis, the other diseases related to asbestos dust exposure are: pleural plaques, pulmonary tuberculosis, mesothelioma of the pleura and peritoneum, lung cancer and cancer of the stomach, oesophaqus, colon and rectum.

PLEURAL PLAQUES

Pleural plaques are present in asbestosis. They appear as fibrous scars on the external lining of the lung. This is due to the irritation caused by the asbestos fibres which are lodged in the external lung lining. Pleural plaques are nodular or smooth. They are composed of firm white material, which may be seen on an X-ray if there is calcium deposition.

PULMONARY TUBERCULOSIS (T.B. OF THE LUNGS)

Research indicates a definite association between tuberculosis (T.B.) and exposure to asbestos dust. In one study in the U.K., out of 82 patients who died of asbestosis, 36% were also suffering from T.B.

MESOTHELIOMA OF THE PLEURA AND PERITONEUM

(Cancer of the membranous lining of the lung and abdomen)

Mesothelioma is a tumour occuring on the membranous lining of different organs. As an asbestos-related disease, it occurs on the membranous lining of the lungs (pleura) and abdomen (peritoneum). Pleuraland peritoneal tumours occur either alone or together.

The following are the signs and symptoms of mesothelioma:

1. Breathlessness accompanied by chest pain.
2. Cough and blood in the sputum.
3. Accumulation of straw-coloured or blood-stained fluid in the lung's lining (pleura).
4. Thickening of the pleura and enlarged growths (tumours).
5. Lung Collapse.
6. Malignant cells in the lining of the lungs and abdomen.

Blue asbestos is about ten times more likely to cause mesothelioma than the white variety, and some experts claim that just five minutes, inhalation of blue asbestos dust can produce mesothelioma even twenty years later. Smoking apparently does not increase the risk of mesothelioma. However, families of workers exposed to asbestos dust from work clothes do face the risk of this kind of cancer. People living near asbestos factories and mines are also in danger of contracting the disease.

This is a fatal disease. There is no drug, surgical or radiation treatment that can cure it.

LUNG CANCER

Lung cancer is yet another asbestos related hazard and often follows asbestosis. It occurs in the lower lobes of the lungs. The risk of its contraction is greatest in the workers exposed to high levels of asbestos dust, especially in those who smoke. The risk of contracting lung cancer is 90 times greater in smokers than in non-smokers.

This form of cancer was first reported by Merewether (Medical Inspector of Factories in the U.K.) in 1947, based on a study of 235 death certificates recording asbestosis. Other studies confirm this.

CANCER OF THE STOMACH, FOOD PIPE, LARGE INTESTINE AND RECTUM

These forms of cancer are also caused by exposure to asbestos fibres.

The method of diagnosis for mesothelioma and the other forms of cancer is a biopsy.

According to an article by J. Kumar in Science Today, no case of cancer due to asbestos has yet been notified in India. This can be due to the fact that asbestos workers are not followed up after they retire and occupational histories of cancer patients are not recorded. In cross-sectional studies of workers, it is difficult to find a person who is still working while suffering from lung cancer or mesothelioma of the pleura.

There are, however, several studies confirming the widespread occurence of mesothelioma, lung cancer and cancer of the stomach, oesophagus, colon and rectum in the West.

INCIDENCE OF THE CANCERS

1. In a study conducted by Dr. Irving J. Selikoff (Mount Sinai School of Medicine, New York), of 632 asbestos insulation workers in New York and New Jersey between Jan 1943 and Dec. 1974, it was revealed that there were 35 deaths of mesothelioma - 10 pleural and 25 peritoneal. There were 42 reported deaths of lung cancer, 20 deaths of cancer of the stomach and food pipe and 23 deaths of cancer of the large intestine.

2. In another study, conducted by Irving J. Selikoff, of 17,800 asbestos insulation workers in the United States and Canada (International Association of Heat and Frost Insulators and Asbestos Workers, AFL-CIO, CLC), between Jan. 1, 1961 and Dec. 31, 1973, the wide prevalence of cancer was established. There were 36 deaths of pleural mesothelimoma and 67 deaths of peritoneal mesothelioma. It was further revealed that there were 321 deaths of lung cancer, 16 deaths of stomach cancer, 14 deaths of cancer of the food pipe and 39 deaths of cancer of the large intestine and rectum.

3. In 1967, 17 fatal cases of pleural mesothelioma were reported in the small town of Manville in New Jersey. By 1973 there were 72 victims of this cancer cancer in this town of 15,000 people, where the giant U.S. Corporation Johns-Manville still has its largest Manufacturing Plant.

REACTIONS IN THE WEST

An avalanche of medical literature and new found public knowledge about the toxic nature of the silicate, has unleashed massive public opinion and protest in the West. This has led to a plethora of legislation to control and regulate the use of asbestos in the manufacturing process and otherwise. Technology in the west has geared itself to devising engineering controls, a variety of personal respiratory protective equipment and care in layout planning. These measures would help to effectively reduce dust levels inside the work premises to 2 fibres per c.c. - 0.2 fibres per c.c., for different varieties of asbestos fibres. (The Asbestos Working Group in the U.S. reported in 1980 that there is no safe exposure limit for asbestos and that all commercial and several non-commercial forms of asbestos cause disease. It recommended a new standard of 0.1 fibre per c.c. as the maximum exposure limit. This is the smallest quantity that can be measured by techniques currently available.) (See box 2 and 3. U.K. asbestos code and U.S. Occupational Health & Safety Act.)

BOX 2

Asbestos Safety Code in the U.K.

1. Asbestos dust can cause lung diseases and there are strict regulations governing the manufacture and commercial use of asbestos products.

   For the home handyman and domestic user of asbestos prodcts it is very unlikely that harmful quantities of dust will escape in normal use. As a precaution they are advised to avoid creating and breathing asbestos dust.

   1) Dampen the work: damp dust does not become airborne and is not inhaled. Do not sand wall plugging compounds, unless damped. When relining car brakes, remove the dust from brake drums with a damp cloth.

   2) Damp any dust that falls to the floor. Pick it up as soon as possible and place it in a plastic bag and seal the bag.

   3) Work in well-ventilated space e.g. outdoors while sawing, filing, drilling, sanding.

   4) Use hand saws and drills which produce less dust than power tools.

   5) Renew worn or frayed asbestos insulators.

(Source: Occupational Hazards:Hunter)

BOX 3

Basic features of the U.S. Occupational Safety and Health Act related to asbestos :-

1. Permanent structural changes to make the workplace safe.

2. Tools generating dust must have exhaust systems at the point of contact of tools.

3. Respirators to limit the amount of dust inhaled are permissable only if engineering controls are under construction. They cannot be a substitute for engineering controls.

4. Asbestos must not be used loose, waste must be sealed in polythene.

5. Warning signs at workplace and on all products of asbestos.

6. Protective clothing and separate lockers for work and street clothes.

7. Prescribed standard of an average of 2 fibres/c.c. for an 8 hour shift. Monitoring of air at a 6 month interval.

8. If a worker is exposed to excess dust (above the standard) then he must be informed within 5 days.

9. Comprehensive medical examination once a year.

10. An individual worker or Union can complain directly to the state authority. The reply must be displayed near the workplace.

11. A Union Representative in every factory (called 'walk-around' representative) will accompany the factory Inspector on his visits and sit in on all discussions between Inspector and Management.

(Source: Asbestos: The killer disease, Audhyogik Jeevan Manch)

The industry, has however, tried to skirt the stringent controls with an uncanny slyness. Litigation has uncovered proof that the industry was not only aware of the developing medical literature on asbestos, but was actively tampering with the scientific reports of the studies and suppressing reports of other studies. As a sequel to these revelations and others, there has been a move in the U.S. Congress to declare these as federal crimes.

The International asbestos industry's own view of its responsibility to label its products as potentially lethal was recently revealed by the disclosure of an internal memorandum of the Asbestos International Association dated 7th July 1978.

According to the memorandum, the industry was unanimous in the view that the best warning label was none at all. Many participants felt that if the use of a label was absolutely unavoidable it would be advisable to adopt the U.K. label which merely states "Take care with asbestos."

Workers and their unions, (particularly in the U.S.A.) still vehemently insist on managements adherence to workplace regulations, incentive payment for hazardous work, the stoppage of asbestos usage and the search for substitutes. Insurance carriers have raised workers compensation insurance rates for employers who continue to use asbestos. In courts, several thousand victims of asbestos cancer have so far used the industry for knowingly marketing deadly products while making no efforts to inform product users of the time-bomb danger of breathing in asbestos dust.

The law suits which are on the increase each day cost giant corporations like the Johns-Manville, Owens Corning, Armstrong and a dozen others and their insurance carriers several billion dollars in damages.

As a result of mounting public pressure, tight legislation, skyrocketing law suit charges and swelling compensations to workers, the consumption of asbestos has decreased in the West. By 1980, the Johns Manville Corporation had closed down four asbestos cement pipes and manufacturing plants in the U.S. alone.

But the company still persisted in sustaining itself with a dogged determination. According to a Business India article, on the 26th August 1982 the company filed for protection under Chapter II of the U.S. Bankruptcy Code, which shields a concern from creditors law suits. It is also suing for $5 billion in damages from insurers alleging tardy settlement of its claims on them.

Multinational companies ruthlessly continue to manufacture and aggressively market asbestos to third world countries where some or all of the following factors ease their entry:-

1. The local elite are willing to import raw asbestos or use the fibre in the manufacture of various products.

2. There is a high demand for the raw fibres and finished asbestos products.

3. Labour is cheaper.

4. The political climate is stable.

5. Government legislation and controls are lax.

6. The levels of working class and public consciousness is in its initial stages of development.

7. The extent of unionization is low.

The western corporate magnate's profit is intact: The Third World capitalist makes his cut. The worker in both countries is doomed to a slow and agonising death. India is one such example.

THE ASBESTOS INDUSTRY IN INDIA

The asbestos industry in India employs over 7,000 people in twenty units, spread over Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu, and Haryana. All the large units are either subsidaries of multinationals or collaborations. (See Box 4).

BOX 4

The following table is a list of the major asbestos companies in India, their products and their linkages.

Name of the Company	Product	Transnational Corporation Link.
Hindustan Ferado.	Brakelinings, sheets, yarns, jointings, textile, mattresses, millboards, packing cloth.	Turner & Newall (U.K.) (T&F)
Hyderabad Asbestos	Sheets, millboards, pressure pipes, jointings, thermal insulation.	Johns Manville USA (T) and Societe Italiana
Shree Digvijay Cement Co.	Sheets and pressure pipes.	Johns Manville U.S.A. (T & F)
Sundaram Abex.	Friction materials like brake linings.	Abex Inc. USA (T & F)
Suri Asbestos Industry	Textiles, ropes, packings, yarn, laggings, jointings.	Johns Manville (T & F) U.S.A.
Rane Brake Linings	Brake linings and clutch facings.	Small and Parkers U.S.A. (T & F)
Reinz Talbros	Asbestos Jointings	Reinz Dichtung - A.G. West Germany (T & F)

* T: Technical
* F: Financial

(Source: DGTD Handbook of Foreign Collaborations 1980).

In 1977, 11 units produced 4.1 lakh tons of asbestos cement sheets. This is .4% of the total value of industrial production in India, while in the same year by comparision the total bicycle production was 15.37%.

Most of the asbestos used in India is imported and only about 20,000 tons is mined in Andhra Pradesh, Bihar and Rajasthan. (See box 5).

BOX 5

Imports of Raw Asbestos

Year	Metric tonnes actual Imports
1978-79	62,707
1979-80	75,470
1980-81	84,264
1981-82	80,854

Portwise imports are in the approximate range

a) Bombay - 60%

b) Madras - 20%

c) Calcutta - 20%

(Source: M.M.T.C.)

BOX 6

Company	Sales of larger Companies Metric Tonnes		Net Profit Lakhs	
	1980-81	1981-82	Year 1981	1982
Hindustan Ferado	4,000	4,000	98.34	33.79
			Year 1981	1982
Hyderabad Asbestos Cement	30,000	23,000	344.52	336.66
Asbestos Cement	18,000	18,000	-	-
			n.p. after depreciation, taxation, and investment allowance.	
			Year 1980	1981
Shri Digvijay Cement Company	9,000	15,000	67.27	74.42
			n.p. after tax.	
			Year 1982	1983
Sundaram Abex.	500/1000	1500/200	0.24	0.51
			n.p. before depreciation and tax	
			Year 1979	1980
Rane Brake Linings	1,000	1,500	68.64	89.80

(Source: for sales M.M.T.C.)

(Source for profit CMIE News clippings)

n.p. = Net Profit.

LEGISLATION IN INDIA

With intensifying debate and growing consciousness about the health hazards of asbestos, asbestosis has been incorporated as a notifiable disease in India, in an amendment in 1976 to the Factories Act of 1948.

The following are the salient features of schedule 14 of the Factories Act, applying to asbestos workers:-

* It applies to factories in which asbestos is handled and manipulated in various processes (The provision of the schedule can be relaxed or suspended by the Chief Inspector of factories, if he is convinced (i) that the use of asbestos is restricted or temporary. (ii) and therefore will not endanger the worker's health. This certificate can be revoked at any time).

* All manufacturing and conveying machinery must be fitted with a mechanically operated exhaust draft, to suppress dust release.

* Mixing and blending of asbestos fibres should not be done by hand but with a mechanically operated exhaust draft, to prevent dust generation.

* The making or repairing of asbestos insulating mattresses must be carried out in an isolated room with adequate exhaust and ventilation equipment.

* Only workers engaged in filling, beating or levelling should be present.

* Floors, benches, covers and fibre filled mattresses should be dampened whilst filling, beating or levelling is carried on.

* Storage chambers, bins containing loose asbestos, dust filtering and setting appratus should not be kept in a workroom. Suitable methods of storage should be found.

* Arrangements should be made to prevent dust discharge from exhaust apparatus.

* The floors, benches and plant should be kept clean and free of asbestos debris.

* The room should be well-lit.

* Sacks used as asbestos containers should be cleaned by machines and made of impermeable material.

* All ventilating and exhaust equipment should be tested at least once in six months and the defects rectified.

* A register containing these records must be maintained and should be made available to the factory inspector on demand.

* Breathing apparatus, overalls and head coverings must be provided for those engaged in handling loose asbestos, cleaning of dust settling or filling chambers and other equipment, and those engaged in filling, beating or levelling in the manufacture of insulating mattresses.

* No Young person should be employed in or in connection with the manufacture of insulating mattresses, blending or mixing of asbestos by hand, in sackcleaning, in chambers or apparatus for dust settling or filtering, in chambers containing loose asbestos or in stripping or grinding the cylinders, including the doffer cylinders or any other part of the carding machine.

MEDICAL PROVISIONS IN THE LAW

* A person is employed only after a fitness certificate is awarded by the medical inspector of factories or certifying surgeon after a medical examination.

* Every worker should be X-rayed by a qualified radiologist at the cost of the employer, before he is employed.

* The X-ray should be submitted to the medical inspector or certifying surgeon within three months of the examination date.

* Medical examinations should be conducted by the medical inspector of factories or certifying surgeon at intervals of twelve months after the first medical examination.

* The Medical Inspector of factories or certifying surgeon can direct the employer to arrange for an X-ray of a worker at the employers own cost, whenever it is necessary, the X-ray must be then handed over to the medical inspector/certifying surgeon.

* A worker who is declared unfit to work on processes specified in the Schedule is banned from working on the same unless an X-ray is taken at the employers cost and the worker is once again certified fit. During such time he may be permitted by the Medical Inspector or Certifying Surgeon to work on any other process which may be safer. This is allowed if the medical inspector is convinced that the worker is not totally incapacitated.

* The Medical Inspector or Certifying Surgeon can direct a worker for radiological, clinical or pathological examinations or any special treatment at the expense of the employer, if he thinks it is necessary.

* The Certifying Surgeon should after each examination grant a certificate which the manager must maintain in a proper register or file, and produce before the inspector on demand.

* The manager should maintain the details of every medical examination and the register shall be produced before an inspector whenever demanded.

LOOPHOLES IN THE LAW

The law framed by a government which represents the interests of private enterprise, is bound to mirror the interests of private industry and management. Both in its formulation and implementation, the schedule is ridden with loopholes, which are taken maximum advantage of by industrialists in their drive for profit.

The following are the major loose ends in the Schedule:-

* More dangerous diseases like lung cancer and mesothelioma continue to be left out of the scope of the Schedule.

* The power of the Chief Inspector to relax or suspend provisions can be misused at the behest of the management or in his "own interests."

* While the Schedule states that "no young person" should be employed in or in connection with certain manufacturing processes, the term "no young person" smacks of gross ambiguity.

* Provisions have been laid down for the suppression and control of dust within the factory premises but not outside the plant. This is likely to affect the people in the vicinity of the factory.

* A provision for separate lockers for work uniforms and ordinary clothes has not been made, leading to contamination of the latter.

* There are no clear cut technical specifications outlined for the nature and quality of the respiratory apparatus, protective clothing and engineering controls. Managements therefore have no qualms about providing inferior quality and inadequate equipment.

* There is no mention of a ban on blue asbestos which is banned in other parts of the world.

* There is no indication for fixing warning labels on the asbestos products.

* There are no provisions for workers' access to their own medical reports and the factory inspection assessments.

* Furthermore, workers do not have the right to information regarding the materials they use and the production process itself.

* The activities of asbestos companies are veiled in secrecy and the only people who can examine them are the factory inspectorates. The government and its related agencies and institutions are also fighting shy of exposing 'revealing' and 'controversial' research reports on occupational health hazards.

  A case in point is Central Labour Institute, that has been with-holding from the public its detailed studies on the Shree Digvijay Asbestos Plant in Ahmedabad and others. A provision should be made in the law to grant permission to journalists, researchers (government and private), social workers and the like to conduct surveys and publish their reports for the public. Permission to take photographs of the plant must be granted.

* Constitutional litigation is frustrated by redtape, nepotism, bribery, and unending delays making a myth of justice. The petitioner often looses faith in the judiciary and his will is ground to a halt.

* As per the provisions of the Factories Act it may be pointed out that the inspector has a series of functions ranging from checking of licenses to health and safety measures. He has to conduct inquiries in the case of accidents and attend courts too. It is ironic that, the last National Labour Conference, 10 years ago recommended 1 inspector for 150 factories. In Maharashtra there are instances of the ratio of inspectors to factories approximating 1:190. It is no wonder then, that among other things, a facile circumvention of an already impotent law is possible.

CASE STUDIES

Not only are there blatant shortcomings in the law, it also remains a paper tiger which is flagrantly abused and flouted at every stage. It may be interesting to note that 2 years ago there was a fiery debate in the U.K. on the conditions in Indian asbestos factories and the double standards adopted by multinationals to which these Indian Companies were linked. This was sparked off by a report in a popular scientific journal in the U.K. The heated debate left the Indian public and worker untouched. Public and worker consciousness about the health hazards of asbestos continues to be in its infancy here. Besides being unaware about the health problems caused by asbestos, workers are blissfully ignorant about the materials they handle and the production process they are engaged in. They are un-informed about their legal rights and have no access to their medical reports. Due to the legal implications involved, factory medical officers rarely identify asbestosis. A Times of India report dated February 11, 1983, states that asbestosis is even deliberately confused with T.B. and bronchitis to avoid legal implications and compensation costs. More often than not, when asbestosis is diagnosed, the management retrenches the worker.

Case studies of the Asbestos Jointing Unit at Andheri, the Shree Digvijay Asbestos Cement Plant in Ahmedabad and Hindustan Ferado Limited in Bombay, are examples of the appalling conditions and brazen evasion of the law found in asbestos factories in India.

I. The Asbestos Jointing Company

The Asbestos Jointing Company at Andheri employs 70 workers. It manufactures joints for insulated pipes. The hazards in this unit are primarily of materials handling. There are 5 basic processes involved in the manufacture of joints:-

* Fibre strage and handling which exposes the worker to dust.

* Mixing of fibres with rubber, petrol and benzene in high heat conditions. The emission of benzene and petrol fumes and the generation of asbestos fibres in cleaning and maintenance operations is hazardous.

* Sheet making and cutting under high heat conditions, resulting in fatigue and exhaustion.

* Shearing which generates dust and

* Shredding operations. Two cyclone machines are involved in the shredding process. The loading into the machines is done with bare hands. Spillage occurs at two points :-

a) when the cyclone works at the loading bay and

b) where bags are filled by a vaccum system. The bags are coated with a film of fibre which gets lodged beneath the worker's skin to form a corn.

The Asbestos Jointing Company outrageously violates the conditions and regulations laid down by the Factories Act.

1. Though the plant has stopped using blue asbestos, piles of white and blue asbestos are heaped outside the unit, polluting the environment. This is in contravention to the storage norms prescribed by law.

2. The workers are not provided with gloves and there are no washing and changing facilities.

3. Though the law provides for the provision of proper breathing apparatus, and head covering, the management has provided them with cloth masks which is a piecemeal measure. The cloth masks have no filter system. They get clogged with asbestos fibres which the workers inhale. Often the workers find the mask so uncomfortable that they remove them.

4. There is no local exhaust system (vaccum suction device) general exhaust fan or shower to dampen the floor.

5. The workers claim that there has not been any inspectin by the factories inspectorate and no genuine records have been maintained.

6. The medical tests seem very perfunctory. The workers report that their nails are just superficially checked and they are sent back.

7. According to the workers, the management has refused to discuss the problem of health hazards with them. This is an outright denial of the right to collective bargaining even after the issue has been raised before the management and the factory inspector.

Further developments have occurred after a letter was sent in recently by the union to the Management and Factory Inspector demanding a medical check up of the workers. The management has insisted on a medical check up. But no official written reply has been received from the factory inspector. What develops further remains to be seen.

II. Shree Digvijay Asbestos Cement Plant (Ahmedabad)

According to a study conducted by J. Kumar of the Central Labour Institute Bombay and the annual report of the National Institute of Occupational Health 1980, the Ahmedabad based Shree Digvijay Asbestos Cement Plant's safety record is no better. The studies revealed that:-

1. The fibre concentrations in the yarn unpacking, mixing, spinning, weaving and rope divisions were 367 fibres per c.c., 418 fibres per c.c., 225 fibres per c.c., and 216 fibres per c.c., respectively. This is far above the statutory permissable level of 2 to 0.2 fibres per c.c. for different kinds of asbestos.

2. Out of 320 workers selected at random, 6.5% suffered from asbestosis due to exposure.

3. The plant continued to use crocidolite which causes mesothelioma. Perhaps it should be pointed out here that manufacturers in the U.K. imposed a voluntary ban on the import of crocidolite fibres in the early seventies.

Another study of the same plant conducted by Barry Castleman, and published in the "New Scientist" said that :-

4. The road leading to the unit was lined on both sides by asbestos cement waste.

5. A high wall surrounded the factory and beyond it untreated waste water was emptied into a trench and piled with solid asbestos waste on either side. Children played on the waste around their homes.

6. Some of the houses were made from hunks of asbestos cement pipes and scraps of corrugated asbestos waste sheets.

III. Hindustan Ferado Limited (HFL)

Hindustan Ferado Limited (HFL) in Bombay is a subsidary concern of the British Asbestos Company Turner and Newall. The Indian Plant which opened in 1956 manufactures clutch linings and asbestos textiles. A collation of reports from the Times of India, India Today, Business India, New Scientist and Science Today point a dismal picture of the health and safety conditions in the unit.

The Company brazenly abuses the law in several ways:-

1. Dust levels stand above the statutory permissable standards and the heat is so opressive that the workers are unable to wear respirators because they feel suffocated.

2. Simple housekeeping measures are not employed.
   a) Floors are swept dry creating dust.
   b) The same lockers hold overalls and the workers clothes, which are thus contaminated.

3. Labourers who work in the dry process and carry the waste from the ventilation traps have no protection. They are covered with asbestos dust.

4. As a result, many employees have been found to be suffering from asbestosis. At least 35% of those still on their jobs are afflicted and not compensated.

5. The ESIC is another eyewash. When a worker is not in service, ESIC contributions stop and he can avail of medical treatment only for a period of 6 months. When a worker dies in service, the ESIC provides for compensation of upto Rs.80,000/- maximum, payable in instalmentsof Rs.500/- p.m. But as soon as it is proved that he has asbestosis he gets retrenched. Further if he dies of the same disease, say two years after he retires from service, neither the management nor the ESIC takes on the liability.

Union representatives have been demanding an improvement in HFL, viz the provision of proper ventilation facilities, separate lockers and bathing facilities for workers. Under such pressure the management has taken the following measures :-

1. In 1980 HFL introduced personal respiratory protection equipment on the shop floor. These form the second line of defence, the main precautionary measure being engineering controls.

2. Raw asbestos is now packed in polyethelene bags which are placed in another polyethelene bag. This is an

improvement over the original packing in jute bags, many of which were damaged, leading to fibre spillage. This decision probably followed Britian's refusal of shipments of asbestos products as they were not triple packed in polyethelene bags as a safety measure.

3. According to government regulations, cleaning and grinding of asbestos fibres in the carding sections as in several other departments should be a mechanical process. Under a recent Union agreement, the management has decided to import some new equipment from Germany.

4. Though the management has introduced plastic strip curtains to separate the dust prone carding section from other sections, much is left to be desired. Plastic strip curtains together with a plywood door, or better still, an air curtain (engineering device by which air can be blown in a particular direction) would be a safer measure.

5. HFL's contract department used to handle another dangerous area. Workers had to go out and spray asbestos fibres for insulation. This activity finally stopped when many workers began suffering from chest ailments.

6. Workers in the carding and fluffing sections get an "inconvenience" allowance for working in these sections. The point in question is whether workers should accept such an allowance.

After much feet dragging the management has been forced to concede to several of these demands under union pressure. It still tries might and main to diffuse issues and evade its responsibility. Its line of defence is is that improvements cost money. The HFL management complains that its wage costs are 28% of the manufacturing costs, while that of Sundaram Abex, another asbestos unit is only 17% of the manufacturing costs. Such costs however should be counted under capital expenditure and not under wages as they are not perks given to workers but are an essential pre-requisite for the manufacture of asbestos.

WHAT CAN BE DONE

History bears evidence of industry's reluctance to give up the use of such a versatile material, without a massive amount of public opinion and worker pressure.

* A move to use appropriate substitutes in lieu of asbestos must be initiated.

* As long as it continues to be used, its use must be regulated by the most rigorous control.

* While it is necessary to use the existing law for some protection, it is necessary to ask for new provisions to be incorporated (as pointed out in the loopholes of the Act).

* Pressure must be brought to bear on the management, for the proper implementation of the Factories Act.

* Workers must demand the right to appoint "safety representatives" from among workers at the factory/ plant level and union representatives who have access to facilities and records, both administrative and medical.

* They must also insist on the right to information regarding details of materials/chemicals used, processes and hazards involved, and such other information as is relevant to the health of workers in the industry.

* Workers must press for the revision of compensation rates according to current price levels.

* If a worker who contracts an asbestos related disease is retrenched after the disease is identified, then the management should be pressurized to pay a compensation till his death. Workers must in addition demand compensation from the Company, in instances of deaths resulting from asbestos related diseases, even after retirement.

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/hrs.

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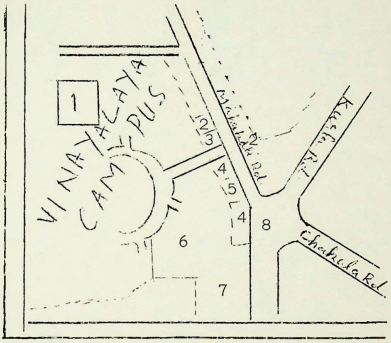
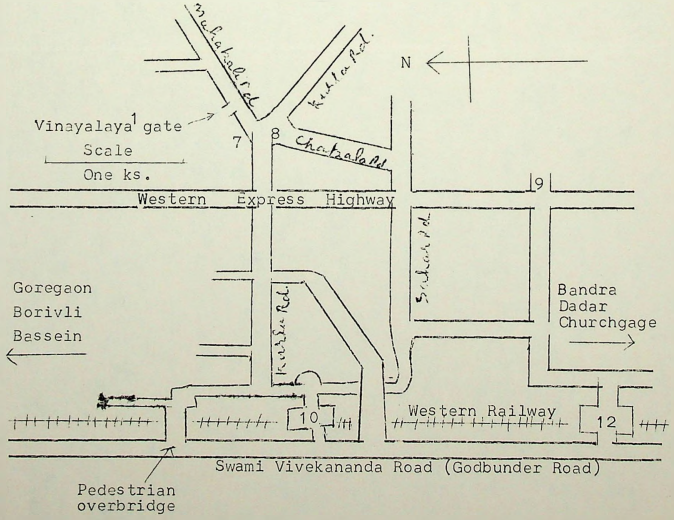
MAP OF VINAYALAYA LOCATION OF THE WORKSHOP

1. Retreat House
2. Slum hutments and stalls
3. Pond
4. Appartment Building
5. Garage compound
6. Cemetery
7. Holy Family Church and School
8. Chakala-Mahakali Road Chowk
9. Airport entrance
10. Andheri Railway Station
11. Flyover (vehicular overbridge)
12. Vile Parle Railway Station





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SOCIETY FOR PARTICIPATORY RESEARCH IN ASIA
45, SAINIK FARM, KHANPUR, NEW DELHI-110062

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SLATE PENCIL WORKERS OF MANDSAUR

MADHYA PRADESH

Though environmental pollution, which leads to acute health problems, is common phenomenon in most of the mining and factory areas of India, perhaps no where it is in as acute a form as in the slate pencil production belt in the District of Mandsaur in the State of Madhya Pradesh. Most of the factory workers of the area men, women and children, suffer from respiratory problems because of prolonged and uncontrolled exposure to stone dust. Most of them look double their age and almost all of them die prematurely. In the recent past, the pitiable condition of these workers has attracted the attention of politicians, social workers, journalists and even labour and health officers. Inspite of sincerity of purpose of these groups, little has actually been done to improve the situation.

The district of Mandsaur is located in the western part of Madhya Pradesh. It is close to Chittorgarh, on the border to Rajasthan. It is in the northern part of the plateau of Malwa. The main mineral resource of the district is Binota Shale sedimentary rock of which slate pencil are made. The mines for this rock are situated in the villages of Multanpura, Gujarda, Birpeeth Khaeri, Dharia Kheri, Balaguha, Gogapur, Bugalia and Daudhari of Mandsaur Tehsil. There are some mines in Malhargarh Tehsil as well.

It may be pointed out that it is the only area that supplies slate pencils to the whole of India. It is an irony of fate that the material which exposes children all over India to literary makes the children of Mandsaur orphans, compels them to work as child labour and remain illiterate and sick for whatever short lease of life they have.

Most of the slate pencil factories are located at Multanpura, Mandsaur and Pipaliamandi. There are about eighty factories of various sizes in these areas, they employ nearly five thousand workers. Most of the workers are local. Nearly 65 per cent of them are Muslims and 35 per cent from among other residents of the area. A wagon load of slate pencil boxes is sent out daily to be sold throughout the country.

The Binota Shalo sedimentary rock is first dug and cut into blocks. The blocks are cut into thin parts or plates by an electric saw. The plates are further cut into the rough shape of a pencil according to required specifications. The pencils are given a finishing touch (e.g. made round and pointed) manually. Then they are packed into boxes. These activities, especially the cutting of rocks into small parts by an electric saw, produce a large

quantity of silica dust which contains 69.63 percent silicon dioxide. It is an established fact that exposure to silicon dioxide is fatal to workers. Yet the mines and factories of the area have not taken adequate precautions to safeguard the workers from exposure to silica dust. As a result, most of the workers eventually suffer from silicosis, which costs them their lives.

The silica dust is inhaled into one's system. During the first six months of his work, the worker gets cold and cough. He sneexes and coughts very frequently. He complains of minor respiratory ailments. Gradually, as the dust is accumulated in the lungs, the worker feels pain in the chest. He coughts like an asthmatic patient. If his chest is X-rayed, a black line in the shape of an eyebrow can easily be found. As the pain increases, the worker turns into a patient. He feels that he suffers from T.B., little knowing that, unlike tuberculosis, his disease is incurable. According to a local doctor, about 150 workers die of this disease in the area annually. During the last twenty five years, approximately 3,500 workers have died of silicosis.

It is not only the regular workers in the mines and slate pencil factories who are exposed to the silicon dust, the factories also offer indirect and casual employment to others, mostly women and children, who are allowed to take work home. The women give finishing touches to pencils a and children pack them into boxes. The job no doubt augments their meagre income, but it also fills their dingy, ill-ventilated homes with silica dust, exposing even newly born babies to the hazard. Needless to add that the polluted home environment aggravates the sufferings of the patients of silicosis who, laid off by the factories, death at home. Besides, it causes environmental pollution throughout the area, exposing the entire population to the dust and disease. In sum, the situation is harmful and dangerous not only for those who work in Binota shale sedimentary rock mines and slate pencil factories, but also for the common men living in the area.

What makes the situation even worse is the fact that the people of the area are so poor that they have got to work in these mines and factories even though they know well what lies in stone for them. The industry offers permanent jobs to only healthy workers; but the exposure to silica turns them into chronic patients. As soon as they become sick, they are deprived of their jobs. They stay back at home, awaiting death. But the family must have money to look after the patient and to feed its members. This compels even children and women to go out and do the same work as has already proved the cause of the disability to the major earning member of the family.

The factory Act, 1948 and the Mines Act, 1952, passed by the Government of India, have declared silicosis a fatal industrial disease. The implications of this declaration are obvious. The duty of the mine and factory owners is not only to pay compensation to the families of workers die of silicosis, but also to take effective safety measures to control the amount of silica dust produced by

the Industry. As most of the dust is caused by the elec tricsaw, some effort has been made to control the dust when the machine is in operation. However, such efforts are inadequate.

Efforts should be made to control the direct exposure of workers to the silica dust while they are at work. No effort has been made so far to control the amount of silica dust in the atmosphere, nor has there been any measure to protect women and children sharpening slate pencils at home. As already pointed out earlier it exposes not only them but also newly born babies and old sick persons at home. As a matter of fact, everybody in that area is exposed to some amount of silica dust and little has been done to control this grievous health hazard.

In so far as mine and factory workers are concerned, much can be done under the existing laws to safequard their interests. For instance, all mines and factories must fulfil the minimum sanitary and health conditions laid down under the laws. The Labour and Health Departments can see to it that the laws are strictly adhered to. Unfortunately, this seldom happens.

So long as factories are not modernised and the state of pollution is not minimised workers are bound to be sick. As the field reports suggest, most of the workers are able to work only for the short span of eight to twelve years. As soon as they get sick and betray symptoms of silicosis, they are fired on one pretext or other. According to the laws, a factory worker is entitled to adequate compensation if he is a victim of silicosis. However, the bullying tactics of the employer create problems for the workers. The worker is usually threatened; if he plans to claim compensation, his family members are denied jobs. If he works for a small entrepreneur of his own community, the pressure on him is even worse. Very often he is given meagre compensation as soon as he is disabled on condition that he keeps quite. As no medical certificate is issued, it is difficult for his family to prove before the Labour Court that he died of silicosis. Consequently, no compensation is paid to the family in case of death.

There are various government sponsored schemes, such as the group health scheme, personal and group insurance, etc. which can help workers in hours of need. But, as the workers are not organised and unionised, they are mostlyunaware of these schemes. There is no conscious effort on the part of the government agencies to bring them effectively under these schemes. As a result, they are deprived of the benefit of these avenues open to them.

Any solution to the problems of mine and factory workers in this area needs a two-pronged approach, preventive and remedial. While priority should be given to preventive measures, remedial measures ought to be taken in all seriousness to improve the condition of those who are victims of the prevailing situation. The minimum that need

to be done is as follows:-

a) To improve the general environment by controlling the release of silicon dust.

b) To enforce the existing laws in such a way that the health of the worker is protected, if the worker falls ill, he gets all medical treatment at the cost of his employer and if he dies, his family is given adequate compensation.

c) To provide alternative means of livelihood so that nobody takes up this job merely because he has no alternative.

Efforts should be made to organise the workers of these mines and factories. Only then the Mines and factory laws can be faithfully implemented. The organised labour will not only demand enforcement of various provisions of the law, but also educate its members about the preventive measures that can be taken to minimise health hazards, compensation that can be claimed in case of a worker is affected by silicosis and protection to be given to him and his family. The organised labour can also fight for the centralisation and modernization of these factories. They can further educate the workers about how to save money, insure themselves against calamities and accidents and educate and prepare their children for other jobs. A break-through is badly needed to make the workers realise that they can have alternatives for their children if they so desire collectively.

/hrs.

List of Workers suffering from Silicosis of Slate Pencil Industry of Mandsaur.

1. Mr. Abdul Rehman
2. Mr. Pappan
3. Mr. Bhola Shankar
4. Mr. Parvet Singh
5. Mr. Nand Lal
6. Mr. Jagdish
7. Mr. Jawahar Lal
8. Mr. Salim
9. Mr. Nanukhan
10. Mr. Babu
11. Mr. Sapteer
12. Mr. Hussain
13. Mr. Asiz
14. Mr. Salim
15. Mr. Wasir
16. Mr. Pappu
17. Mr. Ismile
18. Mr. Babu
19. Mr. Naru
20. Mr. Girdhari
21. Mr. Rajvir
22. Mr. Mohd. Siddiqui
23. Mr. Abbas
24. Mr. Safi Mohd.
25. Mr. Mr. Kanwar
26. Mr. Salim
27. Mr. Chota Khan
28. Mr. Devi Lal
29. Mr. Surinder Prakash
30. Mr. Kesoram
31. Mr. Shankar Lal
32. Mr. Roop Lal
33. Mr. Hira Ram
34. Mr. Kasturchand
35. Mr. Kunwari Bai
36. Mr. Sangabai
37. Mr. Ganpath
38. Mr. Hussain
39. Mr. Mangi Lal
40. Mr. Nashir Shah
41. Mr. Farooq
42. Mr. Babu Lal
43. Mr. Ayub
44. Mr. Heigh Raj
45. Mr. Radha Bai
46. Mr. Hamid Khan
47. Mr. Mohammad
48. Mr. Mohan Singh
49. Mr. Bhawal Lal
50. Mr. Mohammad Hussai
51. Mr. Chota Khan
52. Mr. Raghunandan
53. Mr. Nazir
54. Mr. Ismail
55. Mr. Hiralal
56. Mr. Bhagirath
57. Mr. Kaneer
58. Mr. Dev Ram
59. Mr. Ram Das
60. Mr. Abdul Latif
61. Mr. Mubarik
62. Mr. Shakur
63. Mr. Ayub Shah
64. Mr. Nathu
65. Mr. Mubarak
66. Mr. Kanchanpuri
67. Mr. Sarif Saha Nasir Shah
68. Mr. Suraji
69. Mr. Kasim
70. Mr. Ghasi
71. Mr. Shanti Lal
72. Mr. Jahur Mohammad
73. Mr. Nanha
74. Mr. Abbu
75. Mr. Nanha Badar

Workers of Slate Pencil Industry of Mandsaur District, Madhya Pradesh who have died.

1. Shri Narain s/o Ganga Ram
2. Nanuram s/o Chunni
3. Man Singh s/o Kishan Singh
4. Bani Ram s/o Ganga Ram
5. Nasruddin s/o Iman Baksh
6. Radha Shyam s/o Buanji
7. Shakti Narain s/o Moti Lal
8. Devi Lal s/o Kalu Ram
9. Gaffur s/o Vali Mohamad
10. Nisar s/o Nazir Shah
11. Kasim s/o Jumma Khan
12. Sukha s/o Kashi
13. Chunni Lal s/o Nathuji
14. Rajinder Singh s/o Gajinder Singh
15. Bhawar Singh s/o Gamair Singh
16. Gowardhan s/o Devi Lal
17. Aziz Khan s/o Mustafa
18. Mustaq s/o Sardar
19. Sobha Ram s/o Nathuji
20. Kanya Lal s/o Ganga Ram
21. Ram Das s/o Narain Das
22. Gopal Das s/o Narain Das
23. Champa Lal s/o Baunji
24. Babu Singh s/o Sukhdev Singh
25. Akthar s/o Ayyub
26. Duli Chand s/o Lalji
27. Jairam
28. Naval s/o Nathuji
29. Prabhu Das s/o Chunni Das
30. Shyam Singh s/o Khuman Singh
31. Gulam Mohammad s/o Hari Mohamad
32. Badri Nath s/o Nanu
33. Dal Chand s/o Luxman
34. Nanda s/o Sita Ram
35. Bahadur Singh s/o Shiva Singh
36. Kanhaya
37. Narain s/o Nath
38. Bhuwan s/o Kalu ji
39. Nabi Noor s/o Alimuddin
40. Shukur s/o Khjulu Malia
41. Nabi Noor s/o Ramjani Mogia
42. Alla Noor s/o Ramjani Mogia
43. Maqbool Shaw
44. Abdul Latif s/o Magizool
45. Fakir Das s/o Tikam Chand
46. Sukh Lal s/o Shasi Ji
47. Ghisi Bai
48. Samiulla
49. Nanu s/o Deva Ji
50. Nathu Lal
51. Hanif
52. Ratan Lal
53. Ram Chand
54. Balu
55. Shankar Lal
56. Bogidi Ram
57. Mangi Lal
58. Bansi
59. Hira Lal
60. Chand Mohamad
61. Gopal
62. Sallamuddhin

Society for Participatory Research in Asia
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4 *NEWSLETTER* *July-September 1983*

Editorial: Networking

Several persons have been asking questions about the increasing growth of a variety of networks. The networks of Participatory Research, started seven years ago, are one of the early illustrations of this phenomenon. The need for a network emanates in those situations and issues where a wide and diverse variety of perspectives, experiences and resources are needed, and where these are geographically spread over long distances. A network is different from an organization in that it comprises of individuals in a variety of organizations and different organizations, sharing a common worldview inter-linked through and with each other in ways that satisfy the needs of all those who are part of the network. Since no single organization can possess a diverse range of perspectives, experiences and competencies on a given issue, network becomes a viable alternative for pursuing and promoting that issue. A network has no fixed hierarchy and flow of information, ideas and materials can take place directly between any two or more members of the network.

However, some people have to make an initial effort to start and nurture a network. In the networks of Participatory Research, we started with Regional Coordinators. The regional coordinators acted as a node for flow of information and ideas. Based on our experience, we have found that a lot of correspondence, a periodical information sheet or newsletter, a method of informing people about new experiences, materials and events, and an occasional meeting or workshop etc. help considerably in starting and sustaining a network.

But this single node or coordination is only an initial phase. Gradually, people in the network begin to take their own initiatives, in accordance with their own needs. So the coordination function in the network becomes more widely shared. In fact, people and organizations remain a part of the network only if it continues to meet some of their ongoing and changing needs. As time passed, the Participatory Research networks also became more decentralised. In several regions, coordination of Participatory Research networks has begun vigorously on a sub-regional and/or national levels. This is indeed a healthy sign and the long term viability and usefulness of Participatory Research networks depends on further decentralization and more active communication across nations, sub-regions and regions. We hope the Participatory Research network in Asia will be able to move clearly in that direction with your active collaboration.

Reportage

1. Meeting on Participatory Research in India

As a follow-up of earlier consultations with partners and other like-minded people, this meeting of Participatory Research was convened by Society for Participatory Research in Asia on April 22-24, 1983 at Dehradun, India.

The objectives of the workshop were two fold: firstly, to generate new questions and clarification on PR; secondly, to review past activities and role of PRIA and to evolve future directions. The meeting was attended by 23 representatives of 17 organizations.

The workshop discussed issues like Ideology and PR, linkages between Participatory Research, Participatory Evaluation and Participatory Training, the nature and complexity of roles of participatory researcher, etc. Working in small groups, participants focused upon some special interest topics like primary education and PR, forest studies and PR, designing a baseline survey in PR, women and PR, etc. The discussion on future role of PRIA particularly focused on developing a wide variety of resources on PR.

2. Primary Health Care Meeting

The meeting of case study writers from nine countries—Canada, Chile, India, Indonesia, Nicaragua, Philippines, Senegal, Tanzania and Venezuela-in the ICAE study on "The Role of Adult Education in Community Involvement in Primary Health Care" took place in Peterborough, Canada during July 4-8 1983. There were 18 participants including members of the study Advisory Group, representatives of ICAE and WHO and the study coordinator. Key findings from each case study were shared, collective analysis of factors and strategies relevant to effective utilization of adult education principles and methods in promoting and sustaining community involvement in primary health care was made, the participatory research methodology of preparation of case studies was discussed and plans for next phases evolved. A report containing analysis and abridged case studies is being prepared. For further information, write to ICAE or Rajesh Tandon, study coordinator.

3. Participatory Research Networks

The status of the different regional networks and problems of international coordination were informally discussed recently in Toronto. It was felt that PR networks can grow stronger if more decentralisation in coordination took place. In North America, 3-4 centres of research, education and action are active in local and subregional networking. In Latin America, a colleague has taken over coordination from Francisco Vio Grossi. In Africa, several national coordinators are being identified in nine different countries. In Europe, Southern European PR Network is emerging and in 2-3 other countries, initiatives at national networks are being taken. In Asia, RICE (Rural Institute for Community Education: Eileen Belamide coordinator, Address: Room 304 Caeg Building, 7611 dela Rosa St., Makati, Metro Manila, Philippines) has emerged as a major subregional networking effort for Philippines, Indonesia, Thailand and Malaysia. More Such subregional and/or national networking efforts are needed to further strengthen PR networks. Do you have ideas and suggestions in this regard?

4. RICE News

The Rural Institute for Community Education (Eileen Belamide, coordinator, Address: Room 304 Caeg Building, 7611 dela Rosa St., Makati, Metro, Manila, Philippines.) held a regional meeting recently to evolve a three year program. Comprising of Philippines, Thailand, Indonesia and Malaysia, RICE is encouraging both national workshops and activities and bilateral exchange and learning—e.g. Thailand Philippines exchange on organic agriculture; Malaysia—Indonesia exchange for cultural workshops. The major areas of work of RICE members are peasants, workers and urban poor. RICE is planning to bring out a regular publication on South East Asia situation.

You may be Interested to Know

1. Highlander Nominated for Major Peace Prize

The Highlander Research Education Centre (address: Box—370 RFD 3, New Market, Tennessee 37820, U.S.A.) has been nominated for the Nobel Peace Prize.

From its inception in 1932, Highlander has embo-

died an ideal of education for social change. It celebrated its 50th Anniversy in October, 1982.

Any associations or persons wishing to support the application of Highlander to receive the prize are urged to write to The Norwegian Nobel Committee, Det Norske Nobelinstitutt, Drammersveien 19 Oslo 2, NORWAY.

2. PR Training Needs

One of the outcomes of the Dehradun PR meeting was the recognition of need for PR training materials. Simple, illustrative PR materials, particularly in local languages, are, at present, almost nonexistent.

Both PRIA and Streevani are very much interested in this venture and seek the help of others engaged in the field of PR to identify the type of training materials needed. Interested persons please write to: Dr. Frances M. Yasas, Streevani, Women's Research Project, C/o Society of St. John, Dole Patil Raod, Off Sasoon Road, Pune-411 001.

3. Gram Vikas Primary Education Programme

Gram Vikas is planning for a new and innovative primary education programme for the tribals they have been working with in the Kerandimal region of Ganjam district of Orissa.

Suggestions regarding materials, resources, ideas are welcome: Please write to Gram Vikas, Narasinghpur, P.O. Mohuda, Via Berhampur Orissa-760002.

4. Postponment of Asian Regional Forum on Participatory Research

Due to unavoidable circumstances, the proposed Asian Regional Forum on Participatory Research to be held in Manila, Philippines, in collaboration with RICE, has been postponed to Spring 1984. Those interested in contributing a case study or theoretical paper can contact RICE or us immediately.

5. Participatory Research, Land Alienation and Occupational Health

Two colleagues from Highlander Education and Research Centre, Tennessee, USA are likely to be with us during January—March, 1984. Dr. John Gaventa has considerable experience in utilizing PR to study land ownership and alienation patterns in Appalachia region of USA. Ms. Juliet Merrifield has evolved participatory research and training methodologies in order to study and solve problems of occupational safety and health. We are considering to utilize their resources through a couple of training workshops. We would welcome ideas and suggestions from you regarding your interests and possibilities in this regard.

Materials of Interest

1. Education and Revolution in Nicaragua

Written by Rebort F. Arnove and published by Indian Social Institute, Lodhi Institutional Area, Lodhi Road, New Delhi-110003 1983. Price Rs. 7.50. It describes the scope, organisation and content of the Nicaraguan National Literacy Crusade of 1980 and its aftermath.

2. Development by People

Written by Guy Gran and published by Praeger Publishers, CBS Educational and Professional Publishing, A division of CBS Inc. 521 Fifth Avenue, New York 10175, U.S.A, 1983. It is an analysis of why poor people in third world countries remain poor or become poorer and how this process can be reversed. This book emphasizes the need for human development—where people and their active participation matters.

3. DAE Newsletter

A periodical published by Directorate of Adult Education, Ministry of Education & Culture, 34, Community Centre, Basant Lok, Vasant Vihar, New Delhi—110057. It reports on various activities in the field of Adult Education in the country.

4. Women Hold up more than Half the Sky

A Third World Perspective on Women and Non Formal Education for Development, by Anne Bernard and Margeret Gayfer. Published by ICAE, 29, Prince Arthur Avenue, Toronto, M5R 1B2 CANADA. It is a report of a ICAE project to investigate, in seven Third World regions, non-formal education programmes for women. As a final stage of the project, a workshop was held in

India to share the findings. Report of the workshop is also included.

5. Worldlit

A quaterly newsletter published by World Literacy of Canada. The Newsletter focuses on a theme for critical discussion, reports on various projects of WLC and brief news items on literacy/adult education. Available with a minimum annual donation of $ 15 from World literacy of Canada, 692, Coxwell Avenue, Toronto, Ontario, M4C 3B6, CANADA.

6. Towards A New Forest Policy

Subtitled 'Peoples' Rights and Environmental Needs; it is edited by Walter Fernandes and Sharad Kulkarni (Price Rs. 25/-). This book is a result of a workshop on a New Forest Policy, held at the Indian Social Institute, April 12-14, 1982. Contains papers and case studies presented during the workshop. Order from: Indian Social Institute, Lodi Road, New Delhi-110003.

7. A Handbook to the Management of Voluntary Organisation

Written by R. Sankaran and Ivo Roderigues (1983), this is a very useful and handy guide to voluntary organisations in matters relating to the frame work of laws and accepted norms and procedures of organisational management for voluntary organizations.

Orders from Alpha Publishers, 161, Mount Road, Madras-600 002, Price Rs. 65/-.

8. CENDHRA Network Newsletter

A quarterly brought out by the Centre for the Development of Human Resources in Rural Asia. It acts as an information link between development partners. Request for copies can be made to: CENDHRA, 12230, Narra Street, United Paranaque I, Paranaque, Metro Manila, Philippines.

9. From the Outside Looking In

Subtitled 'Experiences in Barefoot Economics', by Manfred A Max-Neef, 1982 Dag, Hammerskjold Foundation, Ovre Slottsgatan 2, 75220, Uppsala Sweden.

The book illustrates two cases of barefoot economics. The first relates the miseries of Indian and black peasants in the Sierra and coastal jungle of Ecuador and the second the problems of craftsmen and artisans in a small region of Brazil.

10. Capacitacion Y Organization Compesina en America Latina

Prepared by Francisco Vio-Grossi and GIA (1982) on training and organisation of peasants in Latin America. Available with: GIA, Casille 6122, Santiago 22, Chile.

11. TRACE (Training Animators in Conscientization and Education)

This book is useful in training field level animators and advocates Paulo Freire's conscientization method. Price Paper back: Rs. 17/- Hard bound Rs. 24/-. Order from: Trace Team, Janseva Mandal, Korit Road, Nandurbar-425 412, Maharashtra.

Society for

Participatory Research in Asia

23B-14

OBJECTIVES

(i) To develop, refine and promote the concept and practice of Participatory Research in Asia;

(ii) To strengthen and advance the Participatory Research Network in Asia;

(iii) To promote research, action and education into people's participation in development processes;

(iv) To catalyse, advocate and support the utilisation of Participatory Research in various developmental projects and programmes in different countries of Asia;

(v) To coordinate with various regional and international PR networks of International Council for Adult Education;

(vi) To collaborate and maintain links with other similar networks and institutions in Asia and elsewhere;

(vii) To establish and maintain libraries and documentation centres;

(viii) To provide information/reports/publications to members of PR Networks and other interested individuals and organizations;

(ix) To organize seminars, workshops, conferences, exchange visits, study tours etc. on PR and its application to different sectors of development;

(x) To promote continuing and liberating education of adults, particularly the under-privileged sections of different societies;

(xi) To publish books, papers, monographs and other materials for furtherance of the Society;

(xii) To conduct projects on PR in Asia on its own and others' behalf;

(xiii) To organize, sponsor and support training programmes on PR and its related aspects;

(xiv) To support, fund and collaborate with similar projects being conducted by other similar institutions;

Society for Participatory Research in Asia

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Participatory Research Network Series

(in collaboration with International Council for Adult Education)

A special series on Participatory Research is being published on behalf of the network. Intended to promote access to experiences in Participatory Research to people in different regions, the following publications are currently under way:

1. Creating Knowledge : A Monopoly?
Edited by Budd L. Hall, Arthur Gillette and Rajesh Tandon, US $ 7.00 (foreign), Rs 30 (India) (August 1982). Contains a selection of 13 papers (theoretical and case studies) from different regions of the world. 209p.

2. Participatory Research : An Emerging Alternative Methodology in Social Science Research
Edited by Yusuf Kassam and Kemal Mustafa, US $ 7.00 (foreign), Rs. 30 (India) (October 1982). Based on the 1979 African Regional Workshop on Participatory Research held in Mzumbe, Tanzania, it contains the four theoretical discussion papers along with responses to them, and seven case studies from different countries of Africa. Approx. 250p.

3. Participatory Research : An Introduction
This is a collective product of the international network of Participatory Research, US $ 4.00 (foreign), Rs. 15 (India) (October 1982). Based on the case studies presented and discussions held in and since the International Forum on Participatory Research in 1980, it is intended to be a simple introduction to PR for community organizers and field level staff. Approx. 60 p.

4. Case studies in Participatory Research
Contains 18 case studies presented in the International Forum on Participatory Research, Yugoslavia 1980 (1983). Also contains the discussions and debates that were held in the International Forum. Price to be announced later.

ORDER FORM

Please send me the following:

1. **Creating Knowledge: A Monopoly?** ..... copies, Rs. 30.00 each (India) US $ 7.00 each (Foreign)

2. **Participatory Research : An Emerging Alternative Methodology in Social Science Research** ..... copies, Rs. 30.00 each (India) US $ 7.00 each (Foreign)

3. **Participatory Research : An Introduction** ..... copies, Rs. 15.00 each (India) US $ 4.00 each (Foreign)

Add US $ 2.50 per copy for foreign air mail postage or Rs. 5.00 per copy for postage in India.
Local Cheque or Money order enclosed for US $_____

Rs. _____

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Recent Publications on Participatory Research

Research for the People—Research by the People
Edited by Thord Erasmie, Jan de Vries, Folke Dubell, 168 pp, US $ 8.00 (for airmail add US $ 2.00). Selection of 11 papers (case studies and theoretical papers) from the International Forum on Participatory Research, Yugoslavia, 1980.
Order from: Linkoping University, Department of Education, S-581 83 Linkoping, Sweden; and, Netherlands Study and Development Centre for Adult Education, Box 351, 3800 AJ Amersfoort, The Netherlands.

Participatory Research and Evaluation Experiments in Research as a Process of Liberation
Edited by Walter Fernandes and Rajesh Tandon, 216 pp. US $ 5.00 (for airmail add $ 3.00), Rs. 25 (India). Based on papers for the 1981 Workshop on Participatory Research and Evaluation held in Ranchi, India.
Order from: Indian Social Institute, 10 Lodi Road, New Delhi. India 110 003.

Participatory Research: Development and Issues, *special report in journal* **Convergence**
(3, 1981) Six feature articles, selective bibliography, book reviews, US $ 4.50 (cheque or money order),
Order from: International Council for Adult Education, 29 Prince Arthur Ave., Toronto, Ontario Canada M5R 1B2.

Investigacion Participativa y Praxis Rural: Nuevas Conceptos en Education y Desarrollo Communal
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Participatory Training for Rural Development
Edited by Om Shrivastava and Rajesh Tandon, 200 pp,US $ 6.00 (foreign), Rs 25 (India). Published by Society for Participatory Research in Asia, 45 Sainik Farm, Khanpur, New Delhi-110062, India. Order should include postage (foreign airmail US $ 2.50 each, India Rs 5.00 each).

Society for Participatory Research in Asia
45, Sainik Farm, Khanpur, New Delhi-110062

The Knoxville News-Sentinel : Sunday, April 24, 1983.

HIGHLANDER TURMOIL MAY LEAD TO PRIZE

NEW MARKET (UPI) - On a farm in the shadow of the Smoky Mountains, the people of Highlander lead a restful life, but the memories of Martin Luther King Jr., night riders and "We shall Overcome" are never far away.

The roots of the Highlander Research and Education Center are deep in the history of labor movements, and civil rights for blacks and the poor mountain folk of Southern Appalachia.

For teaching blacks how to register to vote and spearheading social change in the 1940s, '50s and '60s the old Highlander Folk School was pelted with stones, firebombed and accused of being a Communist training ground.

Today, the Highlander School has been nominated for a Nobel Peace Prize by Atlanta Mayor Andrew Young and Rep. Ronald Dellums (D-Calif.).

"The mayor has been very familiar with the work of the center over the years and is supportive of it," said Young spokesman Tom Offenburger. "He feels they have made very important contributions to social progress in the country."

The Highlander Center, after being ousted from Monteagle and leaving a headquarters in the center of the black community in Knoxville in 1971, now inhabits a 104 acre farm in New Market on Bays Mountain 20 miles east of Knoxville.

It is a serene and pastoral setting. Twelve staff members work from a woodframe house with a porch swing. There is a dormitory and a library atop a grassy hill.

Gone are the days when a Highlander student like Rosa Parks, a black seemstress, can touch off a spcial storm by refusing to sit in the rear of a bus Montgomery, Ala.

Staffers at the Highlander center spend their days helping Appalachian working people cope with poverty, unsafe coal mines and textile mills and toxic wastes.

The people gathers at the farm on weekend workshops to discuss problems and decide among themselves what changes need to be made to solve them. The charges that the center was a hotbed of civil disobedience and subversiveness have quietened. But they are never forgotten.

Myles Horton founded the Highlander Folk School in 1932 atop a mountain in Monteagle to organize labor unions and improve civil rights. Folk singers Woody Guthrie and Pete Seeger were friends of the group.

"We Shall Overcome," the anthum of the civil rights movement, was introduced to black students by a staffer.

Perhaps the most pivotal time for the school came during its 25th anniversary celebration on Labor Day, 1957, when civil rights leader Dr. Martin Luther King Jr. was a keynote speaker.

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King was a rising star in civil rights at the time and Georgia Gov. Marvin Friffim sent along a photographer, Ed Friend, to infiltrate the meeting. What followed led to the closing of Highlander in Monteagle.

Friend took pictures of King at the conference and soon billborads and postcards popped up accross the South proclaiming "King Attended a Communist Training Center."

King, a 1964 Nobel Peace Prize recipient, later said he was the victim of a "smear campaign."

"We know pretty clearly that there was a movement among Southern politicians to see if they could do something about Highlander," said Hubert Sapp of Eutaw, Ala, Highlander's current director. "They got together and figured out that they ought to close down this "hotbed of trouble."

Highlander was raided in 1959, workshop participants were arrested and the center was charged with operating an integraed school and selling liquor without a license because participants could take beer from a cooler and leave 25 cents.

It reappeared in 1961 in the middle of a black community in Knoxville and was quickly enbroiled in another controversy. Baptists wanted the school's charter revoked and its doors padlocked. Rocks and firebombs were thrown through its windows and the Ku Klux Klan staged protest rallies.

The Knoxville News-Sentinel carried this two-paragraph story in September 1983:

"Twenty-three Knoxville Negro leaders have written Mayor John Duncan a letter defending Highlander Research and Education Center and atacking those who oppose the institution as a "know nothing minority."

"The letter, made public by the Negroes today, said that Highlander seeks to teach Negro and White leaders how to better the condition of the poorer and less literate Negroes."

The letter did nothing to abate the critics.

Opponents in the Tennessee Legislature called for an investigation into Highlander, but the federal courts prevented it.

Lewis Sinclair, the director of Highlander in those days, said the group had to rise above the controversy.

"We didn't let those things slow us down. We knew we were not Communists and were not influenced by Communists and that these were the sort of charges that are thrown at individuals and groups that tried to bring about change," said Sinclair, 68, a former TVA economist now in semi-retirement in Atlanta.

"The criticisms have abated," said Sinclair, who's been involved with Highlander for 37 years. "It's perhaps because most people have become more sophisticated, and now believe in the same things that Highlander has always believed in."

23B-16

The New York Times

For more information Contact
Highlander Center
Box 370, RFD 3
New Market, TN 37820

SURVEY OF CONTINUING EDUCATION Section 12.

Sunday , September 7, 1980.

This School Helps Grass Roots Grow : by RONALD GROSS

New Market, Tenn.

The scene suggests somnolence: cows grazing near fields planted with corn and beans, rows on rows of the Smoky Mountains fading into the distance, bloated clouds in the sky. But awakening people to social-consciousness is the purpose of the Highlander Research and Education Center here, a rare effort in adult education.

"The setting may seem sleepy," said a typical participant who is regularly a union organizer in the region's coal-fields. "But these sessions really woke me up to where the power lies around here."

Currently, the conversations at Highlander focus on an unprecedented study of land ownership in Appalachia that the center is about to release. Planned and conducted as a community - education project, the enquiry has reportedly yielded the largest data base on land ownership ever compiled for one region of the country. Sixty people from six states participated in its preparation, and the findings will now be taken back to the grass roots.

"It's not a process of us telling them," insisted Mike Clark, director of the center. "Folks here already know damn well who's got the land. What we've done is to put the data in a form where the people themselves can use it to press for relief from land and tax inequities.

"Highlander," he added, "is a place where the working people of Appalachia - coal miners, millworkers, farmers - can gather to study their problems and decide what needs to be changed to solve them."

That indicates why Carman St. John Hunter, co-author of the Ford Foundation-sponsored report "Adult Illiteracy in the United States," at a conference of experts on adult education last year, singled out Highlander as "the most notable American experiment in adult education for social change."

Founded by Myles Horton in 1932, at another location, near Chattanooga, Highlander has been repeatedly raided by the police, burned out by night riders, evicted and red-baited. Shortly after the school opened, Mr. Horton was arrested during a bitterly fought coal strike in Wilder for "coming here, getting information, and going back and teaching it."

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In 1959, the center was raided and closed by the police. All its assets were seized for its violation of two state ordinances: Holding intergrated meetings, and selling liquor without a license by letting conference participants take beer from a cooler and leave 25 cents.

It took Highlander's staff more than a decade to acquire and develop the present 104-acre site on Bays Mountain 20 miles east of Knoxville.

During the 1930's, the center was a training base for the Congress of Industrial Organizations in its efforts to unionize Southern industry. Later, in the 50's, it was used heavily by leaders of the civil rights movement.

Recollecting those early days, Mr. Horton, now 74 years old, said: "I got into adult education because I got tired of hearing each generation say that our only hope is with the children - the next generation will clean up our mess, make our society better. I realised the world would only change if the people who are now running things, who are already adults, changed. So I decided that if we want a more decent society we would have to work with today's adults on today's problems."

Today Highlander is run by a young staff with deep roots in the region. Mr. Horton has consciously passed along his authority, though he is still a vital and active presence at the place.

Mr. Clark came to the center with a record of activism against rural poverty, strip mining and other regional afflictions. Under his leadership, the program has rapidly expanded over the last three years. The main work is in occupational and environmental health, labor education, social history, research and cultural activities.

Helen Lewis and Robin Grega head the health program, which aids community clinics organized by millworkers and mine workers, to cope with problems ranging from poor housing and inadequate nutrition to occupational health hazards and depression brought on by political powerlessness. Miss Lewis said, "We help the clinics recruit health professionals, to define what they need to know to run their clinics effectively like how to stay solvent - and to educate their neighbors to promote a healthier community."

A program developed by June Rostan to enable workers to earn their high-school-equivalency diplomas has been hailed by the Amalgamated Clothing and Textile Workers Union as a model for replication in other regions. Juliet Merrifield works on problems of health and safety for the United Furniture Workers of America. Her husband, John Gaventa, a former Rhodes Scholar with a doctorate in political science from Oxford University, provides research assistance to community groups in the region and makes video-tapes to alert people to public issues.

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"There is no similar place in the mountains," he siad, "Where community groups can find information on the issues they face, or where they can receive help from staff members to research the roots of their problems."

David Gann, a young farmer who had always wanted to farm his native soil but couldn't obtain enough land of his own, came to Highlander to raise food, in order to cut costs by making the center more self-sufficient.

The heart of the program is a series of residential conference in which local people come together to articulate their grievances and work out plans for social change. About 35 participants can be accommodated in four large dormitory rooms. Recently, black-lung sufferers from the coal-fields met with cotton millhands to discuss brown-lung disease, how to organize and how to gain compensation.

The comment was typical for the kinds of people who come to Highlander - more likely workers from a furniture factory, union organizers and literacy volunteers rather than lawyers, teachers and executives customarily participating in most continuing-education programs.

In addition to the workshops, a Library-Resource Center provides information to aid people in solving community problems. The shelves are organized not by academic categories, but to yield facts and figures essential to social change. Such research stemming from Highlander has helped local farmers learn about and stop a coal company's plans to develop the largest strip mine in Appalachia in their community. The staff has also aided community groups discover who owns the land and coal in their area and to challenge the low taxation of vast coal-company reserves.

Highlander isn't all work for social change: it is also fun and fellowship - for social change. Candie and Guy Carawan foster the traditional music (particularly singing), poetry and theater of the region.

Nimrod Workman, a retired West Virginia coal miner, now in his 80's sings ancient ballads and Baptist long-meter hymns, side by side with satires and laments out of the day's papers.

Looking to the future, Highlander hopes to help build a unified movement for change in the mountains and even link up with other social-action groups around the country. The center's future is best suggested by Frank Adams, who chronicled Highlander's past in "Unearthing the Seeds of Fire."

"Highlander's life springs from the struggles of hard-pressed people seeking a just society," he said.

Indeed, there are signs that the Highlander idea may be spreading. One noted school reformer, Herbert Kohl, has recently started the Coastal Ridge Research and Education Center, near San Francisco, in which he plans to "apply some of Highlander's educational ideas." Mountain migrants from Cincinnati recently started the Harriet Tubman-Mother Jones Folk School, and visitors from Northern Ireland visited with Highlander staff members to explore establishing a similar institution in their country.

Society for Participatory Research in Asia
45, Sainik Farm, Khanpur, New Delhi-110062.

Dear Dr. Narain

Ravi Narain
22.6.17

WORKER AWARENESS AND OCCUPATIONAL HEALTH

With growing industrialization in India, problems of occupational health have also surfaced. It is now well known that several categories of workers suffer from various types of diseases and health disorders which are directly caused by the production process itself. These arise from dust, humidity, temperature, chemicals, and noise. It is estimated, for example, that eight lakh textile workers in India suffer from respiratory disorders related to cotton dust. Though detailed records of affliction to workers health from work-related causes are not available, the severity of the problem of occupational health in India can not be minimised.

Yet, there is very little that is being done in the country on this issue. The managements and owners are hardly interested in these problems and are exploiting labour surplus situation in the country to avoid making any effort or investment towards preventing the incidence of occupational ill-health. The government has an indifferent machinery and attitude towards these problems, even though the Factories Act provides some safeguards to workers.

The continued preoccupation with daily struggles mostly around wage issues have led to a situation where most trade unions and their leaders are also unable to take up these questions. Even when occupational health issues enter a charter of demands, it is only in the form of compensation (a glass of milk, two boiled eggs, etc.) to workers for the damage done, rather than any preventive efforts. When organized sector is showing indifference, it is easy to see how much more the unorganized and informal sector will be suffering.

Under these circumstances, it is clear that a new awareness among workers and shopfloor level union activists in essential for such issues to be dealt with. Ordinary workers who are most directly affected by the production process caused health disorders, need to become collectively aware and mobilised to put pressure on the managements, government and the unions to work towards prevention of these problems. Though several technical studies on sources and methods of preventing occupational health

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problems exist they are so clinical and technical in nature and methodology that they are not able to make the workers aware of these, thereby not being of much use.

In discussions with a variety of trade union activists and workers over the past six months, it is being proposed that a systematic effort is launched in this direction. We are, therefore, planning to utilize Participatory Research methodology in enhancing worker awareness towards occupational health problems.

Participatory Research is an ideologically biased, non-neutral methodology of inquiry into the phenomena of oppression, poverty and marginalization, with the active collaboration of the have-nots (or their representatives), with a view to their obtaining knowledge, as well as its tools, about their situation and thereby acting on the basis of that newly acquired knowledge to change the situation structurally by collective actions in their common interests.

The following steps are being tentatively envisaged:

a) A workshop (say in Bombay in late February or early March 1984) where 2-3 person teams of workers, activists and researchers from a variety of industries and factories attend. A maximum of 15 such teams could be accommodated. During the 3-4 day workshop, the general problems of occupational health are discussed, PR methodology and its application to occupation health issues is explored, and each team plans a concrete study in their work situation. The teams will thus be able to develop skills in this respect for continued future use.

b) These teams spend next 6-9 months concretely investigating, in a particular factory or shop floor, workers' knowledge, experiences and responses to specific occupational health problems arising from that particular production process. During this period, our staff could periodically assist these teams in carrying out such investigations.

c) The teams then analyse their findings (we could assist in that as well) and then come together for another workshop of 2-3 days where planning to produce educational materials,

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based on these studies and their findings, is done. These educational materials should be locally relevant in content and appropriate in form for raising worker awareness.

d) Over the next 3-4 months, these educational materials are prepared (we could also assist in that).

e) Then these materials are used with local workers to raise their awareness through an educational process that is locally designed and conducted. Short seminars, discussion meetings or workshops could be used for this purpose.

It is likely that we may have two resources persons from Highlander Research and Education Centre, Tennessee, USA (see enclosed information) during the first workshop: Drs. John Gaventa and Juliet Merrifield have both been very actively involved with local unions and action groups on a variety of similar issues.

We are approaching Indian Council of Social Science Research and International Development Research Centre to provide funding to us for carrying out this effort.

We would like to know

a) your suggestions to the above proposal;
b) your interest in participation in this venture; and
c) if you are interested in participating, can you begin to identify industry/factory and focus to a particular set of occupational health problems for your study and action, and likely members of your team ?

We feel that a 2-3 person team comprising of atleast a worker activist/union leader and someone else (preferably employed in the same factory or working closely with workers there) who are interested in these issues and likely to carryout brief local investigations, would be most appropriate.

An early response from you would help in planning this venture more concretely and making preparations prior to the workshop.

Rajesh Tandon
Regional Coordinator.

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Khanpur
New Delhi - 110 062.

11 OCT 1983

hrs.

Gavesh Pandey has suggested your name to me.

23B-18

J U S T O U T!

SOCIALIST HEALTH REVIEW.

VOL. I NO.3 DECEMBER, 1984

FOCUS: WORK AND HEALTH.

Under capitalism health becomes equated to the ability to produce goods, a concept which alienates the worker and reduces him to being just a form of energy for the production process. In this situation, when the working class is looked upon merely as a tool in the production process it is easy to understand why neglect of safety precautions occurs, particularly in countries where surplus workforce exists. Many groups and individuals are experiencing a growing awareness that the political and social dimensions of health and safety at work need to be understood in greater depth. The Socialist Health Review, in this issue, throws light on health issues at the work place. Some features :

* Politics of Health and Safety : As unequal contract exists between labour and capital. The capitalist class has successfully established an ideological framework that individualises the problem of health and safety at the workplace, thus preventing it from becoming a social issue. Anurag Mehra and Sandeep Agarwal critically look into this ideology and show how the scientists, technocrats and doctors protect the interests of the capitalist class by commanding a monopoly of the knowledge pertaining to work process and its consequences for the working class.

* Illness and Accident reporting in Industry : Manipulation and control of the reporting system for occupational diseases and accidents at the workplace by the managerial class and the capitalists, the corruption and lack of concern for workers' health and the loopholes is labour legislations pertaining to workers' health and safety are examined and analysed in this article by Jean D'cunha, Loy Rego, Mihir Desai and Vijay Kanhere. On the basis of this, the authors show why workers have failed in their struggle for a better working environment and point out the directions for future action.

* Industrialisation and Occupational Health in Developing countries: In this article reproduced from a recently published book, Roy Elling examines the political economy of industrialisation in underdeveloped countries dominated by the export of highly hazardous workprocesses, with a view to determining how this has contributed to the degradation of the work environment in these countries. The article hypothesises that only a 'self- determining democratic socialism can prevent abouse of workers' health.

* Hazards of Agricultural Work : The intervention of modern technology in agriculture has not only heightened the probability of accidents at work, but has led to other health hazards as well. The People's Health Group from Punjab presents a case study from the ' green revolution' Punjab showing that technology in itself does not lead to accidents, but the fault lies with the mode of production and the class relations.

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* Death on the Job : A review of this now famous book by Daniel Bergman on the US workers' struggles for health and safety. The book provides historical analysis of how the American bourgeoisie and the State tried to block efforts of workers for almost 75 years before the Occupational Health and Safety Act (OSHA) was passed.

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We invite you to participate in developing an understanding of how the politics and ideology of health care and medicine affects workers.

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5. Samarajit Jana/ Ajoy Mitra, Presenjit Memorial Community Health Centre, 11E, Hemchandra Naskar Road, Calcutta-700 010.
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The Socialist Health Review is a quarterly (4 issues a year). Our first issue, June 1984 was on 'politics and health' (now sold out). The second issue Sept.1984, on 'Women & Health', also sold out, has now been reprinted. Forthcoming issues : Politics of Population control- March '85; Health and Imperialism- June 1985; People in Healthcare September '85.

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****

Health Impact of Bhopal Disaster

An Epidemiological Perspective

Thelma Narayan

The chemical accident at Bhopal has been an experience of a public health emergency caused by a technological disaster, a disaster which overwhelmed the capacity of individuals, physically and psychologically. Because of the numbers involved and its complexities it also overwhelmed the capacity of the macrosystem, that is, the social and administrative structures to respond. An epidemiological perspective and method of study is vital to understanding the pattern and distribution of the adverse outcomes in the community and can provide a variety of data.

The article, the first part of which appeared last week, uses an epidemiological perspective to appraise and review available literature concerning the health impact of the disaster and discusses methodological issues relevant to an epidemiological approach to the study of such a disaster.

VI
Review of Epidemiological Studies

THERE have been very few epidemiological studies about the health impact of the disaster. Reports that are available have been of studies conducted by non-governmental groups. They provide important information about the type and distribution of morbidity in the community. The methodology and findings of these studies will now be described in some detail. Findings from the population-based, cross-sectional study by Banerji et al have been discussed earlier in the section on mortality.

General Morbidity

(1) Andersson et al [1984] conducted a survey in the first fortnight (December 11-17, 1984) "to assess possible long-term visual disability among survivors". The sample comprised of 8 clusters of households, selected in different localities which had received varying degrees of exposure. Two localities of similar socioeconomic status, 15 and 17 km away from the factory, were selected as the control groups. Details of location of the exposed groups are not known. The sample size consisted of 261 exposed and 91 unexposed individuals. The sample size and distribution of the population in each cluster is not known. It was stated that the sample size was restricted because of shortage of time before the exodus from Bhopal during Operation Faith, which disrupted daily life for some weeks. Assumptions to determine sample size have not been mentioned. It was observed that the worst afflicted families had left by the time of the survey leading to an underestimation of effect. Method of sampling has not been mentioned—it was probably not randomly done. Three ophthalmologists (one with an interpreter) were the interviewers. An attempt to maintain uniformity was made—standard questions, method of examination and simplified nomenclature was used.

The findings are: The post exposure death rate (which was specified as the number of deceased/the number exposed) in the worst affected cluster was 3 per cent. There were differences in symptoms between the various clusters or exposure groups: burning of eyes and throat and coughing were the most frequently mentioned symptoms; vomiting was the third most frequently mentioned symptom in clusters close to the factory; further away choking and shortness of breath was higher; collapse and unconsciousness was reported only in the cluster second in distance from the factory—among those unconscious, there were few or no eye symptoms, upon recovery; signs of respiratory distress were most marked in this cluster affecting about 20 per cent of the community; over one half of this cluster demonstrated eye signs; fundal changes were more common in the exposed group especially venous dilatation; there was no case of blindness, irreversible eye damage or difference in age standardised visual acuity; there was a significantly higher proportion of people with active eye infection in the unexposed communities (5 per cent as compared to 1 per cent)—it was stated that this was possibly due to widespread use of antibiotics in the week preceding the survey (absence of secondary infection was observed by Bang in the respiratory system); there was a similar incidence (this should be prevalence) of Bitot's spots in the exposed and control groups reflecting a similar nutritional status in the two groups; and there was evidence of fairly widespread trachoma in all the groups, though very few active cases were seen.

Andersson et al [1985] reported on a two-month follow up in the clusters mentioned above. Among the exposed excluding one cluster to which they had 'no access' the follow up rate was 50 per cent. In both the exposed and non-exposed groups only 36 per cent (131/360) were located and reexamined. This is a very high drop-out rate. No information has been given about the baseline or known characteristics or attempts to follow up the dropouts. The clusters were enlarged and 490 people were examined. No information is given about the new examinees, viz, regarding their distribution according to localities, their demographic structure, method used for their selection, etc. Hence data will have to be interpreted with caution. The findings were:

There were no cases of blindness, decrease in visual acuity or defect in colour vision. There were no corneal scars in the original group but six scars which could impair vision were detected in the new examinees. It was not stated whether these were attributable to the disaster. There was regression of the early healing seen in the first examination. There was one case of persistent unilateral corneal oedema and three with complaints of persistent excess watering in an otherwise quiet eye.

A Patel et al [1985] conducted an epidemiological study of the general health status of the exposed people (see Tables 2-4). It was a population-based, cross-sectional study, using an exposed and a control group. The study was conducted three months after the disaster. Post exposure mortality rates for the different localities, as given in publications by the state government, were taken as indicators of the degree of exposure. Jaya Prakash Nagar, 100 yards from the factory in the direction of the wind that fatal night, had an exposure mortality of 2.34 per cent and was chosen as the study population. Anna Nagar, 10 km from the factory with an exposure mortality of 0.32 per cent, was used as the control group. Both areas were comparable with respect to housing, sanitation and economic status of the population. Study results showed that mortality rates were useful indicators of exposure. However the crude mortality rates found in the study population were much higher than those reported in the government publication. The study findings were: JP Nagar - 86.6/1,000 population, Anna Nagar - 7.9/1,000 population. Post disaster hospitalisation rates were also found to indicate differences in exposure: JP Nagar - 30 per cent, Anna Nagar - 0.72 per cent. Sample size determination was made on the assumption that morbidity would be 15 per cent in JP Nagar and 5 per cent in Anna Nagar. With a 5 per cent level of significance and 90 per cent power, a sample of 180 persons in each group (exposed and control) was chosen. Persons of both

sexes, more than 10 years of age were studied.

Numbering of all the households to provide a sampling frame was already done by the ICMR and the same was utilised in this study. As random selection of individuals was not possible, a random selection of 50 household units was made to yield the required sample size.

A house-to-house survey was conducted. This consisted of the following: (a) a detailed history on a predesigned questionnaire. Non-standardisation or pretesting of the questionnaire has been accepted as a limitation, and was reported not to have been done because of shortage of time. (b) general clinical examination of all the systems, the parameters for which had been defined. (c) pulmonary function tests using Morgans electronic spirometer set at BTPS. A trained investigator, with experience in field-based studies carried out the tests. (d) estimation of haemoglobin percentage. (e) open-ended questions on the people's perception of the health services available after the disaster.

Information about training of the interviewers has not been given. They were not blind to the hypothesis as this was not possible in any of the studies conducted in that situation. Group meetings were conducted in the community to obtain consent. The people were informed about the research group—that they were not related to the government nor were they providers of services, nor involved with the claims for compensation. This would reduce the possibilities for 'compensation malingering' as claimed by some. It was found that members of the particular sample chosen had not been included in any of the other studies being conducted, thus ruling out the possibility of the learning effect or Hawthorne effect.

The two populations were comparable with respect to age and sex structure, body surface area, history of chronic disease and smoking. The exposed were slightly better off socioeconomically than the controls.

There was a rather high non-response rate of 29 per cent in the exposed group and 15 per cent in the control group. However available information about the non-responders was collected. Their age and sex structure was similar to the responders and 50 per cent or more of them were exposed. Sixty and 50 per cent of non-responders in the exposed and control groups respectively were out of town, while 25 per cent were away for work. There were no refusals. Repeated visits were made in the time available to maximise the response rate (the investigators were a group of people who had come from different parts of India and were not resident in Bhopal). It has been argued that since the actual difference in morbidity was much greater than the 10 per cent assumed in sample size calculations, a smaller sample size would have demonstrated a difference and non-response may not make such an impact. Nevertheless the high non-response would have altered the process of random selection and it must be kept in mind that the non-responders may differ from the responders with respect to the outcome following the exposure in unknown and variable ways, e g, as stated by Andersson et al if the more seriously ill were among the non-responders there would be an underestimation of effect.

Briefly the study findings are as follows: Prevalence rates of 26 symptoms were measured in the exposed and control group at the time of the study. Tests to see if the differences were statistically significant were done.

The following 15 symptoms were found to be highly significantly different, being higher in the exposed group: cough with expectoration, breathlessness on usual exertion, chest pain/tightness, blurred vision/photophobia, fatigueability, weakness in the extremities, muscle ache, headache, tingling/numbness, loss of memory, nausea, abdominal pain, flatulence and anxiety/depression.

The following six symptoms were significantly different: dry cough, breathlessness at rest, watering of eyes, skin problems, bleeding tendency and impotence.

The following five symptoms were not significantly different: fever, blood in sputum, jaundice, vomiting, blood in vomit and malaena.

As many as 63 per cent reported all the important symptoms. Only 2.7 per cent reported exclusively pulmonary symptoms, while 35.14 per cent did not report any pulmonary symptoms. Every person in the exposed group reported at least one serious symptom, but quite a few in the control group did not report any.

There was a significant difference in the number of attacks of respiratory infections in the month preceding the study. In the exposed group it was often described as a continuous respiratory problem. It was said that this could be a supportive finding to indicate a state of lowered resistance or immunity.

Exposed women had a significantly higher rate of abnormalities of menstrual flow, alteration in the length of the cycle, dysmenorrhoea and leucorrhoea. The sample was too small to report on abortions and still births. Fifty per cent of exposed mothers in the exposed group reported failure of lactation or a decrease in milk output post exposure, compared to 11 per cent in the controls. Impotence in men was reported by 8.1 per cent in the exposed group and 0.72 per cent in the controls.

On examination: There was no difference in the resting pulse and respiratory rates. The mean haemoglobin per cent in both males and females was significantly higher in the exposed group. There was no case of cyanosis. This was stated to be a significant negative finding in view of the findings of 87 per cent with breathlessness on exertion, the raised haemoglobin concentration and that extensive lung damage was expected to have occurred. 9.4 per cent of the exposed had crepitations and rhonchi in the chest, as against 2.1 per cent in the controls ($P<0.025$). This rate was also stated to be too small to account for the much higher rate of breathlessness on exertion.

There was a statistically significant difference in pulmonary function tests in both sexes in the age groups of 15-45 and 45-60 years. The difference in other age/sex categories were not significant. However there were only a small number of observations in these categories. The mean values of FEV1 and FVC and the FEV1/FVC ratio in all age/sex categories were diminished in JP Nagar compared to Anna Nagar. The 15-45 and 46-60 age groups showed a restrictive pattern while the over 61s had an obstructive pattern. It was stated that the control population was also minimally exposed, thereby diluting or masking the effect of the exposure.

TABLE 2: COMPARISON OF SYMPTOMS REPORTED BY INDIVIDUALS IN JP NAGAR AND ANNA NAGAR (Expressed in percentage. Numbers-of cases are shown in brackets)

Sl No	Symptoms	JP Nagar (Per Cent)	Anna Nagar (Per Cent)	P Value* (a)
1	Dry Cough	27.70 (41)	14.49 (20)	P<0.01
2	Cough with expectoration	47.29 (70)	23.91 (33)	<0.001
3	Breathlessness at rest	10.13 (15)	2.89 (04)	<0.025
4	Breathlessness on usual exertion	87.16 (129)	35.50 (49)	<<0.001
5	Chest pain/tightness	50.00 (74)	26.08 (36)	<<0.001
6	Weakness in extremities	65.54 (97)	36.95 (51)	0.001
7	Fatigue	81.08 (120)	39.85 (55)	0.001
8	Anorexia	66.21 (98)	28.26 (39)	0.001
9	Nausea	58.10 (86)	16.66 (23)	<0.001
10	Abdominal pain	53.37 (79)	25.39 (35)	<<0.001
11	Flatulence	68.91 (102)	25.36 (35)	<<0.001
12	Lacrimation	58.78 (87)	42.62 (58)	<<0.01
13	Blurred vision/photophobia	77.02 (141)	33.40 (53)	<<0.001
14	Loss of memory for recent events	45.27 (67)	11.59 (16)	<<0.001
15	Tingling/numbness	54.72 (81)	20.28 (28)	<<0.001

*(a) P Values were calculated by χ^2 method.

Source: Patel A and Patel A [1985]. The Bhopal disaster aftermath: an epidemiological and sociomedical survey.

WOMEN'S REPRODUCTIVE HEALTH

R Bang [1985] conducted a study of the status of women's reproductive health three months post exposure. This followed the earlier survey of a small number of women

in the two affected slums (refer to section on morbidity). The sample consisted of 114 women in two severely affected areas and 104 women in a control area (see Table 5). Reasons for selection of sample size have not been given. Selection of the sample was from community based ob/gynae clinics. This introduces the problem of self selection as women with ob/gynae problems would be expected to attend these clinics. These cases cannot be related to any population or denominator. Hence epidemiological extrapolations from these case studies cannot be made. It is not known if standardised questionnaires or examination schedules were used. The findings of the study were reported in Table 5. The differences are all highly significant ($P < 0.001$).

The results shown are from a smaller subset of the original sample, as pelvic examination could not be performed in some women due to various reasons like pregnancy, not being married, and refusals, i e, a selection at this stage has also occurred. However in spite of the limitations mentioned and also because similar factors of self selection occurred for both the exposed and control groups the difference between them is large enough to suggest real differences in the two groups and point to the need to study this area. Other studies, subsequently, too have reported similar findings [Patel et al, 1985 and Sathyamala 1986].

In the exposed group there was a history of spontaneous abortion in seven, still birth in four, threatened abortion in one and incomplete abortion in one after the gas leak. No women in the control group reported any of these adverse outcomes of pregnancy.

Severe pallor was found in 37 (36 per cent) of the control group but only in 3 (3 per cent) of the exposed group. This corresponds to the finding of an increase in haemoglobin percentage in the exposed population found in other clinical and epidemiological studies.

Outcome of Pregnancy

Sathyamala C [1986], conducted a community based study of pregnancy outcome, 10 months post exposure (see Tables 6-8). A large sample was needed to detect significant differences in rates of abortion and still birth. The sample size took into account a non-response rate of 25 per cent which had been found in earlier studies. A total population of 8,165 people in 1,632 households were surveyed. Details regarding assumptions to determine sample size, power of study, etc, were not reported. Three exposed localities (bastis) were selected on the basis of post exposure morbidity and/or mortality rate. These were as follows:

JP Nagar - mortality rate 65.3/1000, morbidity rate 66 per cent

Kazi camp - 46.7/1000, 54-60 per cent respectively and

Kenchi chola - 35.7/1000, 91.9 per cent respectively.

These figures were taken from later, unpublished analysis of the study by Banerji et al. The sampling frame provided by the ICMR was utilised and random sampling of households done. A 'historic control' was utilised, i e, history of pregnancy outcome in the year preceding the disaster, in the same population was used as a comparison. This was chosen on the basis of studies carried out elsewhere which demonstrated an abortion recall of 82 per cent accuracy even after a lapse of 10 years. This may have lead to an under-reporting in the controls and an overestimation of the difference between the groups.

A pre-tested questionnaire was used. Methods used to train interviewers and to avoid interviewer bias have not been mentioned. The definition of abortion, missed periods and delayed periods used for the purposes of the study have not been mentioned. Misclassification between the three could possibly occur. The findings were: The non-response rate was 22 per cent, within the limits of what had been considered in sample size determination.

There were 275 live births and 13 still births in the population after the gas leak. The birth rate was stated to be 33.68/1000 population and was said to be comparable with the national birth rate. However births for only 10 months were taken to calculate the rate. Normally a period of 12 months is used and hence the rate calculated would be an underestimation. It is also the crude birth rate, not being standardised for the age and sex structure of the population. The still birth rate post exposure was found to be 47.27/1000 live births. However live and still births together should be taken in the denominator. The rate then is 45.25/1000 births. No comparison with national, regional or study based still birth rates has been made.

The overall spontaneous abortion rate after the gas leak was 370.96 which was statistically very significantly higher than the spontaneous abortion rate of 32.178 before the gas leak.

A second important finding is that the rate of spontaneous abortions in women who conceived after the gas leak is again statistically highly significantly greater than the abortion rates before the gas leak. The increase being about 5 times greater than before the gas leak.

The overall foetal death ratio was statistically significantly increased in the year following the gas leak in comparison to the previous year.

While past obstetric history, parity, period of gestation at the time of abortion, etc, were measured they were not taken into consideration in the analysis. These are important interactive and confounding variables. Changes in regularity of the menstrual cycle, delayed and missed periods, length of cycle and type of flow, were also found to be statistically significantly different before and after the gas leak.

Case Referent Study of Watering of Eyes

Andersson et al [1986] conducted a case referent study of persistent eye watering. An eye hospital started in Bhopal in response to the disaster was used as the source of cases and controls. Two consecutive retrospective series of clinical records were drawn for outpatients on whom exposure data were available. This would be a source of selection bias as it is probable that exposure status may not have been recorded equally in the exposed and non-exposed groups. The method by which exposure was assessed and recorded has not been mentioned. The findings were:

Table 3: Comparison of Significant Symptoms Reported by Individuals in JP Nagar and Anna Nagar

Sl No	Symptoms	JP Nagar (Per Cent)	Anna Nagar (Per Cent)	P Value* (a)
1	Skin problems	29.05 (43)	11.59 (16)	<0.01
2	Bleeding tendency	9.45 (14)	2.89 (04)	<0.025
3	Headache	66.89 (99)	42.02 (58)	<0.001
4	Muscle ache	72.97 (108)	36.23 (50)	<0.001
5	Impotence	8.10 (12)	0.72 (01)	< .05
6	Anxiety/depression	43.92 (65)	10.14 (14)	<<0.001

Notes: Numbers of cases are shown in brackets.
* (a) Values were calculated by X^2 method.

Table 4: Comparison of Non-Significant Symptoms Reported by Individuals in JP Nagar and Anna Nagar

Sl No	Symptoms	JP Nagar (Per Cent)	Anna Nagar (Per Cent)	P Value* (a)
1	Blood in sputum	10.13 (15)	7.24 (10)	NS
2	Fever	27.70 (41)	28.98 (40)	NS
3	Jaundice	0.67 (01)	00	NS
4	Blood in vomit/stool/malena	12.16 (18)	10.14 (14)	NS
5	Vomiting	11.48 (17)	5.79 (08)	NS

Notes: Numbers of cases are shown in brackets.
*(a) P Values were calculated by x^2
Source: Patel A and Patel A [1985].

Gas exposed people were three times more likely to present with watering eyes (odds ratio – OR- 2.96, 95 per cent confidence interval – CI – 2.3 - 3.4) and nearly 4 times more likely to present with watering and at least one other irritant symptom (burning, itching, redness) (OR 3.8, 95 per cent CI 3.12 - 4.4). There was no association between exposure and refractive errors (OR 1.16, 95 per cent CI 0.83 – 1.9).

There is no explanation for the symptom of persistent watering of the eyes. The report suggests tear film instability due to long-term effect of exposure on epithelial maturation or abnormality of the mucus component of the tear film which is derived from the epithelium itself and from conjunctival goblet cells.

In summary, the epidemiological investigations conducted have studied different aspects of the health impact of the disaster at different points in time (see Table 9). They vary in methodology used and critical comments regarding this aspect have been given above. They were conducted in difficult circumstances and despite some methodological limitations they all record very serious effects on the health of those exposed. They support clinical findings of multisystemic and long-term effects. However, some of the important findings from these studies, that may provide clues for etiology, if followed up are:

(A) The varying pattern of morbidity in clusters at different distances away from the factory in the acute phase. This was not just in magnitude of effect, but there were qualitative differences of differing symptomatology (Andersson et al) in different clusters. This points to the possibility of the role played by different chemicals. Follow up studies should look at different clusters over time.

(B) The presence of a percentage or proportion of individuals with multisystemic symptoms in the absence of lung disease (Patel et al) in the sub-acute phase. This suggests that severe lung damage may not account for all the chronic effects.

(C) Significantly higher adverse outcome of pregnancy in exposed women conceiving after the disaster, compared to controls. Congenital abnormalities also need to be studied. This very serious observation points to the presence of continuing toxicity.

Infants, pre-school and school age children, a vulnerable group, have not been studied. Respiratory disability has not been studied at the population level. Natural history of the morbidity and the excess mortality that continues to occur also remain to be studied.

VII
Experimental Studies

Pre-Disaster: Data on the toxicology of MIC was scarce at the time of the disaster. Median lethal doses in animals were available, e g, it was 5 ppm for 4 hours by inhalation in the rat. In another experiment a dose of 62.5 ppm for 4 hours killed all the exposed rats. Corneal injury has been recorded in rabbits. A dose ranging study in human volunteers has been referred to by the ACGIH (American Conference of Governmental Industrial Hygienists). There were no effects at 0.4 ppm but exposure to 21 ppm was unbearable.

Mention has been made of the intense irritation caused to eyes, nose and the throat. Kimmerle and Eben [1964], studying MIC toxicity by inhalation exposure, observed that it was highly irritating to skin and mucosa and that it produced pulmonary oedema. There was little published material on the effects of sublethal doses, dose response and metabolic/chemical breakdown products of MIC.

Post-Disaster: Several toxicological studies on different animal models have been conducted after the disaster. Because of the short life span of the animals used, each animal year being equivalent to several years of human life, an estimate of long-term effects of exposure can be made relatively early. Experiments and pathological investigations not ethical or permissible to be conducted on humans can also be performed. The main limitation of animal studies however, in general is that extrapolation of results to humans has to be made with caution because of the differences in the biological systems. Another limiting factor to be borne in mind in this particular case is that in all the animal experiments conducted so far, only pure MIC has been used as the agent of exposure. In Bhopal under the prevalent conditions of high pressure and temperature and in the presence of catalysts other chemical reactions could have occurred with the formation of other chemicals. However the advantage is that these experiments can indicate lesions attributable to MIC. They can be used to support/explain epidemiological observations and similarly epidemiological data can provide clues for experimental work. The objective of both endeavours together being to explain mechanisms/pathogenesis to the extent necessary for rational interventions in the treatment and/or rehabilitation of victims and in the prognosis of their condition.

The method of MIC exposure used in animal studies has been by inhalation, with doses varying between experiments. They all tried to simulate the possible dose range that could have existed during the Bhopal disaster.

Harding et al [1985] reported the development of lens opacities or cataracts when rat lenses were incubated with MIC.

Salmon et al [1985] reported that at low concentrations in rats MIC caused severe sensory irritation with slow, irregular breathing and the production of a sedative effect. At higher concentrations this was masked by arousal resulting from respiratory distress. Eye damage was always confined to the epithelial layer with most severity at intermediate exposures suggesting that at high doses some protective response was evoked. Urinary thiocyanate levels in the exposed were lower than in the controls. They observed a dose dependent response and supported the use of death rates and incidence of pulmonary damage as a crude index of exposure in epidemiological studies.

Nemery et al [1985] reported that at very high concentrations (10 mg/L for 15 mins) 50 per cent of the rats died. The lungs were enlarged with air. Gross oedema or haemorrhage was present only in 2 rats killed after exposure. The main effects of low concentrations of MIC on the respiratory tract was to injure the proximal airways with little alveolar injury. At high concentrations lung parenchyma was also damaged with resulting interstitial and alveolar oedema, inflammation and haemorrhage. Though there was complete destruction of bronchiolar epithelium, repair took place. However despite rapid resolution, they found isolated foci of more recent injury in animals killed 2-3 weeks after exposure. They found MIC to be a respiratory irritant, i e, both a sensory (stimulation of nerve endings in the nasal mucosa) and pulmonary irritant (impact on lower respiratory tract).

Ferguson et al [1986] im mice experiments also found MIC to be a potent sensory and pulmonary irritant. They have considerable experience in working with isocyanates and have found MIC to be the most potent pulmonary irritant they have tested in the isocyanate series. They found that the RD 50 (the concentration evoking a 50 per cent decrease in the respiratory rate) and the RD 50 TC (the RD 50 in tracheally cannulated mice) was separated only by a factor of 1.5. Thus a concentration capable of evoking intense sensory irritation of the eyes, nose and throat is close to that capable of inducing pulmonary irritation. MIC is thus classified as a respiratory irritant. They found it to be seven times more potent than chlorine.

Luster et al [1986] found a steep dose response for toxicity. During 90-day recovery studies epithelial injury generally resolved,

TABLE 5: FINDINGS OF R BANG'S STUDY

	Exposed Group	Control Group	Chi Square
Total no studied	114	104	—
Pelvic exam done	72 (63%)	52 (50%)	—
Leucorrhoea	65/72 (90%)	14/52 (27%)	51.67
PID	57/72 (79%)	14/52 (27%)	34.67
Cerv erosion/endocervicitis	54/72 (75%)	23/52 (44%)	11.39
Excess menstrual bleeding since exposure	27/87 (31%)	1/81 (1.2%)	26.19
Suppression of lactation	16/27 (59%)	2/16 (12%)	10.17

The differences are all highly significant ($P < 0.001$).

but prominent fibrosis developed in the walls of the major bronchi. They reported no injury to the spleen, liver, kidney, thymus or brain. Haematological values except for slightly increased haematocrit were within the normal range. They found humoral immunity to be unaffected. In spite of a 30 per cent suppression in T cell lympho-proliferative response they found host response resistance not affected.

Fowler and Dodd [1986] studied rats, mice and guinea pigs. Gassert [1986] observed that this study was the most comprehensive inhalation study of MIC to date. It was produced some years before the Bhopal disaster under private contract 48 with Union Carbide but was not published until 1986. It provided evidence of bronchiolitis obliterans in guinea pigs (only) exposed to 10.5 and 5.4 ppm MIC for six hours. They also noted dose related lesions in the respiratory tract. No deaths occurred in animals exposed to 1 or 2.4 ppm MIC. The majority of deaths for 10.5 and 20.4 ppm occurred through post exposure day 3; at 5.4 ppm deaths occurred throughout the 14 days. Deaths were attributed to pulmonary vascular alterations.

ICMR studies [1985] found that the cherry red appearance of the blood could be due to the direct action of MIC (by carbamylation) and need not necessarily be due to cyanide or carbon monoxide. Carbon monoxide poisoning was ruled out. Analysis of human tissue by gas chromatography indicated the presence of monomethylamine. On animal studies they found that MIC had an LD 50 dose of 85 mg in mice, but with thiosulfate therapy it shifted to 195 gms. For

TABLE 6: RATE OF SPONTANEOUS ABORTION BEFORE AND AFTER GAS LEAK

	Before	After
Total conceptions	404	310
No of abortions	13	115
Abortion rate	32.178/1000 conceptions	370.96/1000 conceptions

rats the figures were 270 and 344 respectively. Normal rabbit lungs weighed 6 gms, following MIC exposure they weighed 29 gms and had a large number of haemorrhagic patches. When given sodium thiosulfate immediately after MIC exposure the lungs weighed 24 gms but the appearance was normal. With pure MIC they also found a dose-dependent response in the respiratory tract. They found that MIC had bactericidal activity.

Salmon [1986] also reported that MIC could produce a reddish tinge to blood. However differences could be detected on spectrometric analysis.

Varma et al reported adverse effects on the oestrus cycle and fertility in male and female mice.

Gassert et al [1986] reported on a 14-month follow up of rats exposed to MIC. Two exposed rats died at 6 and 8 months following sudden onset of respiratory distress. Six rats killed at 14 months revealed a history of mild respiratory infections. Mild interstitial fibrosis in the peribronchiolar region was present in all exposed rats. A notable finding was that MIC exposed animals had four times the amount of lymphoid aggregates found in control animals adjacent to the bronchiolar airways. A mild infiltrate of eosinophils was present in the bronchiolar mucosa. Eosinophil and lymphoid infiltrates were found in the mucosa of the conjunctiva of the eyelids and perilimbal regions. They state that long-term changes in the eyes and lungs may result from a single two-hour exposure to acute sublethal doses of MIC vapours and that the immune system is most probably directly involved. They suggest that lymphoid hyperplasia may be due to persisting exposure related antigens or to an increased susceptibility to other immunostimulating agents following MIC exposure.

Thus animal experiments reveal that MIC is extremely toxic on inhalation—being a potent respiratory irritant. Chronic morbidity and a continuing increase in mortality has been reported in the exposed animals. The studies suggest three possible mechanisms by which this may occur: (a) due to long-term sequelae of severe lung damage caused by the direct toxic or irritant effects of the chemicals. (b) due to damage to the immunological system. (c) due to systemic toxicity caused by mechanisms as yet unknown.

VIII
Discussion

The discussion on methodological points will cover the following areas: a) the exposure variable, b) the population at risk, c) the health outcomes, d) confounding variables and e) sources of bias.

EXPOSURE VARIABLE

Results from the few early studies conducted, together with experience of physicians and social workers in Bhopal and toxicological studies in animals indicate that the exposure has resulted in long-term adverse effects on health. These findings point to the need for long-term follow-up of the victims. As a first step valid measurements of exposure need to be evolved.

(a) *Defining Exposure*: It is necessary in the conduct of epidemiological studies in Bhopal to have a working definition of the exposure variable. Indicators or measures of the degree of exposure are also needed to estimate possible dose-dependent responses in the outcome variables of mortality, morbidity and disability.

Previous studies have used the following as indicators of exposure: post-exposure mortality rates in defined localities as reported by the state government study findings have shown that these did provide a rough estimate of exposure in different localities. The rates found in the studies were, however, much higher than the rates reported by the government. Issues concerning mortality rates have been discussed earlier: A combination of death in the family or exposure-related mortality rates along with grades of morbidity as a measure of exposure; one study found that immediate post-exposure hospitalisation rates were also related to the degree of exposure.

(b) *Variability in Exposure*: Epidemiological studies reveal that control areas 10km away from the factory have been mildly exposed. Studies have also shown a variability in the picture of morbidity in different localities as well as variability in individuals or groups of people living in the same locality. Besides differences in individual susceptibility accounting for some of the variability, both the above observations suggest that the factor of 'exposure' needs to be considered more carefully. The two important issues to be considered are: the area and hence the population exposed may be larger than the accepted 2,00,000, several variables which determine the exposure level for an individual—results from the various studies have indicated that these are: (1) distance

TABLE 7: ABORTION RATE IN CONCEPTIONS BEFORE GL ABORTED BEFORE GL AND ABORTION RATE IN CONCEPTIONS AFTER GL

Conception BGL	Abortion BGL	Abortion Rate	Conception AGL	Abortion AGL	Abortion Rate
404	13	32.178/1000 Conceptions	310	45	145.16/1000 Conceptions

(BGL-before gas leak, AGL-after gas leak).

TABLE 8: FOETAL DEATH RATIO BEFORE AND AFTER GAS LEAK

Quarter	1984			1985		
	Number Delivered (LB+SB)	Number Aborted	FD Ratio	Number Delivered	Number Aborted	FD Ratio
January-March	30	2	6.66	76	27	35.52
April-June	87	12	13.79	77	24	31.16
July-September	56	3	5.35	94	20	21.27

(LB - live births, SB - still births; FD ratio - foetal death ratio).
Note: The foetal death ratio has not been defined but appears to be the number of abortions per 100 live and still births.

from the factory at which the individual was at the time of the disaster, taking into consideration the direction of the wind; (2) type of housing: pucca (well built), kutcha (without brick and cement), presence of gaps/holes letting in air (3) action taken at the time of the disaster, viz, a) measures of exposure to the atmosphere: kept all doors and windows closed and remained indoors, opened doors and windows, stayed in the house, went out, remained in the area; (b) measures of exertion: left area, walked, left area, ran, left area, cycled, left area, used motorised transport; (c) use of neutralising/protective measures: used a wet cloth over the face, covered face with a blanket, went in a direction opposite to that of the wind.

Thus a single parameter by itself, e g, distance away from the factory, may not reflect the true exposure status of the individual which would also depend on other actions that the person took at the time of the disaster. This could be one of the reasons to explain the variability in mortality and in the pattern and degree of morbidity in different individuals even in the same locality. Other factors like age, level of nutrition and general resistance, presence of other diseases, etc, would also play a role. All the above will have to be considered in studies of morbidity as well as in determining priority groups of people who would need greater care and follow up.

(c) *Exposure at individual and population level*: Mortality rates could be a measure of exposure to classify localities and areas, i e, they could be used as indicators of degree of exposure at the population level. While the other factors outlined above could be used as measures of the exposure status of individuals.

(d) *Measurement (assessment) of exposure*: History taking is the traditional medical method of determining the exposure status of an individual. However in Bhopal a large population has been affected. Several studies into the health effects will need to be conducted over a long period of time and several interviewers will be involved. To ensure comparability between studies and consistency over a period of time, a standard, repeatable and valid method of determination of exposure should be used. A standardised questionnaire, using the factors discussed earlier would provide a simple, inexpensive, non-invasive tool of investigation.

There have been attempts to develop biological markers of exposure, e g, antibodies or enzyme-related makers. They are still in the experimental stage and will have to be field-tested. However, any invasive method—in this case blood samples will be needed—have the drawback of increased nonresponse. Besides this, increased costs, the need for investigators who have requisite skills, the availability of laboratory facilities, etc, will have to be considered. Studies carried out so far have shown that the use of crude morbidity and mortality rates have served as markers of degree of exposure. Salmon et al [1985] have confirmed this on the basis of experimental studies. With a little refining as suggested above, standardisation and pretesting, questionnaires could continue to be used to measure the degree of exposure.

Population at Risk

The population at risk would comprise all those who were exposed to the agent and who could potentially manifest adverse health outcomes as a result of the exposure. It would form the denominator in calculating exposure-related rates of morbidity and mortality for the population. Various subgroups of this population could also be studied, e g, according to age, sex, socio-economic status, degree of exposure, etc. Epidemiological profiles for groups broadly classified as severly, moderately and mildly exposed could be built up. Factors discuss-

Table 9: Summary of Epidemiological Studies Conducted in Bhopal—Methodological Aspects

Investigator	Focus of Study	Type of Study	Time	Place	Person	Sample Size	Sampling Method	Non-Response	Study Instrument
1 Andersson et al	Eyes, general morbidity	Population based, clusters + controls, +2 month follow up	December 1984, and February 1985	Severely + moderately + mildly exposed areas	General population	261 exposed, 91 unexposed persons	Opportunistic sample, i e, as many as could be examined	64 per cent at follow up	3 ophthalmologist interviewers, attempts to maintain uniformity in history-taking and examination
2 D Banerji et al	Mortality, general features	Population based, cross-sectional	January 1985	Severely + moderately exposed areas	General population	700 households	Random sampling	?	Pre-designed questionnaire, trained investigator
3 R Bang	Women's reproductive health	Clinic based case series in exposed + control areas	February-March 1985	Severely exposed + control areas	Women-reproductive age group	114 exposed, 104 unexposed persons	Self selected sample, women attending field based Ob/Gyn clinics	Pelvic exam not done in 43.2 per cent	1 gynaecologist investigator, routine history-taking and clinical exam
4 A Patel et al	General health	Population based, cross sectional, exposed + control areas	March 1985	Severely exposed + control areas	General population >10 yrs of age	180 persons in each group	Random sampling	29 per cent in exposed, 15 per cent in control group	Pre-designed questionnaire with defined parameters, ? training of investigators
5 Sathyamala	Outcome of pregnancy	Population based, cross-sectional, historic control	September 1985	3 severely exposed areas	Pregnant women out of general population	8165 persons in 1632 households	Random sampling	22 per cent	Pre-designed, pre-tested questionnaire, ? training of investigators
6 Andersson et al	Watering of eyes	Case control, record based	November 1985-January 1986	Eye hospital	Eye patients from general population	989	Those with recorded exposure status	—	Hospital case records

ed under exposure variable will have to be considered.

Numbering of all the households to create a sampling framework was done shortly after the disaster. Since a relatively small population has been affected and there is a need for long-term follow-up, a population register or case registers could be maintained on computer after a census of the exposed population.

This would provide a good base for follow-up studies.

Health Outcome

(a) *Mortality rates/standardisation*:

The number of deaths following the disaster would have to be related to the exposed population to derive crude rates. These could be standardised for age and sex by comparison with a standard population of similar socioeconomic status, and Standardised Mortality Ratios (SMRs) could be calculated. The time period during which deaths are enumerated would have to be considered in the calculation of exposure-related mortality rates. As with morbidity this could be calculated for the acute, subacute and long-term phases. Rates for different localities should also be calculated.

These rates could be calculated using routine sources of data. However in the longitudinal study, life table analysis could be done. There should be a good reporting system for deaths in the exposed and control populations. Staff and investigators should be trained in the use of the International Classification of Diseases and if necessary suitable, standardised criteria could be evolved for the classification of deaths. Autopsies should be preformed in a sample of deaths among the exposed group, as is the requirement in any medico legal case.

(a) *Assessment criteria*: This has been the first time that a whole population has been exposed to high concentrations of these chemical agents. The exposure has, therefore, resulted in a group of symptoms and signs which together do not fit easily into established disease entities. This new disease complex would have to be named appropriately, e g, the 'Bhopal Toxic Gas Syndrome'. For the purpose of epidemiological studies working case definitions of this disease complex would have to be developed. This would have to be done based on the clinical experience of medical professionals treating the exposed population together with the help of epidemiologists to ensure simple, standard criteria which can be applied in the field. It would basically comprise of groupings of characteristic symptoms and signs.

(b) There may be a lag period between the exposure and some pathological conditions which have not as yet manifested. Rothman [1985] states that one must allow for the following: a biologically appropriate induction time during which a sufficient cause becomes complete. This may be quicker for heavy exposures and slower due to interaction with other factors for lower doses of exposure; and latent period, which is the period after causation before the disease is detected.

Early studies may thus miss still evolving disease conditions which could be picked up by prospective longitudinal studies or epidemiological monitoring systems.

(c) Complementary causes or predisposing factors would play a role in the development of the disease outcome by increasing the susceptibility of individuals. People with a larger set of complementary causes would need a smaller dose of exposure to complete a sufficient cause and result in a diseased condition [Rothman 1986]. Exposure to the toxic chemicals may unmask or exacerbate existing disease, e g, chronic bronchitis, asthma, TB, etc. These would be considered confounding factors in the analysis of studies. But, from the point of view of the health condition of the people and for the provision of health care services, their presence would cause the individual to be placed in a priority group.

Confounding Variables and Sources of Bias

Socioeconomic status is closely related to exposure and to outcome and would be a confounding factor. Stratification in design or group matching could be used to account for this. Age and sex would also have to be considered. In the Bhopal situation, smoking, exposure to smoke or air pollution in the home (cooking on smoky fires) or at work, nutritional status, presence of chronic diseases, e g, TB, trachoma, asthma, chronic bronchitis would be interactive factors which would have to be measured and allowed for in the analysis.

Several sources of bias have to be considered: (a) Stewart [1985] has raised the issue of 'survivor bias' in follow up studies of survivors of the atomic bomb explosion in Hiroshima and Nagasaki. This could occur in any cohort of people surviving a major catastrophe. The parent population loses a high proportion of vulnerable individuals—the very young, the old and the sick. Thus when comparisons of mortality are made with a control group in follow-up studies there will be an underestimation of the effect. One may get a normal death rate in the survivors, though it may actually be slightly raised. This is similar to the bias caused by the "healthy worker effect" in studies of occupational groups. This factor would have to be kept in mind in long-term studies in Bhopal.

(b) There would be a selection bias in hospital or clinic based studies due to self selection of people attending these services. With the plurality of services and factors of accessibility this would be important in Bhopal. The utilisation of health services in the subacute phase as reported by Banerji et al [1985] shows that this occurs.

(c) Bias due to migration of people into and out of the population, new births and deaths, all of which would affect the baseline population have been considered earlier in the report.

(d) Misclassification of exposure status or of outcome (if the diseased condition is undiagnosed or misdiagnosed) will enhance or decrease the association depending on the direction of the misclassification. In Bhopal this is very likely when using routine sources of data, as many medical professionals dealing with a previously unknown situation, have tended to use the nearest known diagnosis to fit the presenting symptoms and signs. This re-emphasises the need to have a working definition of the outcome for documentation and study.

(e) The non-response rate has been found to be quite high (20-29 per cent) in all the studies conducted in Bhopal. Besides altering the sample size this would also affect the composition of the sample, depending on the characteristics of the non-responders. Allowance for non response should be made in determination of sample size and also in budgeting for time and finances to allow for more intensive follow-up of a percentage of the non-responders.

(f) Observer bias leading to a bias in history-taking, recording, interpretation of findings or in diagnosis may occur. The factors that play a role specifically in Bhopal are: Those who believe that all is well in Bhopal try to underplay or explain away the symptoms of the people. This is evident in the attitude of many who attribute every symptom to the presence of chronic diseases or as psychosomatic symptoms or as compensation malingering. On the other hand those who believe that a conscious anti-people crime has been committed in Bhopal may let their beliefs affect reporting or interpretation of what the people say.

The above factors could be reduced by the training of interviewers and in the use of blind techniques when possible in certain investigations, e g, in reading X-ray films, etc. Keeping investigators blind to exposure status is not possible.

(g) Measurement bias would be important to keep in mind especially when using instrumentation for lung function tests. Standardised instruments and techniques are available. The instruments should be calibrated and maintained to give accurate and reliable readings over a period of time.

Suggestions

Several research projects, involving different specialities, are being undertaken in Bhopal and elsewhere, on various aspects of the disaster. As outlined earlier there is a need for supportive epidemiological studies, especially those that are population-based.

In Bhopal a cohort of people have been exposed at a point of time to chemical agents. There is a need to study:

(1) the range of health effects stemming from the exposure,

(2) the natural history of these health effects.

An epidemiological study is basically an exercise in quantifying disease occurrence and using a logical method in deriving inferences/explanations to account for varia-

tions in disease distribution by relating them to putative causes. In this particular situation, where the exposure has defined time and place characteristics, though the composition may be uncertain, observational follow-up or longitudinal studies seem logical. Here the study population are selected with reference to their exposure status.

The application of case control studies, where the study population are selected with reference to their disease status, would be limited. The disease outcome in Bhopal, is not a well defined entity and is still evolving. The prevalence of what has occurred, is not rare, but affects 30-60 per cent of the severely and moderately exposed population. Also, a large proportion of the local population of similar socioeconomic background have been exposed to the agent, to some degree.

Cross sectional studies in the subacute phase have provided prevalence rates of various symptoms and have also indicated areas of importance. A repeat cross sectional study could give prevalence rates of symptoms and signs post exposure. It could provide age, sex and area specific distribution of the "Bhopal toxic gas syndrome". Relationships with respects of the exposure variable could also be tested. Cross-sectional studies using exposed and control groups, a variant of case control studies, could be used for analytical purposes, to study the relationship between symptoms or groups of symptoms and exposure.

Longitudinal Study: A cross sectional study should form the baseline for a prospective, longitudinal study. Important points in the conduct 'of a longitudinal study are now considered.

(1) Objectives: The hypothesis should be explicitly stated. There is a need to define the time period of the study. This would be selected based on biologic assumptions of the disease outcome and its relationship with the exposure. The broad objectives could be:

(a) to study the prevalence/incidence of the 'Bhopal toxic gas syndrome'.

(b) to relate symptoms/signs observed at the start or appearing during the course of the study, to various aspects of the exposure.

(c) to study the natural history of the condition—its severity, fatality, the impact of therapy, etc.

Other specific areas to be studied are (a) the percentage of exposed individuals with multisystemic symptoms and signs in the absence of lung findings. (b) levels of urinary thiocyanate in the exposed and control population. (c) prevalence of psychiatric disorders in the two groups. (d) outcome of pregnancy in the years following the disaster. The specific parameters of these outcomes would have to be evolved locally.

(2) Sample: Small clusters in different localities could be selected to be able to study the variation in outcome in the different localities. Other aspects of the exposure variable would also have to be measured in the individuals in these clusters.

Sample size determination would have to be done locally, with details of the baseline population. Differences in the prevalence of symptomatology between the exposed and control groups, as found in previous studies, should be used for the calculation. The level of statistical significance and power required for the study should be decided. The high non-response rate as found in previous studies and possible dropout rates should be considered.

To ensure representativeness and to avoid bias, population based, random sampling should be used. With this method the probability of selection into the sample is the same for all individual units. Though the sampling framework has been set up, it could be rechecked keeping in mind the discussion of the population at risk. The method used in the cross-sectional and longitudinal studies would have to be a house-to-house survey.

Community meetings as in the study by Patel, et al, should be conducted with the people to inform them of the study, discuss with them the need for continued study, reasons for random sampling, etc.

(3) Ethical aspects: Obtaining consent from study participants and maintenance of confidentiality of patients records should be planned for.

(4) Study population: Besides the general adult population, infants, preschool and school age children should also be considered. This group has not been studied in the studies reviewed. The advantages of this group are that they would have had no serious exposure to smoke (though passive smoking would have to be considered) and occupational pollutants. Chronic disease would also be minimal. Their respiratory systems are also more sensitive to insults which makes it easier to detect adverse effects. It has been found that children can carry out spirometric lung function tests from about seven years and can manage a single measurement of PEFR at five years [Florey and Leeder 1982].

(5) Control population: An unexposed or minimally exposed population is needed for comparison. It should be comparable in terms of broad socio-economic characteristics. It would provide an estimate of disease rates expected to occur in the absence of exposure.

(6) Measuring the exposure and outcome variables: The main issues regarding these variables have been discussed. Working criteria/case definitions for the assessment of exposure and outcome need to be defined. Several types of outcome can be observed, e g, post exposure mortality, specified decrease in lung function, onset and frequency of respiratory infections in addition to those mentioned under specific objectives. Sub-classification into definite, probable and possible 'cases' could be made. Criteria and methods of assessing the exposure and outcome variables should be the same in both the exposed and control groups.

(7) Examination techniques: Simple, valid, repeatable, field tested instruments will have to be used. These would include questionnaires, clinical examination, lung function tests, etc. The parameters to be measured at entry and follow-up should be specified. Numerous studies of diseases of the respiratory system and its risk factors have been conducted. Instruments which are valid and reliable are available. Three standard questionnaires have been developed for the study of respiratory epidemiology by the British Medical Research Council, US National Heart and Lung Institute (NHLI) and the American Thoracic Society. A suitable one could be combined with general health questionnaires. Standardised methods for spirometric lung function tests are also available. Random and systematic sources of error in measurement must be minimised.

(8) Other factors to be considered are the training of investigators, pilot testing and planning for the follow-up of a percentage of non-responders.

(9) Analysis: In a longitudinal study an unbiased estimate of the relation between exposure and outcome is obtained. The relative risk (incidence rate in the exposed/incidence rate in the unexposed) and absolute risk (incidence rate in the exposed-incidence rate in the unexposed) can be calculated. It would be more useful to work out person years of risk and calculate the force of mortality/morbidity or the instantaneous mortality/morbidity rate. The risk of developing a particular outcome (death/disease) can be estimated for a variety of initial characteristics, e g, distance from factory, action taken at the time of disaster, main presenting symptom in the acute phase, etc.

(10) Difficulties: Dropouts causing attrition of the sample are to be expected. Every effort to get a good follow-up should be made. Substantial loss to follow-up may raise doubts the validity of the results as bias would be introduced if the loss is correlated with both exposure and disease.

It is important also to maintain consistent criteria and techniques for measurement throughout the study period. This is in view of the fact that turnover in staff and availability of newer instrumentation and techniques will occur over time.

A longitudinal study is also a major undertaking in terms of resources—personnel, facilities, finances, etc. The seriousness of the situation, however, demand this effort, which would be best conducted under the auspices of the state health authorities and the ICMR.

Multiple or Serial Cross-Sectional Studies: Difficulties inherent in the conduct of cohort studies have led to the use of multiple cross sectional studies. This would be carried out on random samples of the population at different points in time. In Bhopal they would be able to show if there are changes in prevalence from one survey to another. However, since the same individuals would not be followed up, the natural history of the disease will not be studied. Changes in population structure in the intervening period could cause a change in the measure

of outcome. The sampling method, method of data collection and analysis and response rate should be comparable at each examination. Comparison of mean values or frequencies of variables such as age and sex could give an idea of changes occurring in the population structure. Sample sizes will be larger than for cohort studies because the greater power of tests of difference between paired observations in the same individual cannot be exploited [Florey and Leeder 1985]. Independent non-governmental groups could probably undertake this study design.

A detailed longitudinal study with intensive efforts to obtain a good response rate and follow-up need be done only for a small sample of the exposed cohort. The setting up of an epidemiological monitoring unit should be considered for the entire exposed population. This would be based on routine records from hospitals and health centres regarding admissions and deaths. It would necessitate the building up of an efficient system of recording, reporting and analysis. A special census of the exposed population could be conducted and a method of identification of exposed individuals evolved. The system would be able to pick up important changes in morbidity or mortality on which appropriate action could be taken.

IX
Conclusion

The Bhopal disaster has been a human tragedy of immense dimensions. The suffering caused is incalculable. Important tasks remain ahead for the provision of the best possible care for the victims and for the prevention of such events in the future.

There is a need, first, for the measurement, understanding and documentation of the impact of the disaster on the health of those exposed, so as to be able to provide rational care. It is necessary also to document the seriousness of the effects so as to prevent an easy erasure from human memory of the event. Epidemiologic skills could help in this effort as described in this report.

At the present time it is known that similar small-scale 'technological disasters' occur frequently. Larger scale disasters could also occur. Hence, along with the deeper causes of these disasters being tackled, there is a need to have a strategy to deal with such events.

Outlines for this are as follows:

It is necessary to have epidemiological data for an adequate understanding of the effects on human health. This would include data regarding the numbers and demographic structure of the population at risk, the age/sex/area distribution of the fatalities if they occur, and similar data regarding morbidity.

Through collaboration between clinicians and epidemiologists, it would be necessary to evolve simple, standard criteria for assessment and documentation of morbidity.

Similarly, a method to assess exposure needs to be evolved.

Collaboration and communication between administrators, service providers and researchers is important.

Close contact and communication with the affected people is the most important factor. In the absence of this, one could easily slip into esoteric, theoretical exercises, which are meaningless to the problem at hand.

These efforts have to be seen in the context of the broader issues raised by such events. In Bhopal, these would include: the economic relationship between multinationals and countries of the third world which determine factors like technologies and safety systems used; the exploitative relationship with the workforce and the local community to maintain high profit margins; the siting and safety systems of hazardous chemical plants; legislation regarding and implementation of safety controls; the workers, and communities, right to information; the role of pesticides; and the acceptable limits to the chemicalisation of our world. The true causes of the disaster and the scope for preventing such events in the future, lie in the matrix of these issues.

(Concluded)

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2. Dr. P. K. Biswas
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4. Dr. S. K. Roychowdhury
5. Dr. N. Pal Chowdhury (Br. Secy.)

Delhi
1. Col. S. L. Chadha
2. Dr. H. C. Govel
3. Dr. B. N. Bhattacharya (Br. Secy.)

Howrah
1. Dr. B. Bhar
2. Dr. S. C. Bej (Br. Sec.)

Jamshedpur
1. Dr. L. R. Agarwal
2. Dr C. D. Sinha
3. Dr. A. R. N. Prasad

Karnataka
1 Dr. R. K. Bhagwan
2. Dr. V. Balakrishna
3. Dr. K. V. Subramanyam

Kerala
1. Dr. M. N. Shenoy
2. Dr. T. B. F. Moniz (Br. Secy.)

Pune
1. Col. S. K. Chib
2. Dr. R. K. Bhatra (Br. Secy.)

Tamil Nadu
1. Dr. C. K. Ramchandar
2. Dr. G. Gopalraj
3. Dr. S. Bhoopathy Vijay Krishna
4. Dr. M. K. Mani
5. Dr. P. P. Santanam (Br. Secy.)

Thana Kolaba Branch
1. Dr. R. B. Pradhan
2. Dr. M. A. Chitnis (Br. Secy.)

Ex-Officio Members
2. Past Presidents
1. Dr. P. B. Bharucha
2. Dr. J. C. Kothari

Co-opted Members
Dr. S. Chakraborty
Dr. Harwant Singh

INDIAN ASSOCIATION OF OCCUPATIONAL HEALTH

NOTICE

The Annual General Body Meeting of the Indian Association of Occupational Health for the year 1975 will be held at 4 P.M. on 11.1.76 at Vigyan Bhavan, New Delhi.

Agenda

1. To confirm the Annual Report for 1974.

2. To receive, consider and confirm the proceedings of the last Annual General Body Meeting held at Bombay on 30.3.75.

3. To receive, consider and adopt the Annual Report for 1975.

4. To receive, consider and adopt the audited accounts of 1975. (As the meeting is being held in early January the Hony. Treasurer may not be able to have the Accounts audited in time for the meeting).

5. To pass the Budget for 1976.

6. To appoint Auditors for the year 1976 and to fix their remuneration.

7. To consider any resolutions brought forward by the Central Council Members and/or individual members.

8. To transact the following business :
   (i) Election of the Editor and the Associate Editor Journal Secretary of The Indian Journal of Industrial Medicine.
   (ii) Election of Trust Committee.
   (iii) Ratification of Office Bearers and Central Council Members for 1976.
   (iv) Installation of the President Elect 1976.
   (v) Any other business with the permission of the chair.

Calcutta
Dated 20th Nov. 1975.

P. K. Biswas
Hony. General Secretary.

INDIAN ASSOCIATION OF OCCUPATIONAL HEALTH

ANNUAL GENERAL BODY MEETING :

HELD AT MAFATLAL SABHAGRIHA ON 30TH MARCH 1975.

MEMBERS PRESENT

Name	Branch	Name	Branch
1. Dr. C. V. Talwalkar	Bombay	29. Dr. J. C. Nag	Calcutta
2. Dr. Harwant Singh	,,	30. Dr. A. K. Banerjee	Howrah
3. Dr. S. K. Chatterjee	Ahmedabad	31. Dr. J. R. Bhate	Hyderabad
4. Dr. P. K. Ghosh	Calcutta	32. Dr. M. B. Goverdhan	Karnatak
5. Dr. J. C. Laskar	Assam	33. Dr. M. K. Thacker	Bombay
6. Dr. S. Chakraborty	Calcutta	34. Dr. K. A. Turiambak Rao	Tamil Nadu
7. Dr. H. N. Chitnis	Bombay	35. Dr. C. K. Ramchandar	,,
8. Dr. N. Ginwalla	,,	36. Dr. N. Rajagopal	,,
9. Dr. A. K. Sen	,,	37. Dr. G. R. Kamat	Bombay
10. Dr. G. Arjundas	Tamil Nadu	38. Dr. B. B. Joshi	,,
11. Col. S. L. Chadha	Delhi	39. Lt. Col S. K. Chib	Pune
12. Grp. Capt. J. K. Sehgal	..	40. K. K. Vadhera	,,
13. Dr. Hem C. Govel	,,	41. Dr. J. J. Merchant	Bombay
14. Surg. Commander. N. B. Idnani	Bombay	42. Dr. K. N. Shah	,,
15.	,,	43. Dr. M. A. Chitnis	,,
16. Dr. P. D. Joshi	,,	44. Dr. S. M. Bopardikar	Pune
17. Dr. A. N. Shaw	Dhanbad	45. Dr. S. A. Kelkar	Bombay
18. Dr. A. M. Mehta	Bombay	46. Dr. R. R. Phanse Kar	,,
19. Dr. K. C. Jain	Pune	47. Dr. S. M. Pethe	,,
20. Dr. C. G. Nataraj	Tamil Nadu	48. Dr. Mrs. Krishna	,,
21. Dr. S. R. Patwardhan	Bombay	49. Dr. S. N. Sodah	,,
22. Dr. T. B. F. Moniz	Kerala	50. Dr. N. R. Nimkar	,,
23. Dr. M. N. Shenoy	,,	51. Dr. M. L. Gadgeel	,,
24. Dr. V. P. Pathak	Bombay	52. Dr. C. D. Sinha	Jamshedpur
25. Dr. J. Fonseca	,,	53. Dr. N. V. Gulvady	Bombay
26. Dr. L. Desouza	Bombay	54. Dr. P. C. Mehta	,,
27. Dr. N. M. Pant	,,	55. Dr. M. C. Narawane	,,
28. Dr. B. Prabhakara Rao	Andhra Pradesh	56. Dr. R. B. Pradhan	,,
		57. Brig. H. M. Gangopadhyay	Assansol

Name	Branch
58. Dr. M. J. Saldanha	Bombay
59. Dr. V. S. Srivastava	Direct
60. Dr. D. R. Sen	Bombay
61. Dr. A. C. Basu	Delhi
62. Dr. G. G. Davay	Bombay
63. Dr. P. C. Bhate	Baroda
64. Dr. S. K. Mehta	,,
65. Lt. Col. R. K. Kochtrar	Pune
66. Dr. A. N. Dandekar	Bombay
67. Dr. J. V. Telang	,,
68. Dr. N. C. Mukherjee	Andhra Pradesh
69. Dr. J. R. Mehta	,,
70. Dr. J. C. Kottari	Bombay
71. Dr. B. K. Jani	,,
72. Dr. L. G. Doshi	Ahmedabad
73. Dr. M. C. Dutta	Andhra Pradesh
74. Dr. R. Lobo Mendonca	Bombay
75. Dr. Ratan Singh	Andhra Pradesh
76. Dr. M. P. Hirve	Bombay
77. Dr. S. D. Pradhan	,,
78. Dr. R. C. Panjwani	,,
79. Dr. D. Rajaram	,,
80. Dr. G. D. Bhatia	,,
81. Dr. C. P. Sadarangani	,,
82. Dr. V. R. Jayawant	,,
83. Dr. S. Bhar	,,
84. Dr. J. K. B. Tavaria	,,
85. Dr. M. B. Adagra	,,
86. Surg. Comendr. T. D. Masilamani	Bombay
87. Dr. H. S. Captain	,,
88. Dr. A. S. Khullodkar	,,
89. Miss M. S. Kotnis	,,
90. Dr. K. H. Jagasia	,,
91. Dr. M. R. Bhatt	,,
92. Dr. P. K. Biswas	Calcutta

Minutes of the Annual General Meeting of the Members of the I.A.O.H. held at Mafatlal Sabhagriha Bombay-25 on Sunday 30th March 1975.

Dr. P. V. Thacker presided.
After having ascertained the quorum he called the meeting to order.

Condolence : Before transacting the business as per the Agenda tho house stood in silence for a minute to pay respects to the memory of the following members who passed away since the last general body meeting.

Dr. A. Venkataraman—Senior Vice-President. Tamil Nadu.
Dr. S. D. Donde, Past President, Bombay Branch.

A resolution of condolence was adopted and it was further resolved to send copies of the same to the bereaved families.

The President then informed the members that Dr. P. B. Bharucha whom we had elected as President once again at Bangalore, had on account of his pre-occupation with Smallpox Eradication work in Bihar, requested him in October 1974 to take over the duties of the President and that he had by his letter dated 26th February 1975 sent in his resignation which the Council at its 4th Meeting held on 28th March had accepted, recording the services rendered by Dr. Bharucha to the Association. The members approved of the action taken by the Council. Similarly, Dr. Prasad, the Honorary General Secretary had also for the same reason handed over his charge to Dr. P. K. Biswas from July 1974 onwards, but Dr. Prasad technically was still in the office. He had regretted his inability to attend the meeting.

The President then took up items on the Agenda.

Agenda Item 1—Confirmation of the Minutes of previous General Body Meeting held on 10.2.74.

Dr. P. K. Biswas informed the members that since Dr. Prasad had not sent tho above minutes to him, these could not be presented.

During the discussion Dr. J. C. Kothari stated that both Dr. Bharucha and Dr. Prasad while passing on their offices had not taken the Council members into confidence by sending them even a formal letter by way of information. It was a matter

of regret that the minutes of the General Body meeting held a year ago were not available even till today. He suggested a procedure to be laid down requiring the office bearers to inform the council members whenever they were unable to function and that while handing over the office, they must hand over the necessary papers to their successors.

Brig. Gangopadhaya (Asansol), Drs. Rajgopalan (Tamil Nadu) Laskar (Assam) and Merchant and Gulwandi (Bombay) also participated in the discussion giving various suggestions to overcome the above difficulties. Summing up the discussion the President agreed that non-availability of these minutes was irregular and requested the general body to condone the same under the circumstances narrated above. He added that owing to an unprecedented situation this year even the joint Secretary was not able to function during the last month. The only course open now was to request the incoming general secretary to obtain a copy of the minutes from Dr. Prasad and place the same before the 2nd Council meeting from the year 1975 for approval and thereafter present these at the next annual general body meeting to be held in 1976 for confirmation. Proposed by Dr. S. K. Mehta and seconded by Dr. Chaddha this proposal was adopted unanimously

Item 2—Hony. General Secretary's Annual Report.

The President informed that similarly the Annual Report for 1974 was not prepared either by the General Secretary or by the Joint Secretary and hence the same could not be circulated along with the notice. The Honorary Jt. Secretary then read out a brief report prepared by him. Proposed by Dr. S. K. Chatterjee and seconded by Dr. Talwalkar this report was adopted unanimously. Dr. Biswas was however requested to circulate a detailed report as early as possible.

Item 3—Audited Statement of Accounts.

Presenting the audited statement of accounts for 1974, copies of which were circulated to all the members attending this meeting, Dr. Bhatt stated that against the item Sir Ardeshir Dalal Memorial Lecture, a sum of Rs. 100/- was yet payable to Dr. C. K. Ramchandar and that this amount would be paid during the current year. He further informed the members that Dr. Ramchandar had desired to donate this amount to "Dr. K. M. Bhansali Memorial Fund" with an addition of Re. 1/- from his own. Members greeted this announcement and appreciated Dr. Ramchandar's gesture.

Dr. G. D. Bhatia and Dr. Sadarangani desired to know the propriety of Dr. Bharucha's signature on the statement since he was no longer the President. Dr. Bhatt replied that the cyclostyled copies circulated were prepared about 2 weeks ago whereas Dr. Bharucha's resignation was accepted only 2 days ago at the 4th Council Meeting. He added that the original statement approved at the 4th Council meeting held on 27th March were signed by Dr. Thacker as President. Thereafter the statement of accounts was approved, as proposed by Dr. S. K. Mehta and seconded by Dr. S. Chakraborty.

Item 4—Draft Budget

Draft budget as presented by the Hony. Treasurer in absence of the Honorary Secretary was circulated among the members and adopted. Proposed by Dr. Chitnis and seconded by Dr. S. K. Chatterjee.

Item 5—Appointment of Auditors.

As the auditors have necessarily to be from the place where the Treasurer's office was located, this item was postponed until the election of office bearers was gone through, thereafter proposed by Dr. S. K. Mehta and Seconded by Dr. B. K. Jani M/s G. S. Sadashivan, Chartered Accountants, Bombay were appointed as auditors for 1975 on the same remuneration as in the previous year.

Item 6—Dr. S. K. Mehta's Resolution and Item 7(i) Ratification of the Election of Office Bearers.

The President informed that the 4th Council meeting after a good deal of deliberations had come to the conclusion that the election of office bearers for the year 1975 as conducted by the Joint Secretary has not been in order. Even though the election procedures as recommended under the revised constitution were not approved at the annual general meetng held at Bangalore, the second council meeting had decided to include the outgoing Council members in the electoral college and had thus enlarged the same. Some branches had taken objections to the procedure adopted as it was in their opinion undemocratic. Under the unprecedented circumstances narrated above and also taking a note of the fact that a resolution submitted by one of the members (Dr. S. K. Mehta) which had been duly circulated to all the the members and put on the Agenda of the Annual General meeting, the Council decided that the General Body meeting of the members be requested to elect office bearers for the year

1975 from amongst the Council members for 1975. He then read out the Council's recommendation on the subject which is reproduced below :

"As the last general body meeting held at Bangalore did not approve of the various changes incorporated in the revised draft constitution and as no further action had been taken by the Rules Revision Committee since then, the election of the Office Bearers for 1975 should have been conducted as per the existing rules. Since the elections conducted have not been as per the existing procedures, the Council could not accept the same.

In view of the extra ordinary circumatances thus created and taking a note of the fact that conducting the elections for 1975 once again would involve time and money, the Council recommends to the annual general meeting to elect the office bears for the year 1975 out of the Council members for the year 1975. In view of the above decision all full members of the Indian Association of Occupational Health present and voting at the general body meeting will form the electoral college".

The above resolution of the Council was put before the meeting from the chair and was passed unanimously. Thereafter the President requested the 3 members of the election committee viz. Dr. Arjundas, Dr. L. D'Souza and Dr. P. K. Ghosh (in place of Dr. B. Bhar who was not able to attend the meeting) to conduct fresh elections for all the vacant posts of office bearers viz. President, 2 vice-Presidents, Honorary General Secretary, Honorary Joint Secretary and Honorary Treasurer and himself stepped down from the Chair.

Dr. Arjundas taking the chair invited nominations from the floor for the above post one by one.

President : Proposed by Dr. M. R. Bhatt (Bombay) and seconded by Dr. Subramanium (Karnataka). Dr. P. V. Thacker was declared elected unopposed.

Senior Vice-President : Proposed by Dr. S. K. Mehta (Baroda) and seconded by Dr. B. K. Jani (Bombay), Dr. Gopalraj was declared elected unopposed. Dr. P. K. Biswas proposed by Dr. C. K. Ramchandar, seconded by Dr. M. R. Bhatt. Dr. Biswas however declined to accept the nomination.

Vice-President : Proposed by Dr. C. K. Ramchandar (Tamil Nadu and Dr. M. R. Bhatt (Bombay), Brig. Gangopadhaya was declared elected unopposed.

Honorary General Secretary : There were two nominations :

(i) Dr. P. K. Biswas—proposed by Dr. J. C. Nag and seconded by Dr. A. K. Sen (Bombay), (ii) Dr. S. K. Mehta, proposed by Dr. P. C. Bhatt (Baroda) and seconded by Dr. G. D. Bhatia.

Voting was carried out by ballot. Dr. Arjundas while distributing the Ballot papers reminded the members present more than once that only the full members of the Association and those who had paid their subscription for 1974 were eligible to vote. The result of the ballot was 45 in favour of Dr. Biswas and 38 in favour of Dr. Mehta with one invalid vote. Dr. Biswas was thereafter declared elected.

Honorary Joint Secretary proposed by Dr. C. K. Ramchandar and seconded by Dr. Chakraborty. Col. Chadha was declared elected unopposed.

Honorary Treasurer : There were two nominations :

(i) Dr. M. R. Bhatt proposed by Dr. C. K. Ramchandar and seconded by Dr. L. G. Doshi, (ii) Dr. S. C. Bej proposed by Dr. Banerjee, seconded by Dr. J. C. Nag.

Dr. Banerjee thereafter withdrew his nomination of Dr. Bej and Dr. M. R. Bhatt was thereafter declared elected unopposed.

On completion of the election work Dr. Arjundas on behalf of his committee handed over the chair to Dr. P. V. Thacker after thanking the members for their cooperation.

Agenda item 7 (i) and (ii)

The names of the newly elected office bearers for 1975 having thus been announced, Dr. P. V. Thacker the President elect was thereafter installed as President for the year 1975. The President and other office bearers thanked the members for electing them.

Agenda item 8—Any other business with permission of the Chair.

The President put before the members the following resolution of the Council adopted at its 4th meeting held on 27.3.75.

"This Annual General Meeting of the members of the IAOH HELD at Bombay on 30 March 1975, having taken note of the fact that the clauses pertaining to the (i) Election of office-bearers and (ii) Composition of the Central Council as contained in the draft of the revised Rules and Bye-laws, having not been approved at the General Body Meeting held at Banglore on 10.2.1974, and further that the Rules Revision Committee entrusted with this task has not been able to finalise these items so far, hereby resolves that :

The election of office bearers for the year 1976 and for future years be held as per the procedures laid down under items 10 and 11 of the old Constitution, and that any difficulties that may arise in interpreting these clauses arising out of errors grammatical and/or otherwise be interpreted as per procedures and conventions prevailing in the past.

It is further reiterated that the office beraers for the Central Council should always be elected on democratic lines i.e. to say, from amongst the members who are going to form the Council for that particular year. This is the spirit and essence of the bye-laws Nos. 10 and 11 under the old Constitution."

Dr. P. K. Ghosh stated that since the above Resolution has not been circulated to the members in advance, it could not be considered at this meeting.

The President explained that as this was a Resolution from the Council arising out of its discussions at a meeting held only two days ago, it evidently could not be circulated in advance. It however, would be in order to discuss the matter. The resolution did not envisage any change in the constitution of the Association but was only a reiteration of the existing laws and was meant for giving guidance to the future council with regard to conduction of election so that unprecedented situation in which we found ourselves today may not be repeated.

Dr. C. K. Ramchandar supporting the resolution explained at length the situation which had necessitated the election of the Office Bearers from the floor this year. He added that members were aware that election procedures as submitted in the revised draft constitution have not been approved by the General Body at Bangalore and that the Rules Revision Committee has not been able to come out with any recommendation on the subject. Some branches had given their opinion that the election of office bearers should be on democratic lines from amongst the new council members and which in fact, is the position today as per the relevant constitutional clauses exist-

ing. If we have to wait for clarifying the position until the next General Body meeting, he was afraid we may find ourselves in the same predicament. Dr. S. V. Bhatt and Dr. L. D'Souza spoke supporting adoption of the resolution. Dr. Ghosh desired that his objection be recorded and demanded a poll which was carried out by show of hands. There were 83 in favour of the resulution and 4 against. The resolution was thereafter declared approved.

The President then placed before the House the following Resolution submitted by Dr. C. K. Ramchandar and seconded by Dr. S. V. Bhatt:

"Notwithstanding anything said, done and recorded, and notwithstanding anything provided for in the laws, bye-laws, established procedures and conventions, and in view of an unprecedented predicament, the election of office bearers having been carried out by the General Body as per recommendation of the Council for 1974 after according its approval to this procedure, the General Body hereby records its opinion that the election of the Office Bearers for 1975 carried out at its meeting held on 30.3.75 at Bombay is final and unchallengeable in any manner. It further records that as the election rules have now been revised the Rules Revision Committee is hereby dissolved.

The resolution was approved unanimously.

NEXT ANNUAL CONFERENCE

The President announced that Delhi Branch has invited the next Annual Conference and the Council has provisionally accepted the invitation subject to approval of the general body meeting. He added that this will be a unique occasion and would give us an opportunity to project our image with the government circles in the capital. Members accepted the invitation wholeheartedly and thanked the Delhi Branch for the same.

Dr. L. G. Doshi, Ahmedabad Branch, stated that his branch was preparing to host the 1976 conference, but in view of the importance of Delhi as a venue for the next Conference, his branch would now like to invite the members for the 1977 conference. Dr. Doshi's invitation was accepted and the President thanked him on behalf of all the members.

The Honorary General Secretary announced that he has just received a communication from 15 doctors in the Thana region proposing to revive the Thana Branch

with effect from this year. This matter would be taken up in the first Council meeting of the 1975 and all assistance will be rendered to these members to form an active branch in that area.

The Hony. Gen. Secretary thanked the Bombay Branch for agreeing to holded the Annual Conference at a very short notice and for their hospitality and Kindness extended to all the members attending the Conference.

Dr. P. K. Biswas
Hony. General Secretary

HONY. GENERAL SECRETARY'S

ANNUAL REPORT

For the Year 1975

1975 has been a year of progress and consolidation for the Association. The Declaration of the Emergency in the country and the subsequent emergence of discipline and hard work in its wake has helped the Association in its pursuit of Scientifi work amongst "people at work". The Social awareness of providing an adequate occupational health service to industries mines, plantations and offices has also contributed to its growth and utility. The Hony. General Secretary takes this opportunity in thanking the Hon. Health Minister, the Hon. Labour Minister. Senior officers of the Ministries of Health and Labour of Govt. of India C.S.I.R., I.C.M.R The Directors and staff of the National Institute of Occupational Health Ahmedabad. All India Institute of Hygiene and Public Health Calcutta, the Central and Regional Labour Institutes, the Labour and Health Departments of the State Governments the I.M.A. and the various voluntary agencies for all the help and assistance rendered to the Association.

XXVI Annual Conference

The 26th Annual Conference and the 23rd Annual Convention of the Bombay Branch was held at oberoi Sheraton Hotel and Matatlal Sabagriha Bombay between 28-31ts March 1975. The Scientific Sessons were well planned and evoked keen interest amongst the speakers and the participitants. The warm hospitality of the Bombay Branch will be remembered by all the members and their families attending the conference.

The Sir Ardeshir Dalal Memorial Lecture "Dust is Dangerous" was delivered by Dr. S. H. Zaidi Director, Industrial Toxicalogy Research Centre, Lucknow. In his erudite lecture Dr. Zaidi traced the role of dusts in causing health hazards and occupational diseases. He described the relation of malnutrition and infection to silicosis and ended his lecture by suggesting ways and means of preventing these diseases.

The authors of the following 2 papers have been judged as the joint recipients of the Bel-Ind-Med Award 1974.

1. "Effects of Exposure to mercuray in Caustic Soda Plants in Maharashtra" by Drs Hariwant Singh and V. P. Gupta.

and

2. "Follow up behaviour of Byssinosis and chronic Bronchitis" by Drs. S. R. Kamat, V. Y. Salpekar, D. D'Sa, H. Singh., A. L. Sadekar and G. R. Kamat.

The work of the Association is incorporated in the work of the following Subcommittees :

Scientific Subcommittee Members elected are :

1. Dr. S. K. Roy Choudhury (Calcutta)
2. S. Chakravorty (Convenor)
3. Dr. R. Mazumder
4. Dr. P. K. Biswas
5. Dr. C. P. Sadarangani (Bombay)
6. Dr. S. K. Mehta (Baroda)
7. Dr. B. Prabhakara Rao (Andhra Pradesh)
8. Dr. P. P. Santanam (Tamil Nadu)
9. Dr. K. V. Subramanyam (Karnatak)

During the year the Scientific Subcommittee met regularly and finalised its report on the Pre-employment Medical Examination.

The Sub-Committee has begun work on "Survey of Periodic Health Examination" which will continue through out the year.

Journal Subcommittee

Members elected are :

Dr. B. B. Chatterjee (Calcutta) *Editor*
Dr. R. Mazumder (Calcutta) *Associate Editor*
Dr. B. Roy (Calcutta) *Journal Secretary*
Dr. B. Bhattacharjee (Calcutta)
Dr. A. L. Mukherjee (Calcutta)
Dr. P. K. Biswas (Calcutta)
Dr. B. B. har (Howrah)
Dr. C. V. Talwalkar (Bombay)
Col S. L. Chadha (Delhi)
Dr. M. P. Prabhakar (Tamil Nadu)

The Journal Committee published 4 issues of the Journal during the year. The Editor has tried to publish the maxiumm number of scientific articles and papers-

received by him within the limited resources available to him. Members from all over India are earnestly requested to secure advertisements for the Journal. So that it may become financially self-sufficient. To facilitate regular receipt of the journalst The Journal Secretary requests all Branch Secretaries to keep him informed of new subscribers and changes in addresses of members.

Association's Policy Subcommittee

Members elected are :

Dr. C. K. Ramchandar (Tamil Nadu) *Convener*
Dr. P. V. Thacker (Bombay)
Dr. J. C. Kothari (Bombay)
Dr. G. Arjundas (Tamil Nadu)
Dr. P. K. Ghosh (Calcutta)
Brig H. M. Gangopadhyay (Asansol)
Dr. S. S. Verma (Delhi)
Mr. K. Narasimha Raju (Andhra Pradesh)
Dr. G. R. Dholakia (Baroda)

Terms of reference of the Sub-Committee are :

(*a*) To implement ILO Recommendations.
(b) To advise Employee's State Insurance Scheme's Policy in respect of Occupational Diseases.
(c) Factories Act possible revision infuture.
(d) Past recommendations of the Association and their follow up.

The Sub-Commit ee is pursuing in advising the Association in attaining the above objectivictes.

XVIII. International Congress on Occupational Health held in Sept '75 at Brighton England

The following members attended the above congress.
Dr. P. V. Thacker (Bombay)
Dr. P. K. Ghosh (Calcutta)
Dr. S. K. Mehta (Baroda)
Dr. R. C. Panjwani (Bombay)
Dr. B. Bhar (Howrah) and
Dr. A. K. Sen (Calcutta)
Dr. P. K. Ghosh and Dr. S. K. Mehta read papers in the conference

Permanent Commission on Occupational Health.

It is a matter of great pride and honour for the Association that its President Dr. P. V. Thacker is the first Indian to be elected on the Permanent Commission on Occupational Health. This election took place during the XVIII International Congress on Occupational Health.

Membership

During the year both Branch and Direct Membership have increased from the previous year.

Branchwise membership position is given below

Branch	No. of Members					Total
	H	L	F	A	I	
Ahmedabad	—	—	31	—	—	31
Andhra Pradesh	—	—	32	2	—	34
Asansol	—	—	28	—	—	28
Assam	—	—	13	—	—	13
Baroda	—	3	24	5	3	35
Bihar Coal Fields	—	—	30	2	—	32
Bombay	1	4	108	16	1	130
Calcutta	—	2	97	2	—	101
Delhi	—	—	63	6	—	69
Howrah	—	—	17	1	—	18
Jamshedpur	—	1	29	10	4	44
Kerala	—	—	10	—	—	10
Karnataka	—	—	93	12	—	105
Pune	—	—	26	—	—	26
Tamil Nadu	—	—	106	17	—	123
Thana-Kolaba	—	—	16	—	—	16
Direct	—	—	18	—	1	19
Total	1	10	731	73	9	824

H - Honorary
L - Life
F - Full
A - Associate.
I - Institutional

Finance

The able work of the Hony. Treasurer is reflected in the Statement of Acco for the current year. All the Branch Secretaries have co-operated by sending ha the Centre's Subscription for the year within 30th June.

Election of Office Bearers for 1976

There was unanimity in the nominations for the posts of the President and Presidents and hence no election was necessary. This angurs well for the smooth ning of the Association.

3rd Eastern Regional Conference

3rd Eastern Regional Conference was held this year at Gauhati on 22-23rd The Assam Branch is to be congratulated on arranging an interesting Scientific cultural programmes.

Activities of the Branches

All the Branches pursued their usual activities in holding lectures. Scie Symposia and clinical meetings. The H. P. Dastur Memorial Medal donated Jamshedpur Branch was awarded to Dr. S. N. Sharma.

Formation of a New Branch

Thana-Kolaba Branch with 16 members was formed in April 1975. We come them amongst our midst and wish them all success for the future.

Central Council Meetings

The 2nd and 3rd Central Council Meetings were held in Madras Ahmedabad respectively. The President and the Hony. Gen. Secretary atte both the meetings and helped to Strengthen the liasion between the Centre and Branches.

The Hony. Gen. Secretary gratefully acknowledges the help and guidance ceived fsom the President Dr. P. V. Thacker the Hony. Treasurer Dr. M. R. the Editor Dr. B. B. Chatterjee the Journal Secretary Dr. B. Roy the Hony. Jt tary Col. S. C. Chadha the Past Hony. Gen. Secretary Dr. A. R. N. Prasad, Council Members and Bsanch Secretaries for the smooth running of the Ass

Colcutta
20th Nov. 1975.

P. K. Bis
Hony. General Secret

INDIAN ASSOCIATION OF OCCUPATIONAL HEALTH

CENTRAL COUNCIL MEMBERS 1976

(To be ratified by The General Body)

edabad
Dr. S. K. Chatterjee
Dr. H. M. Parikh
Dr. L. G. Doshi
(Br. Secy.)

Andhra Pradesh
1. Dr. N. C. Mukherjee
2. Dr. J. R. Bhate
3. Dr. B. Prabhakara Rao
(Br. Secy.)

Asansol *

am
Dr. M. C. Kachari
Dr. J. C. Barua
(Br. Secy.)

Baroda
1. Dr. S. K. Mehta
2 Dr. D. V. Vyas
3. Dr. P. C. Bhatt
(Br. Secy.)

Bihar Coal-fields
1. Dr. P. Prasad
2. Dr. A. S. Mandal
3. Dr. A. N. Shaw
(Br. Secy.)

bay
Dr. M. J Saldhana
Dr. C. V. Talwalkar
Dr. J. C. Kothari
Dr. C. P. Sadarangani
Dr. R. C. Panjwani
Dr. M. R. Bhatt

Calcutta
1. Dr. M. K. Basu
2. Dr. S. Chakraborty
3. Dr. J. C. Nag
4. Dr. B, Roy
5. Dr. N. Pa. Chandhuri
6. Dr. P. K. Biswas

Delhi
1 Dr. B. Bhattacharya
(Br. Secy.)
2. Dr. H. C. Govel
3. Col. S. L. Chadha

Howrab
1. Dr. B. Bhar
2 Dr. S. C. Bej (Br. Secy.)

hedpur
r. P. B. Bharucha
A. R. N. Prasad
C. K. Sengupta

Karnataka
1. Dr. V. Bala Krishna
2. Dr. R. Bhagwan
3. Dr. K. Venkata Rao
4. Dr. Ravi Narayan
5. Dr. K. V. Subramanyam
(Br. Sec.)

Tamil Nadu
1. Dr. C. K. Ramchandar.
2. Dr. M. K. Mani
3 Dr. S. Bhoopathyvijaya-Krishna
4. Dr. K. S. Krishnagopal
5. Dr. P. P. Santanam

Pune *

* COUNCIL MEMBERS NOT RECEIVED

Ex-Officio Members	1. Dr. P. V. Thacker
Immediate 2 Past Presidents	2. Dr. P. B. Bharucha
Editor	To be elected at AGBM
Journal Secretary	To be elected at AGBM

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List of Publications of Dr.N.K.Chakraborty, Scientist 'E', Central Mining Research Station, Dhanbad.

RESEARCH PAPERS :

1. Relative Importance of Different Heat-Stress Indices in the Assessment of Physiological Strain of Work in Indian Mines - Presented at the Physiology Section of the 61st Indian Science Congress Session at Nagpur, 1974.

2. Metabolic Cost of Coal Miners' Work in India - Presented at the Physiology Section of the 61st Indian Science Congress Session at Nagpur, 1974.

3. Pneumoconiosis Problem in Indian Mines - Presented at the IV International Pneumoconiosis Conference, Bucharest, 27 September - 2 October 1971 (

4. Effect of Heat Stress in Repetitive Mining Work - Proc. of the Symp. on 'Health in Relation to Work and Heat Stress in Places of Work' organised by the National Institute of Occupational Health, Ahmedabad, held in January, 1972, p.111.

5. Environmental Stresses and their effects on Miners' Work - Presented at the Seminar on Ergonomics, Organised by the Life Science Centre, Calcutta University in Feb.1972 - Proc. under publication.

6. Physiological study on a coal cutting machine - Presented at the Seminar on Ergonomics, organised by the Life Science Centre, Calcutta University in Feb.1972.

7. Pneumoconiosis Research in India with Special Reference to Mines - Presented at the Seminar on 'Man at Work', organised by the Central Labour Institute, Bombay in April, 1972. Proc.under publication.

8. Comparison of physical working capacity and physiological work load of Indian and Swedish Miners - Presented at the Seminar on 'Man at Work' organised by the Central Labour Institute, Bombay in April 1972. Proc. under publication.

9. Changes in Chemical Constituents of Blood in Comparison to other Physiological Responses in Mining Operations - Ind. Jour. Indust. Med. Decr.1971.

10. Air Pollution Problem in Mining Industry - Proc. Seminar on Pollution and Human Environment, Organised by Bhaba Atomic Research Centre, Bombay, 1970, p.397.

11. Full Shift Dust Exposure in Indian Coal Mines - Ind.Jour.Indust. Med., 16, 113, 1970.

12. Changes of Ventilatory Function amongst Smokers and non-smokers - Ind. Jour. Physiol. and pharmacol. 14, 165, 1970.

13. Hazards of Dust in the Manufacture of Refractories - Ind. Journ. Industr. Med. 17, 74, 1971.

14. Blood Lactic Acid in Comparison to other Common Physiological Responses in Determining the Heaviness of Mining Work - Presented at the Physiology Section of the Indian Science Congress Session in 1971 and accepted for publication by the Ind.Journ. Physiologist and Pharmacologist.

15. Physico-Chemical Properties of Goldmine Dust in Relation to the Nature of Silicosis Caused by Its Inhalation - Ind.Journ. Industr. Med. 15, 815, 1969.

16. Comparison of Some Soda-Lime Preparations for Suitability of Use in Breathing Apparatus - Journ. Mines, Metals & Fuels, 1969, Nov. p.391.

17. Study of Sidero-Silicosis Problem in an Iron Ore Mine - Research Paper No.54, Reference CMRS.H4/54, 1972.

18. Recent Trend of Thinking on Dust Problem in Mines in Relation to the Minerals Involved - Jour. Mines, Metals and Fuels, 16, 299, 1968.

19. Dust Problem under Diverse Occupational Situations - Ind. Jour. Indust. Med. 14, 147, 1968.

20. Environmental Stresses Limiting the Working Efficiency of Indian Miners - 12th Indian Standard Convention, Bhubaneswar, 14-21 Dec., 1968.

21. Industrial Plumbism and Its Control - Ind. Jour. Indust. Med., 14, 1, 1968.

22. Respiratory Function in Indian Miners - Ind. Jour. Industr. Med., 14, 167, 1968.

23. An Integrated Approach to the Assessment of Environment Work Stress in Mining - Ind. Jour. Indust. Med., 13, 118, 1967.

24. Measurement of Residual Volume - Ind. Jour. Physiol. and Allied Sc., 21, 14, 1967.

25. Some Important Problems of Health Associated with Miners'Work - Ind. Journ. Industr. Med., 13, 1, 1967 (P.P.Chowdhury Memorial Lecture).

26. Physiological Comparison of Standard Exercise Tests - Ind. Journ. Physiol. and Allied Sc., 20, 31, 1966.

27. Aerobic Working Capacity of Indian Miners - Proc. Symp. on 'Human Adaptability to Environments and Physical Fitness' - Ed. M.S.Malhotra, Defence Institute of Physiol. and Allied Sc., Madras, 1966, p.107.

28. Pulmonary Function Tests : III. The Effect of Respiratory Frequency on Determination of Maximum Breathing Capacity: Ind. Jour. Physiol. and Allied Sc., 19, 73, 1965.

29. Pulmonary Function Tests:
II. Maximum Breathing Capacity and Its Relation to Timed Expiratory Capacities : Ind. Jour. Physiol. and Allied Sc., 18, 87, 1964.

30. Pulmonary Function Tests:
I. Lung Volumes and Capacities of Indians in Health: Ind. Jour. Physiol. and Allied Sc., 18, 35, 1964.

31. Manganese in Normal and Excessive Intake: Ind. Jour. Indust. Med., 10, 110, 1964.

32. An Industrial Hygiene Survey in a Lead Smelting Factory: Ind. Journ. Industr. Med., 10, 145, 1964.

33. Observations on the Physiological Responses in Mine Rescue Work: Ind. Jour. Indust. Med., 9, 156, 1963.

34. Certain Aspects of Environmental Health Conditions in Indian Mines - A Study : Ind. Jour. Indust. Med., 9, 91, 1963.

35. Atmospheric Pollutions - A Study in Calcutta : Ind. Jour. Med. Res. 50, 295, 1963.

36. A Preliminary Work on Assessment of Dust Hazard in Indian Mines : Ref. H1/2, Central Mining Research Station, Dhanbad, November, 1961.

37. Report of Manganese Poisoning Enquiry Committee : Published by the Ministry of Labour & Employment, Govt. of India, 1960.

38. Atmospheric Pollution - Is it a Health Problem in Calcutta? : Journ. Science Club, 13, 39, 1959.

39. Air Pollution in Calcutta : Proc. of the Second Asian Conf. Occup. Health, November 14,23, 1958, p.114.

40. Air Pollution - The Problem in Industrial Cities : Ind. Jour. Indust. Med., 3, 1, 1957.

41. The Toxicity of Tris (Beta-Chloropropyl) Thio Phosphate - Report of Kettering Laboratory, University of Cincinnati, Ohio, U.S.A., 1957.

42. The Immediate Toxicity of 1, 2, 3 Trichloro - 4, 6 - Dinitrobenzene: Report of the Kettering Laboratory, University of Cincinnati, Ohio, U.S.A., 1955.

43. The Toxicity of Dicapryl Diglycollate and of Several Related Compounds - Report of the Kettering Laboratory, University of Cincinnati, Ohio, U.S.A., 1955.

44. Study of the Occupational Lead Hazards in Select Indian Industries : Ind. Journ. Med., Res. 38, 429, 1950.

45. Study of Occupational Lead Hazard in two Electrical Accumulator Industries : Ind. Med. Gazette, 87, 114, 1952.

46. An Investigation of Occupational Lead Hazard in Indian Workers - Thesis submitted to Calcutta University in 1951 which enabled me to get D.Phil.(Sc.) degree of that University.

47. Hazards of Manganese Ore Dust in Indian Mines - Ind. Mining & Engg. Journ., Sept. Oct., 1959, p.140.

48. Characteristics of Refractory Dusts in Relation to Silicosis Hazards to the Exposed Workers - Proc. V. Asian Conf. Occup. Hlth, Bombay, 1962, p.62.

49. Physiological Limit for Sustained Work of Indian Miners. Proc. V. Asian Conf. Occup. Hlth., Bombay, 1968, p.193.

50. What is to be Measured in Dust for Control of Health Risk? - Second Tech.Conf.on Mining - Ventilation Engineering & Mine Environment, Ind.School of Mines, Dhanbad, 1968.

51. Dust Problem in Coal Washeries - Presented at the Annual Conference of the Indian Association of Occup.Health, 1972.

52. Physiological Cost of Some Ancillary Work in Connection with the Safety Measures in Coal Mining - Presented at the Annual Session of Ind. Assoc. Occup. Hlth., held at Hyderabad, 1973.

53. Dust as Air Pollution Problem in Mines & Washeries - Presented at the Annual Session of Ind. Assocn. Occup. Hlth., held at Hyderabad, 1973.

REVIEW PAPERS AND ARTICLES :

1. Thermal Pollution and its Impact on Nature and Man - Republic Day Special Issue, 1973, New Sketch, Dhanbad.

2. Review of Air Pollution Control Measures in India - Report on the Regional Seminar on Air Pollution Control held at Nagpur 4-16 December, 1972 - WHO Project SEARC, 0150, 1973.

3. Environment and Health - Republic Day Special Issue, 26th January, 1974, The New Sketch, Dhanbad.

4. Research on Safety in Mines in India - Safety in Mines, Souvenir, Singareni Collliery Company Ltd., p.44.1973

5. Sir Ardeshir Dalal Memorial Lecture - 'Industrial Dust - Its Properties and Measurement for Control of Health Risk' - Ind. Jour. Indust. Med. 16, 41, 1970.

6. Evaluation of Inhalation Hazard from Assessment of Environmental Dust: Ind. Jour. Occupl. Health, 11, 139, 1968.

7. Man in Relation to the Environment, He Lives in Or Creates by His Activity: Bihar Factory Inspection Service Assoc., Jour., January-June 1,& 2, 1968, p.8.

8. Pneumoconiosis Problem in Indian Mines; Mines Safety News 3, 7, 1967.

9. Consideration of Human Factors in Industrial Planning: Coal & Steel, 6, 13, 1967.

10. Breathing Apparatus in Mine Rescue Work and Fire Service: Jour. Mines, Metals & Fuels, 14, 362, 1966.

11. Pneumoconiosis as an Occupational Health Problem: Souvenir, All India Med. Conf. 42nd Session, Dhanbad, 1966, p.71.

12. Certain Important Factors in the Consideration of Industrial Health and Efficiency: Pat. J. Med. 40, 395, 1966.

13. Work Physiology - Its Application in Industry for Increased Efficiency, Ind. Jour. Indust. Med. 11, 135, 1965.

14. Industrial Dust and Its Assessment: Jour. Mines, Metals and Fuels, 12, 267, 1965.

15. Health Hazards in Mining Industry: Metal and Minerals Review, 4, 35, 1965.

16. Special Health Problems in the Mining Industry : Jour. Mines, Metals & Fuels, 12, 105, 1964.

17. Industrial Toxicology and Its Recent Trend : Ind. Journ. Indust. Med., 10, 1, 1964.

18. Health Hazards in Mines: Coal & Steel, 3, Novr.1, 1963.

19. Plan to Reduce Mining Health Hazard Needed: Indian Manufacturer, 2, 12, 1961.

20. Dust Problem in Coal Mines: Jour. Mines, Metals & Fuels, 9,1,1961.

21. A Mathematical Model for Measuring Mass/Number Index of Respirable Air-Borne Coal Dust: Jour.Mines, Metals & Fuels, July 1970, p.359.

22. Dimension of a Gravimetric Coal Dust Collecting Sampler: Jour. Mines, Metals & Fuels., May, 1971, p.143.

23. Problem of Fatigue in Mining Industry: The New Sketch, 26th January, 1971, Special Number.

24. Dangers from Dust in Mines: The New Sketch, CSIR Jubilee Supplement, Aug.1968, p.23.

25. Environmental Stress and Mining Work: The Coalfield Times, CSIR Silver Jubilee Supplement, Aug. 1968, p.9.

26. Refractory Dusts and Silicosis Hazards, Swasth Hind, 13, 198, 1969.

CENTRAL LABOUR INSTITUTE
SION, BOMBAY - 22.

LIST OF RESEARCH REPORTS PUBLISHED

1. Investigation on the incidence of occupational diseases in the manufacture of dichromate and in the mining and concentrating of chromite (1953).
2. Environmental and Medical studies in the storage battery industry (1955).
3. Silicosis in Mica Mining in Bihar (1953)
4. Health hazards in Mica Processing (1954)
5. Vital Capacity of the lungs of silica and fire-clay brick workers in Bihar with special reference to dust exposure, exercise tolerance test and incidence of silicosis (1954).
6. Cardiac response to effort of silica and fire-clay brick workers in Bihar. Results of exercise tolerance test with special reference to vital capacity measurement and incidence of silicosis (1954).
7. Preliminary study on thermal environmental conditions in two typical cotton weaving sheds in a textile mill in Delhi (1954).
8. Silicosis amongst supervisory staff in Mica mining in Bihar (1955).
9. Accidental deaths from insecticidal fumigant mixture of ethylene dichloride and carbon tetrachloride 3 ; 1 (1955).
10. Silicosis in metal grinding (scissors and razor grinders in Meerut),(1955)
11. Silicosis in the pottery and ceramic industry(1956).
12. Silicosis amongst hand drillers in mica mining in Bihar, (1956)
13. Vital capacity of the lungs of workers in ceramics and potteries industry (1956)
14. Cardiac response to efforts of workers in ceramics (1956).
15. Silicosis in the female (1956).
16. Report on thermal stress in textile industry, 1957.
17. Survey of carbon disulphide, hydrogen sulphide and sulphur dioxide hazards in the Viscose Rayon Industry in India, 1959.
18. Health hazards during D.D.T. manufacture(1959).
19. Pneumoconiosis in the Coal Mines in Jharia and Raniganj Coal Fields,(1961)
20. Silicosis Hazards in a Lead and Zinc Mine in Rajasthan,(1961)
21. An Industrial Hygiene study in a Ferro Manganese Plant, 1962.
22. Body Measurement of Male Workers in Textile Mills in Bombay; by Dr. A.K. Sen Gupta and Dr. R.V. Sen, 1964.
23. Heart Rate Response in wearing of variety of Industrial Protective face masks - by Dr. S.K. Chatterjee, 1964.

24. Assessment of Workload and Thermal Stress on relation to Physiological Responses of Workers in a cotton textile mill in Bombay - by Dr. R. N. Sen, Dr. S. K. Chatterjee, P.N. Saha and A. Subramanian,(1964.)

25. Assessment of Workload and Thermal Stress in relation to Physiological Responses of Workers in a Soap Factory in Bombay - by Dr. R. N. Sen, Shri P. N. Saha and Shri A. Subramanian (1964).

26. Muscular Fatigue during transport of Load in the Horizontal Plane - by Dr. M.M. Gupta and Privatedozent Dr. Ing. W. Rohmert (1964).

27. Rationalisation of Work Period and Rest Pause in a Steel Rolling Mill in Bombay - by Dr. R. N. Sen, Dr. S. K. Chatterjee, Shri P.N. Saha & Dr. J.C. Fletcher.

28. Studies of Attitude and Morale in three units of large chemical process undertaking - by Dr. D.H. Jones, Dr. T. Ganguly & Dr. C.S. Sequerra (1964).

29. Study on the Attitudes of Officers towards changes in Management Practices in a Textile Factory - by Dr. M.C. Maule & Dr. T. Ganguly (1964)

30. Medical and Environmental study in a plant manufacturing D.D.T. (1965).

31. Investigation of Occupational Hearing Impairment and Noise in a Nitric Acid Plant, (1965).

32. A study on Management Morale in a private industrial undertaking - by Dr. M.C. Maule & Dr. T. Ganguly (1965)

33. A Study of Road Accidents in B.E.S.T. undertaking - by Dr. T. N. Ganguly and Shri R. C. Kasbekar.

34. Visual Performance of Workers in Textile and Engineering Trades - by Dr. M.M. Gupta and Dr. Harwant Singh (1966).

35. A study on Attitude and Morale. Its impact on Personnel Relation and Recruitment in an Engineering undertaking - by Dr. T.N. Ganguly (1967).

36. A study on Attitude and Morale of Employees at Dalmia Cement (Bharat) Ltd. Trichy - by Dr. T.N. Ganguly & R.C. Kasbekar (1968).

37. Body Measurements of Indian Workers in relation to sitting arrangement Part I - Study in a Radio Manufacturing Factory in Bombay - by Shri P.N. Saha (1968).

38. Body Measurement of Indian Workers in Relation to Sitting Arrangement : Part II- Study in a Pharmaceutical Factory in Bombay - by Shri P.N. Saha (1968)

39. Study of Parathion Exposure in Formulation Process - by Dr. S.K. Chatterjee and R. A. Ballare, (1968).

40. Report on cases of Dermatitis of Industrial Workers by Dr. S.K. Chatterjee and Dr. B.B. Merchant, (1968).

41. Ocular Effects and Visual Performance in Welders by Dr. M.M. Gupta and Dr. Harwant Singh, (1968).

42. A comparative Study of Attitude and Morale of the employees in 3 Divisions of a large Industrial Complex - by Dr. T. N. Ganguly, R.C. Kasbekar and S. K. Diwakar (1969).

45. Studies on Absence from Work - by Dr. C.N. Ganguly, J.B. Bartlett & B. C. Kasbekar (1970).

44. Physiological Evaluation of the jobs of Doorman of the Cokeoven Battery of a Steel Plant - by Shri P.N. Saha (1972).

45. Thermal Stress in Textile Mills in Vidharbha - by P. N. Saha & Dr. S.K. Das.

46. A Study of Personal Factors contributing to the causation of Road Accidents in Tamil Nadu State Transport - by Dr. C.N. Ganguly & S. K. Bhattacharya, (1972).

47. Assessment of Health Status of Foundry Workers - by Dr. S. Bhar, P.N. Saha, Dr. S. K. Das & S. K. Dangwal (1972).

48. Report on the investigation of study on Dermatitis in an Engineering Industry - by Dr. Harwant Singh & Dr. S. Bhar.

49. A Study of Management Moral in an Iron & Steel Industry - by C.N. Ganguly & B. C. Kasbekar.

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STANDARD NOTE ON INDUSTRIAL MEDICINE DIVISION

(as on 1st January, 1974)

1. FUNCTIONS

1.1. The main functions of this Division are:

i) to carry out research, surveys and studies on health hazards and occupational diseases;

ii) to promote awareness of occupational hazards and measures to combat them;

iii) to render technical advice regarding occupational health aspects to industry, mines, plantations and Docks;

iv) to provide training facilities for Medical Inspectors of Factories and others;

v) to assist the Chief Inspectors of Factories on Industrial Health problems.

1.2. These involve occupational history taking, clinical examination, X-ray and bio-chemical examinations, wherever necessary, of workers exposed to various toxic and other occupational hazards.

2. FACILITIES

2.1. The laboratory is well equiped with special equipments for conducting studies on

(1) Noise problem
(ii) Visual acuity
(iii) Pulmonary functions
(iv) Neuromuscular reactions.

3. STUDIES & SURVEYS

3.1. Studies and Surveys carried out during 1973.

1) A survey on Health Hazards of Mercury was carried out at M/s. Century Chemicals, Kalyan.

2) A study on Health Hazards of pesticides was carried out at M/s Khandesh pesticides Ltd., Dharangaon.

3) A study on health Hazards of pesticides was carried out at M/s SANDOZ Ltd., Thana.

4) A survey on the suspected health Hazards in the sewage treatment plant at the Air-India Building, Nariman Point was carried out. Necessary recommendations were made to the management.

4. TRAINING

4.1. The following groups/individuals received training on various aspects of occupational health during 1973.

1) Dr. U.Sit Than Oo. Medical Inspector of Factories, Burma, on occupational Health, Health Hazards and Factory Inspection.

2) A group of 4 Trainees from Iran for 3 days in Occupational Health Hazards.

3) About 100 under graduate medical students in 3 batches from the G.S. Medical College, Bombay, on Occupational Health.

4) Sixth Refresher Course on Occupational Health organized by this Division for medical officers concerned with Occupational Health.

5) Seventh Refresher Course on Occupational Health Organised by this Division for the medical officers concerned with Occupational Health.

6) A total of 6 probationers from the Tata Administrative Services in batches of two at a time, on Occupational Health.

7) A group of 8 Safety Inspectors attending a certificate course in Safety of the Cochin University.

8) Training in Industrial Medicine to 7 post-graduate medical officers from the Armed Forces Medical College, Poona (D.I.H. course) for one week.

9) Mr. Samraveera, Inspector of Factories, Ceylon, a trainee sponsored by I.L.O. was given a short training in Occupational Health.

4.2. The following lectures/talks were delivered during the year 1973 by the officers of this Division.

1) "Noise-its effects on man" to a group of middle management personnel attending a course in Industrial Ergonomics organized by this Institute.
2) "Health Hazards" to a group of middle management personnel attending a course in Industrial Safety organized by this Institute.
3) Lectures on the following subjects were delivered by the officers of this Division during the 6th Refresher Course on Occupational Health conducted by this Division.
   i) 1) Poisoning by Phosphorus and its compounds
   ii) Noise-its effects on man
   iii) Pneumoconiosis and occupational Lung diseases
   iv) Asbestosis
4) The following lectures were delivered by officers of this Division during the training course for factory inspectors.
   i) Occupational Diseases.
   ii) Activities of the Industrial Medicine Division
   iii) Noxious Gases
   iv) Noise Control, practical evaluation.
5) Health Hazards of "Copper," "Mercury," "Arsenic" and "Lead Compounds" and "Emergency measures and first aid in controlling poisoning by pesticides" to a group of manufacturers of pesticides and others attending a course on "Health Hazards of pesticides and their control."
6) "Effect of Noise on Man" to the participants of the course on Industrial Fatigue and Rest Allowances.
7) "Occupational Health" to the participants of the Course on Modern Aids to Managements.
8) "Industrial Injuries and Compensation" to the trainees of the Degree Course on Physiotherapy at the All India Institute of Physical Medicine and Rehabilitation, Bombay.

9) "Hearing Conservation Programme and Audiometry" to the participants of the Course on Industrial Noise.

10) "Health Hazards" to a group of senior management personnel of Small Scale Industry attending a Course on Industrial Safety.

11) Lectures on the following subjects were delivered by the officers of this Division during the 7th Refresher Courses on Occupational Health Conducted by this Division.

i) Pneumoconiosis and Occupational lung diseases
ii) Workmen's Compensation Act
iii) Poisoning by Mercury
iv) History of Occupational Health
v) Hazards of Lead.

12) The following lectures were delivered by officers of this Division during the IIIrd Training Programme on Hazards in Chemical Industry for Factory Inspectors :

i) Dust Hazards
ii) Occupational Lung Diseases
iii) Occupational Dermatitis.

4.3. Officers of this Division participated in the following Seminars and presented papers in some.

i) Seminars on "Physical Medicine and Rehabilitation" at New Delhi. Paper on 'Evaluation of Industrial Injuries'.
ii) Conferance of the Association of Physicians of India at Udaipur. Paper on 'Asbestos and its Health Hazards'.
iii) All India Conferance of Indian Association of Occupational Health at Hyderabad. Papers on 'Investigation of Dermatitis in an Engineering Industry' and on 'Environmental Noise in a power Plant'.
iv) Seminar on Air Pollution Control Techniques.
v) Medical Symposium on Oceanography sponsored by the Indian Navy.

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UNIVERSITY OF POONA

Ordinances & Regulations for the Diploma in Industrial Health (D.I.H.)

O.33A.1

No candidate shall be admitted to the course for the Diploma in Industrial Health (D.I.H.) unless he :

(i) has passed the M.B.B.S. degree examination of this University or an examination of any other staturoty University revognised by this University as equivalent thereto.

(ii) has completed such period of postexamination, pre-degree compulsory housemanship or internship which entitles him to the award of the Degree of Bachelor of Medicine and Bachelor of Surgery as required by and to the satisfaction of this University, where applicable.

(iii) has taken the said degree and

(iv) has acquired registration as a medical practitioner according to the rules in force for full registration under the Maharashtra State Medical Council or any other Medical Council und the Indian Medical Council Act prior to registration with this University for the said Diploma course.

O.33A.2.

A candidate admitted to the said Diploma shall

(i) comple a course of study as prescribed for the Diplom for a period of not less than four academic terms after registration for the course with the University of Poona under a recognis teacher. Two of the above four terms shall be spent in a recogni resident or full-time post in Industrial Health or Public Health or Preventive and Social Medicine or equivalent, in a recognised institution. However, if a candidate has already held a residenc post or equivalent as stated above in a recognised institution for a period of one year, he or she may be permitted to register for the said Diploma, granting exemption of two academic terms and be permitted to appear for the examination for the Diploma on satisfactorily completing the prescribed course for the Diploma fo not less than two academic terms, and

(ii) complete a course in General Medicine for a period of not less than 3 months under a recognised teacher at a recognised institution concurrently or after completion of the prescribed course for the Diploma. This however, does not apply, to a candid who has done a resident post in General Medicine for a period of not less than three months each prior to registration in a recogn sed institution under a recognised teacher.

.... 2/-

R.33A.1

The syllabus for the Diploma shall be as under :-

I. Introduction

1. Course objectives
2. History of Public health and industrial health
3. Role of preventive medicine with special reference to occupational health.

II. Biostatistics

1. The role of statistics in preventive medicine
2. Collection and presentation of data - tables and diagrams
3. Average - mean, median, mode, geometric mean
4. Variability - range, mean deviation, standard deviation, coefficient of variation, etc.
5. Theories of probability.
6. Binomial, poison, normal and other distributions
7. Simple tests of significance regarding means and proportions - standard error of mean, standard error of proportion, standard error of difference between two means, standard errors of difference between two proportions, t-tests, χ^2 test, etc.
8. Correlation and regression equation - corelation coefficient.
9. Sampling methods
10. Principles and methods of clinical trials, and prospective and retrospective studies.
11. Population census and demography
12. Vital statistics - measures of fertility, birth rate, fertility rates, gross and net reproduction rates, etc.
13. Vital statistics - measures of mortality, death rates, infant mortality rates, standardised and specific death rates, life tables, occupational mortality rates, etc.
14. Health statistics - morbidity statistics, statistics of maternal and child health, reporting, interpretation, etc
15. Interpretation of numerical data and statistical fallacies.

III Nutrition

1. Principles of dietary requirements and planning of balanced diet.
2. Chemistry of food
3. Physiology of food
4. Nutritive value of foods and processing of food
5. Ration scales - principles and planning.
6. Food preservation - refrigeration, dehydration, canning, pasteurization, etc.
7. Food inspection, food laboratory, legal procedures.
8. Malnutrition and undernutrition
9. Nutrition and diet surveys.

..... 3/-

IV. Public Health Administration.

1. Principles of public health administration
2. Organization of health services in India - central, state and municipal (including two weeks attachment to the office of Medical Officer of Health, Poona Municipal Corporation, Poona, and office of the Director of Public Health, Government of Maharashtra, Poona).
3. Health aspects of the five-year-plans
4. Community development programmes
5. International health organizations
6. Hospital administration (and visit to a hospital)
7. Port and aerodrome health administration
8. Health organization in the armed forces
9. Public health and sanitary laws, social security, etc.

V. Public Health Chemistry

1. Chemical analysis of water
2. Detection and estimation of poisonous metals in water
3. Chemical analysis of trade effluents and sewage
4. Food adulteration, preservatives and colours
5. Industrial laboratory techniques including the environmental and "threshold level" studies.

VI. Health Education

1. Objectives, principles and scope of health education
2. The learning process - incentives to learning
3. Methods and media
4. Evaluation, testing and analysis of the results
5. Education of special groups
6. Field work and public speaking.

VII. Maternal and Child Welfare

1. Care of the mother
2. Care of the infant
3. Care of the toddler
4. Care of the child in general
5. Care of the school child
6. Family planning.
7. Field work and visits to the clinics and institutions.

VIII. Sociology, Social Anthropology, Human Ecology and Basic psychology.

IX. Genetics

1. Principles of genetics
2. Heredity in relation to health and disease.

X. Epidemiology

1. Definition and scope
2. Principles and uses of epidemiology
3. Host, agent and environmental factors in health and disease
4. Statistical methods in epidemiology.

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XI. Communicable Diseases

1. Epidemiology, control and prevention of common communicable diseases - air-borne, fat ailmentary tract infections, contact diseases, arthopod-borne diseases, zonotic infections, etc.
2. Disinfection and disinfestation
3. Clinical work in infectious diseases.

XII. Non-communicable Diseases

1. Epidemiology, control and precention of accidents
2. Ischaemic and hypertensive heart diseases
3. Hypertension
4. Cancer
5. Mental health
6. Peptic ulcer
7. Diabetes mellitus
8. Obesity.

XIII. Microbiology and Immunology

1. Principles and general considerations of bacteriology, mycology, virology, protozoology, entomology, helminthology, etc.
2. Principles and general considerations of serology and immunology.
3. Occupational infections - brucellosis, anthrax, tetanus, etc.

XIV. Environmental Sanitation

1. Water supplies
2. Disposal of waste products including industrial wastes
3. Housing including town planning with special reference to industrial towns.
4. Rural planning.
5. Slum clearance
6. Air pollution
7. Ventilation, noise, lighting etc.
8. Field work and visits for study of sanitation.

XV. Applied Physiology

1. Physiology of thermal regulation
2. Comfort zones and thermal comfort standards
3. Physical environments in relation to health and disease of worker, e.g., temperature, humidity, air velocity and other climatic factors.
4. Physiological principles of air-conditioning.
5. Ventilation and effects of dust control.
6. Lighting and illumination, noise and vibrations, and high and low pressures.
7. Ionizing radiations and their effects and measurements.
8. Principles of equipments design (ergonomics)

XVI. Visit to Primary Health Centre.

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XVII. Industrial Psychology

1. Selection of personnel.
2. Intelligence, and aptitude tests
3. Rest intervals, hours of work, boredom and discomfort in relation to industrial fatigue.
4. Human and interpersonnel relationship.
5. Job analysis and placement of the workers.
6. Time and motion study.
7. Vocational guidance.
8. Load carriage, muscular work, fatigue and ergometry.

XVIII. Industrial Hygiene

1. Hygiene of work environments
2. Toxic vapours, fumes, mists and dusts
3. Disposal of industrial and radioactive wastes
4. Air sampling and measurement of noise, dusts, lighting, etc.

XIX. Industrial Hazards

1. Physical, chemical, biological and psychological hazards
2. Toxic agents in industry, their modes of entry and toxic effects (physiological and pathological)
3. Industrial toxicology
4. Hazards of dust, noise, and radiations in industry.
5. Industrial accidents and safety
6. Personal protective measures.
7. Control and prevention of the industrial hazards.

XX. Occupational Diseases and Industrial Medicine

1. Common occupational diseases - etiology, symptomatology, pathology, diagnosis, treatment and prevention.
2. Incidence of occupational diseases in India and in the world.
3. Miner's health problems.
4. Industrial hospitals - surgical and medical emergencies.

XXI. Industrial Law

1. Industrial legislation and labour relations
2. The industrialist, the state and the worker
3. Labour unions and labour welfare.
4. History of industrial laws in India and abroad
5. Factory and mine inspection system.
6. Social security and employee's state insurance scheme.
7. Creche and other welfare activities.

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XXII. Industrial Health Services

1. Planning and organization of industrial health services.
2. Functions of such service in relation to management, workers and the state.
3. Role of industrial physician, industrial nurse, industrial psychologist, industrial safety engineer industrial hygienist, and other personnel.
4. Industrial Health surveys.
5. Health education in industry.
6. Nutrition of workers, dietary deficiencies, organisation of canteen and mid-day lunch.
7. Maintenance of health and sickness records.
8. Occupational mortality and morbidity rates
9. Measurement of health of workers
10. Absenteeism in industry.
11. Principles of disablement and rehabilitation, and services.
12. Implementation of national health programmes in industries, including family planning.
13. Routing and periodic medical examination of workers.
14. Research - basic and applied in industrial health.

XXIII. Clinics.

1. Traumatic surgery and orthopaedics
2. Chest diseases
3. Ophthalmology
4. Dermatology.
5. Ear, nose and throat conditions
6. Radiology
7. Communicable diseases.
8. Dentistry.

XXIV. Attachment to mine

1. Work environments in mines
2. Health hazards and the preventive measures taken in mines.
3. Organization of occupation health services for the miners.
4. Industrial hygiene services in the mines
5. Welfare services for the miners.
6. Laws and legislative measures pertaining to health of miners.
7. Research activities of the Mining Board.

contd -)

XXV. Visits to ~~Exp~~ the Industrial and other Health Establishments and Institutions.

1. Central Labour Institute.
2. Light and heavy engineering, chemical factory, glass factory, food canning and processing factory.

XXVI. Visit to Employee's State Insurance Scheme Office.

XXVII. General Medicine as related to Industrial Health.

R. 33 A.2.

The scheme of the examination shall be as follows :-

The examination consist of three papers of 100 marks each, and a clinical practical and oral examination carrying 200 marks.

Part A.

Industrial Health Paper I — 3 hours — 100 marks

a. Biostatistics and nutrition
b. Public health administration
c. Industrial Law, Social security and labour relations
d. Occupational health services
e. Environmental sanitation and industrial hygiene
f. Industrial psychology
g. International health and labour organizations

Industrial Health Paper II — 3 hours — 100 marks.

a. Social sciences
b. Epidemiology and control of communicable and non-communicable diseases,
c. Industrial toxicology
d. Applied physiology
e. Public Health chemistry
f. Health education.

Industrial Health Paper III — 3 hours — 100 marks.

a. Industrial health hazards
b. Occupational diseases
c. Practice of industrial medicine
f. Safety in industry
e. Genetics

Part B

i. Clinical and Field Work — Marks 100
   a. clinical examination
   b. day-book and field inspection examination

ii. Oral and practicals - an oral and practical examination. — Marks 100

O.33A.3.

No candidate shall be allowed to appear for the said Diploma examination unless he produces certificates of satisfactory attendance and study of subjects prescribed for the course for the required period.

O.33A.4

A candidate who has satisfactorily completed terms for M.D. branch V (Preventive and Social Medicine) may be allowed to appear for the examination for the Diploma in Industrial Health without keeping fresh terms.

O.33A.5.

A candidate who has once satisfactorily kept terms for the said Diploma course and has either failed at the examination or did not appear therein, need not keep fresh terms again for appearing or reappearing at the examination.

O.33A.6.

A candidate who has passed D.P.H. examination of Poona University or any other equivalent examination of another Universi recognised by the Poona University may be given exemption of one academic term of Industrial Health Diploma course (which is commo with Diploma in Public Health course).

O.33A.7.

Notwithstanding anything contained in the foregoing, a candidate who has practised in the speciality for a period of not less than seven years previously may be permitted as a special case by the Academic Council on the recommendation of the Faculty of Medicine to appear for the said Diploma examination without keeping the necessary terms. Such a candidate shall appear for the whole examination.

R.33A.3.

To pass the examination a candidate shall obtain a minimum of 50% marks in each of the following heads separately and simultaneously.

1. Theory
2. Clinical and field work.
3. Oral and practical.

R.33A.4.

Those of the successful candidates obtaining 75% marks separately in part A (Theory) and part B (clinical, field work, oral and practical taken together), shall be declared to have passed the examination with distinction, provided that the candidates pass at the first attempt.

MHS/- -x-x-x-x-x-x-x-x-

INDIA

In India postgraduate training in public health is available at 8 institutions. Five institutions are departments of medical colleges and are academically attached to the respective universities. One of these—the Department of Preventive Medicine of the Armed Forces Medical College, Poona—falls within the authority of the Ministry of Defence of the Government of India; its chief administrative officer is the Commandant, Armed Forces Medical College, Poona. The other 3 institutions function under the jurisdiction of, and are financed by, the Central Government. The medical colleges are directed by a Principal or a Dean, and the departments of social and/or preventive medicine by a Professor, who is Head of the department. The departments are concerned with both undergraduate and postgraduate training in public health.

The All India Institute of Hygiene and Public Health in Calcutta is a constituent college of the University of Calcutta. The Institute is self-governing and is financed by the Central Government. At present it has 10 sections that impart training in public health to physicians and other health personnel. In addition, the Institute conducts pure and applied research in public health and evolves methods of utilizing the findings of research in public health practice. It is also one of the 3 Central Family Planning Institutes and serves the country's Eastern Region. At the head of the Institute is a Director.

The Calcutta School of Tropical Medicine (one of the colleges affiliated to the University of Calcutta) provides postgraduate training in tropical medicine and hygiene and assists and advises medical practitioners, institutions, and governmental and other organizations in dealing with various problems related to tropical diseases. The School is headed by a Director.

The National Institute of Health Administration and Education, New Delhi, is academically attached to the University of Delhi and operates under its jurisdiction. The Institute is financed by the Ministry of Health of the Government of India. At the head of the Institute is a Director.

Courses offered

The following courses are organized:

(1) Diploma in Public Health (D.P.H.); the course is offered at all the institutions, with the exception of the Calcutta School of Tropical Medicine and the National Institute of Health Administration and Education, and is of 10-12 months' duration.

(2) Doctor of Medicine in Community Health; the course is offered at the National Institute of Health Administration and Education at New Delhi and lasts for 2 years.

(3) Doctor of Medicine (Preventive and Social Medicine), offered at the Armed Forces Medical College, Poona.[1]

(4) Doctor of Philosophy (Public Health) (Ph.D.), offered at the Armed Forces Medical College, Poona.

(5) Doctor of Science (Public Health); this degree, conferred by Calcutta University, is awarded to holders of the D.P.H. subsequent to their obtaining a bachelor's or licentiate's degree in medicine and surgery (M.B., B.S. or L.M.S.) and after at least 2 years of regular training in a recognized institution in some special public health project previously approved by the Faculty of Medicine, or at least 3 years' work in any other approved laboratory in some special public health subject previously approved by the same Faculty.

(6) Diploma in Tropical Medicine and Hygiene; the course lasts for 9 months.

(7) Diploma in Clinical Pathology; the course lasts for 12 months.

(8) Diploma in Laboratory Techniques; the course lasts for 12 months.

(9) Licentiate in Tropical Medicine and Public Health; the course lasts for 9 months.

(Courses (6)-(9) are offered at the Calcutta School of Tropical Medicine.)

(10) Diploma in Industrial Health; the course lasts for 10 months and is offered at the Armed Forces Medical College, Poona, and at the All India Institute of Hygiene and Public Health, Calcutta.

(11) Diploma in Maternity Health and Child Welfare; the course lasts for 10 months.

(12) Diploma in Health Education; the course lasts for 12 months.

(13) Diploma in Dietetics; the course lasts for 10 months.

(14) Diploma in Nutrition; the course lasts for 10 months.

(15) Diploma in Health Statistics; the course lasts for 12 months.

(16) Licentiate in Public Health; the course lasts for 10 months.

(17) Master of Engineering (Public Health), requiring 2 years of training (including 1 year of theoretical and practical instruction plus 1 year of supervised practice).

(18) Master of Veterinary Public Health; requiring 2 years of training (1 year of theoretical and practical instruction at the All India Institute of Hygiene and Public Health, and 1 year at the Indian Veterinary Research Institute).

(19) Certificate in Public Health Nursing; the course lasts for 10 months.

(20) Certificate for Health Nursing Supervision; the course lasts for 3 months.

(21) Course for District Family Planning Officers; the course lasts for 4 weeks.

(Courses (11)-(21) are offered at the All India Institute of Hygiene and Public Health, Calcutta.)

[1] The course leading to the degree of Doctor of Preventive and Social Medicine is also offered at the Topiwala National Medical College, Bombay, and at the S.M.S. Medical College, Jaipur.

(22) Certificate Staff College course for assistant and deputy directors of health services, officers in charge of defence health services, etc. The course, organized by the National Institute of Health Administration and Education, New Delhi, lasts for 8-10 weeks.

The academic year begins in June-July and ends in April-May.

The following paragraphs relate particularly to the courses leading to the Diploma in Public Health and to the degree of Doctor of Medicine in Community Health.

Conditions of admission

There is no age limit for admission to the D.P.H. course but applicants should preferably be below 40 years. Admission is open to medical graduates from a recognized Indian institution, or to holders of equivalent qualifications, who have completed at least 1 year (but generally 2 years) of practical work in the field of public health or general medicine. There is no entrance or medical examination. Candidates are selected on the basis of merit, preference being given to those sponsored by the Government, local authorities, etc. In some instances the students enrolled are health authority personnel who have been required by their employers to take the D.P.H. course. Civilian candidates seeking admission to the course offered at the Armed Forces Medical College, Poona, should apply to the Commandant of the College, through the Registrar, University of Poona. At a number of schools the facilities available would allow for a greater intake of students.

The admission requirements for the course leading to the Doctor of Medicine in Community Health are the same, except that candidates are required to have performed 4 years of field work (or 2 years if they already hold a postgraduate diploma) after obtaining the basic medical degree.

Tuition fees are charged; for the academic year 1970-1971 they amounted to 405 rupees for the D.P.H. course and 370 rupees for the M.D. in Community Health course. Foreigners are eligible for enrolment.

Curriculum

The following is an outline of subjects studied in the course leading to the *Diploma in Public Health:* health organization and related subjects (viz., public health administration, public health law, principles of public health, sociology, social anthropology, psychology, family planning, health education, economics, international port administration, municipal corporations, and primary health centres); statistics (viz., biostatistics, biometry including statistics, vital statistics, and statistical methods); epidemiology (including human ecology, communicable diseases, infectious diseases hospitals, tuberculosis control, and venereal diseases control); environmental health (viz., environmental sanitation, industrial hygiene, occupational health, sanitary engineering, physiological hygiene, and applied physiology); and microbiology (viz., entomology, bacteriology, protozoology, helminthology, public health chemistry, parasitology, virology, and serology). Also: nutrition; genetics; problems of disablement, etc.

The curriculum of studies leading to the degree of *Doctor of Medicine in Community Health* is as follows: health organization and related subjects (including health administration principles and practice, medical care, public administration, hospital administration, and research in administration); statistics; and epidemiology. Also: health education; health economics; and social sciences.

The subjects studied in the course leading to the *Diploma in Tropical Medicine and Hygiene* include tropical medicine and hygiene, tropical pathology and bacteriology, and medical parasitology and entomology.

Instruction is theoretical and practical and includes, in addition, clinical training, 1 month's experience in rural public health practice, an industrial tour, and field visits.

Most of the teaching institutions have their own rural health centres; some, such as the All India Institute of Hygiene and Public Health, have an urban health centre for the students' field training. The National Institute of Health Administration and Education in New Delhi utilizes a whole district with its complex of community health services in an adjoining State, health service facilities in the metropolis of Delhi, and the rural health training centres of local medical colleges for the practical training of the students.

Examinations

There is an examination at the end of the course conducted by a Board of Examiners, whose members include external examiners. (In Calcutta the examination is conducted by the University of Calcutta.) The examination consists of written and oral tests, and field and practical work in class, and covers 4 groups of subjects. The written test lasts 3 hours for each group of subject. In order to pass, the candidate must obtain a mark of at least 50% for each group (two-fifths in the written test, two-fifths in the oral, and one-fifth in the field and practical work).

Candidates who fail to pass in any one of the 4 groups may be re-examined in that group on payment of the prescribed fee. If they fail in more than one group they are obliged to take all the written papers again at the subsequent examination.

Qualification

The candidate who has completed the course of study and passed all the requisite examinations is awarded the Diploma in Public Health, the Doctor of Medicine in Community Health, or the Diploma in Tropical Medicine and Hygiene, as the case may be.

In India possession of the Diploma in Public Health or the degree of Doctor of Medicine in Community Health is essential for all senior posts in the public health services, for research and consultative appointments, for specialists in public health in the Armed Forces and the Indian Railways, and for teaching posts in social and/or preventive medicine above the rank of Assistant Professor.

Name and address	*Year public health course started*	*Academic year 1970-1971*		
		No. of teaching staff	*No. of students in all courses*	*No. of students in public health course*
ANDHRA Department of Postgraduate Public Health (D.P.H. Course) Osmania Medical College Osmania University HYDERABAD	1960	7 ft 39 pt	14	14
DELHI National Institute of Health Administration and Education E-16, Greater Kailash-I NEW DELHI 48	1969	21 ft	29 m (N)	4
KERALA Department of Preventive Medicine Medical College, Trivandrum Kerala University TRIVANDRUM	1962	14	1 502	6
MAHARASHTRA Department of Preventive and Social Medicine Grant Medical College Byculla BOMBAY 8	1915	5	1 511	2
Department of Preventive Medicine Armed Forces Medical College POONA 1	1959	14 ft	30	15
UTTAR PRADESH Department of Social and Preventive Medicine K.G. Medical College LUCKNOW	1963	20 ft 12 pt	16 m	3
WEST BENGAL All India Institute of Hygiene and Public Health 110, Chittaranjan Avenue CALCUTTA 12	1933	112 ft	184 m (N) 69 f (N) 3 f (F)	46
Calcutta School of Tropical Medicine Chittaranjan Avenue CALCUTTA 12	1921	55	71	71

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PUBLIC HEALTH

MINISTRY OF HEALTH--Matters connected with health fall largely in the State field. The Central Government's functions in respect of matters in the State List are the co-ordination of policy and planning, the collection and exchange of information, expert technical assistance and advice on matters relating to hospitals, medical education, Local Self-Government or water-supply schemes and guidance on other matters of country-wide interest, such as drug legislation, prevention of food adulteration or control of epidemics. The Centre is directly responsible for State subjects in the Union Territories of Andaman and Nicobar Islands and Laccadive, Minicoy & Amindivi Islands. The Central Government also administer a number of important training institutions and other establishments in various places.

THE MINISTRY of Health and Family Planning deals with all matters relating to Health (inclusive of drugs control and prevention of food adulteration). It also deals with the national watersupply and sanitation scheme. The important subjects which are dealt with by the Central Government pertain to post-graduate medical education; the promotion of special studies in medicine and nutrition; port and airport health organisation; International Sanitary Regulations and India's relations with the W.H.O., etc.

CENTRAL HEALTH SERVICE - has been constituted with a view to att acting better medical personnel to man the posts under the Central Government and other participating bodies by providing uniformity of standards, pay scales and other conditions of service of medical and public health personnel.

DRUG MANUFACTURE & CONTROL

THE CONTROL over the quality of drugs imported, manufactured, sold or distributed in the country is exercised under the Drugs Act, 1940, as amended in 1955, 1960, 1961 and 1962 and the Rules framed thereunder. The State Governments are responsible for the control over the quality of all drugs manufactured, sold or distributed in the country. The Government of India have powers to keep a check on the quality of imported drugs. The Drugs Technical Advisory Board, constituted under the Drugs Act, 1940, is an important statutory body, advising the Central and State Governments on technical matters arising out of the administration of the Drugs Act. The DRUGS CONSULTATIVE COMMITTEE is a statutory committee appointed under the Drugs Act to advise Central and State Governments and the Drugs Technical Advisory Board and on matters tending to secure uniformity throughout India in the administration of this Act. The first INDIAN PHARMACOPOEIA was published in 1955. The CENTRAL DRUGS LABORATORY, CALCUTTA, is a statutory institution set up under the Drugs Act of 1940, which analyses and tests samples of such drugs as are sent to it and performs other functions of the Central and State Governments. MEDICAL STORES ORGANISATION has depots in Madras, Calcutta, Bombay Hyderabad and Karnal for supplying mainly hospitals and dispensarie run by the State Governments, local bodies etc. The factories of the Organisation manufacture a large number of drugs and dressings. It has also a repair workshop. The training of trade representatives are given in Government Laboratories. STATE PHARMACY COUNCILS have been constituted in several states. The Drugs and MAGIC REMEDIES (OBJECTIONABLE ADVERTISEMENTS) Act, 1954, which came into force on the 1st April, 1955, prohibits the publication of advertisements relating to sexual stimulants, alleged magic cures for veneral diseases peculiar to women.

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EXPORT OF PHARMACEUTICALS

EXPORT ACTIVITY in the field of pharmaceuticals is of comparatively recent origin. Although the manufacture of pharmaceuticals in the country started nearly 60 years ago, till 1950 the progress was limited. However, the industry registered a phenomenal growth thereafter. Exports of pharmaceuticals consist of basic drugs, intermediates, and fine chemicals including quinine salts which are exported exclusively by the government.

LABORATORIES AND DEPOTS

B.C.G. VACCINE Laboratory, Guindy, Madras - was established in 1948 by the Central Government with the help of UNICEF and WHO and is the world's largest vaccine producing centre. The Laboratory supplies tuberculin and B.C.G. Vaccines.

CENTRAL DRUGS Laboratory, Calcutta - is a statutory laboratory set up under the Drugs Act to analyse and test samples of drugs which may be sent to it by the Central Government and to carry out other functions as may be assigned to it by the Central and State Governments.

CENTRAL FOOD Laboratory, Calcutta - has been set up by the Central Government under the Prevention of Food Adulteration Act 37 of 1954 for analysis of food samples, investigation for the purpose of fixation of standards of any article of food, etc.

CENTRAL RESEARCH Institute, Kasauli - was established in 1905 and supplies vaccines of TAB, cholera, rabies, etc.

HOFFKINE INSTITUTE, Bombay - manufactures sulpha drugs. The main functions of the Institute are medical research, training of research workers, supply of vital biologicals and diagnosis aids to the medical profession. The Institute is run by the Government of Maharashtra and collaborates with such national and internationa organisations as the Indian Council of Medical Research, the WHO and the Rockeffeller Foundations.

INDIGENOUS SYSTEMS OF MEDICINE

THE GOVERNMENT of Indiahave decided to recognise only the modern system of medicine. But the well-settled policy of the Government is to give all possible help and encouragement to the indigenous and homoeopathic system of medicine and incorporate contributions of approved value from them in the existing system of medicine. THE CENTRAL COUNCIL OF AYURVEDIC RESEARCH has been set up in pursuance of one of the recommendations of K.N. Udupa Committee set up in 1959. The CENTRAL INSTITUTE OF RESEARCH IN INDIGENOUS SYSTEMS OF MEDICINE has been functioning since August 24, 1963 at Jamnagar with a hospital and an outpatient department. A new Siddha unit was started in theyear 1956-57. A post-graduate training centre in Jamnagar and another research centre at Banaras Hindu University on Ayurveda have been started. State Boards have been set up in almost all States for the regulation of practice in indigenous system of medicine. INDIA's first Ayurveda University was inaugurated on 6th January 1967 at Jamnagar Gujarat. The survey of Medical Plants Units at Hardwar and Ranikhet (U.P.) conducts surveys and collect specimens of plants and seeds from the Himalayan and sub-Himalayan regions.

THE GOVERNMENT of India have purchased land at Kothrud, near Poona, to establish a Central Herb Garden and Museum of Drugs. This garden and Museum which is known as the Jawaharlal Nehru Ayurvedic Medicinal Plants Garden and Herbarium was inaugurated on November 14, 1964.

IN 1955, the Government of India approved a five-year Degree course in homoeopathy. There are over 30 institutions imparting training in homoeopathy, and some are recognised by the State Boards.

THE UNANI Advisory Committee has also been formed.

HEALTH PLANNING COMMITTEES

THE VARIOUS Committees for the promotion of health in India are mentioned below:

MEDICAL COUNCIL OF INDIA - was reconstituted in 1960 under the Medical Council Act of 1956. The Council, inter alia, is responsible for the maintenance of the Indian Medical Register which contains the names of all medical practitioners who are enrolled on the State Medical Registers and who possess any recognised medical qualifications under the aforesaid Act.

CENTRAL COUNCIL OF HEALTH - was started on August 9, 1952 under Article 263 of the Constitution. It considers and recommends board lines of policy in regard to matters concerning public health in all its aspects.

INDIAN NURSING COUNCL - was inaugurated at Delhi on May 19, 1949. One of the main functions of the Council is to lay down minimum standards for the training of nurses. The Indian Nursing Council has been vested with the power to inspect training institutions and examinations. The main object of the Council is to ~~lay down minimum standard of the training of nur~~ establish a uniform standard of training for nurses, midwives and health visitors, etc.

CENTRAL COMMITTEE FOR FOOD STANDARDS - The main functions of the Committee are to advise the Central and State Governments on matters arising out of the administration of the Prevention of Food Adulteration Act, 1954 and to carry on other functions enumerated in the Act.

STATE MEDICAL COUNCILS - which began to function in 1942, are now functioning in all the States. The State Councils keep registers of qualified practitioners, supervise medical education and inspect examinations, exercise disciplinary powers over medical practitioners, and also advise the State Governments in regard to recognistion of various medical qualifications.

PHARMACY COUNCIL OF INDIA - is a statutory body constituted under Sec. 3 of the Pharmacy Act of 1948. Its functions are to regulate the profession and practice of pharmacy, complete enforcement of the Pharmacy Act, the furtherance of training in pharmacy and educating the public about the profession.

DENTAL COUNCIL OF INDIA - with the passting of Indian Dentists Act of 1948, the Council was inaugurated on May 14, 1949 for the development of dental training and practice of the profession through the establishment of the Dental Councils at the Centre and the in the States.

ALL INDIAN COUNCIL OF POST-GRADUATE MEDICAL EDUCATION - has been constituted to prescribe standard for post-graduate medical education in the Universities and offer suggestions to evolve univormity of standards throughout the country.

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NATIONAL NUTRITION ADVISORY COMMITTEE - was set up in 1960 in pursuance of the recommendation of Rome Conference of F.A.O. in 1957. It formulated that the member Governments should take implementing policies and plans relating to food production and due account of the national need of the population in settling and consumption including international trade in food.

THE CENTRAL MEDICO-LEGAL ADVISORY COMMITTEE - was set up in 1955 to advice the Central and State Governments on matters pertaining to medico-legal procedure and practice in India and to promote the development of new and modern techniques in the field of medico-legal work.

FOOD ADULTERATION

The PREVENTION OF FOOD ADULTERATION ACT, 1954 and its Rules are in operation throughout the country. It provides for severe punishment to offenders and prohibits the manufacture, imports or sale of adulterated food articles. The CENTRAL COMMITTEE FOR FOOD STANDARDS and the CENTRAL FOOD LABORATORY have been established in Calcutta.

CONTROL OF DISEASES

NATIONAL MALARIA ERADICATION PROGRAMME - The Government of India launched a National Malaria Control Programme in 1953, which was converted into National Malaria Eradication Programme in April 1958. Malaria eradication programme is a phased campaign consisting of an intensive period of spray operation for at least 3 to 5 years. The programme is being asisted by the WHO and USAID. At present, 393.250 units each covering a population of 1.3 to 1.5 million are functioning in the country. The NATIONAL INSTITUTE OF COMMUNICABLE DISEASES is responsible for research and for the training of staff in methods of malaria eradication. 6 regional coordinating organisations have been established at Bangalore, Baroda, Bhubaneswwar, Hyderabad, Lucknow and Shillong.

NATIONAL FILARIA CONTROL PROGRAMME - launched in 1955, comprises mass administration of drugs to people in filarious communities and adoption of anti-mosquito measures. At present, 6 Headquarters units, one each in Andhra Pradesh, Madhya Pradesh, Goa, Mysore and Keralu are functioning in the country. As a result of the surveys, it is estimated that over 13.6 crore persons live in filarious areas of the country. A centre for practical demonstration and field training is functioning at Kozhikode and a new training centre has been started at Rajahmundry. There are 4 research-cum-training centres in Rayavaram (A.P.), in Uttar Pradesh and in Madhya Pradesh. Recently one A type and one B type Filaria Control Units were established at Udipi in Mysore and at Broach in Gujarat respectively bringing the total number of units functioning in the country to 90.

VENERAL DISSASES - It has been established that about 5 p.c. of the population suffer from syphilis and an equal p.c. from gonorrhoea. Free supply of VDRL antigen and vials of PAM are made to various V.D. clinics. PAM is an imported item. A Central V.D. Advisory Committee was also constituted during 1963-64. 142 V.D. Clinics have been established in the country.

YAWS - Yaws temas are continuing their operation in the States of Madhya Pradesh, Andhra Pradesh, Orissa and Maharashtra.

NATIONAL TUBERCULOSIS CONTROL PROGRAMME - National T.B. survey completed in 1958 showed that nearly 50 lakh persons suffer from active or probably active T.B.

The WHO and UNICEF render assistance in the form of BCG kits, vehicles, etc. The T.B. Association of India is the largest voluntary organisation in the country. Since its establishment in 1939, it has been engaged in anti-T.B. work. T.B. Hospital, Mehrauli Road, New Delhi is administered by the Association.

The research on T.B. is being undertaken at the T.B. Chemotherapy Centre, Madras and T.B. Research Unit, a department of the Union Mission Tuberculosos, Arogyavaram, Madanapalli. 532 R.B. Clinics are presently functioning in the country. There are now 216 BCG teams. 15 demonstration and training centres have been established. Training is also imparted in other instituions and centres.

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3 mobile X-ray units have been procured and have since been supplied to Agra, Madras and Culcutta. A National T.B. Institute has been started since March 1959 at Bangalore with the assistance of WHO and UNICEF. There are 140 sanatoria and hospitals, 427 clinics, 152 wards and over 36,581 beds available for T.B. patients.

LEPROSY - The Leprosy Control Programme was launched in India in 1954-55. Nearly one-fifth of the world's 11 million lepers live in India. The number of leprosy cases in India is now estimated at about 25 laksh. Andhra Pradesh, Bihar, Kerala Madhya Pradesh, Tamil Nadu and certain parts of Maharashtra, Uttar Pradesh and West Bengal are areas of high incidence. 221 Leprosy Control Units, 1,396 Survey Education and Treatment Centres, 12 Training Centres and 32 Voluntary Agencies are functioning in the country. Some of the important centres of leprosy treatment are: 1. Gandhi Memorial Leprosy Foundation Centre, Chilakala Palli (Andhra Pradesh) 2. Central Leprosy Teaching And Research Institute, Chingleput (Tamil Nadu); 3. Lady Willingdon Leprosy Sanatorium Chingleput; (4) Silver Jubilee Children's Clinic Saidapet (Tamil Nadu). Voluntary organisations are: Mission to Lepers, Hind Kusht Nivaran Sangh, Maharogi Seva Mandal, Gandhi Memorial Leprosy Foundation, Ramakrishna Mission and Vidarbha Maharogi Seva Mandal.

CHOLERA - 5 institutions are producing cholera vaccine in the country. One Central and 3 Regional Offices, one each in Maharashtra, Orissa and West Bengal are being set up.

TRACHOMA - The Trachoma Control pilot Project was established in Aligarh on 1st December, 1959, for the preparation of topographical map of trachoma in India. The National Trachoma Control Programme was launched by the Government of India with effect from March 30, 1963.

INFLUENZA - Influenza vaccine centre was opened in 1950 at the Pasteur Institute, Connoor. A pilot plant, set up there in 1954, produces influenza vaccine and seeks to improve the method of its manufacture.

CANCER - The Government utilizes all cancer research institutes of the country for the treatment and research on cancer. Cancer research centre, Bombay and treatment are being carried on by the Indian Cancer Research Centre, Bombay, Chittaranajan National Cancer Research Centre, Calcutta, Tata Memorial Hospital, Bombay and Cancer Institute, Madras. Cobalt Beam Therapy Units are available in 18 hospitals in the country.

THE NATIONAL SMALL POX ERADICATION PROGRAMME was launched in 1962. Under this programme, 154 eradication units are working in the country. Four institutes located at Patwadnagar (U.P.), Guindy (Tamil Nadu), Belgaum and Hyderabad were settled were selected for the production of freeze dried vaccine.

MEDICAL RESEARCH

Medical research in thecountry is organised largely through the Indian Council of Medical Research, founded in 1912 in New Delhi. The Council plays a significant role on aiding, promoting and coordinating scientific research on human diseases, their causation, prevention and cure. The research works are done through the Council's several permanent research institutes, research units, field survey, research service units and a large number of ad-hoc research enquiries financed by the Council in Medical Colleges, research institutions, University Science Departments, etc. It maintains Cancer Research Centres, Tuberculosis Chemotherapy Centre at Madras, Virus Research Centre at Poona, Nutrition Research Laboratory at Hyderabad and Blood Group Reference Centre at Bombay.

THE field stations, one at Sagar in Mysore State and another at Vellore in Tamil Nadu State, of Virus Research Centre, Poona are functioning for investigations on specific problems. The VRC has been recognised as a Collaborating Laboratory of the WHO for arboviruses.

Caloric intake - of food per adult in Punjab, Himachal Pradesh, Madhya Pradesh and West Bengal is about 3,000 while in other states it ranges from 2,000 to 2,050 Kerala having the lowest with only 1800 calaries.

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MEDICAL EDUCATION AND TRAINING

Medical Education in general is the responsibility of the States. The Government of India's interest is limited to the promotion of higher studies and specific schemes of research and specialised training.

There are at present 97 medical colleges, 15 dental colleges and 11 institutions for training in the allopathic system of medicine.

CENTRAL HEALTH EDUCATION BUREAU - established in November 1956, coordinates and promotes health education in the country. It functions through two main Media and Methods Divisions. The Media Division is completed with the exception of Museum and Exhibition units. Under the Methods Division the training and research units are functioning. There is a separate unit for school Health Education. It also produces 2 quarterly bulletins and 2 monthly magazines and maintains a film library.

ALL INDIA INSTITUTE OF MEDIAL SCIENCES, NEW DELHI - was set up in 1956 under an Act of Parliament and enjoys the status of an institution of national importance It was set up with a view to (i) attaining self-sufficiency in post-graduate medical education (ii) developing patterns of teaching to demonstrate a high standard of medical education and (iii) bringing together in one place educational facilities of the highest order. The Institute has an Undergraduate Medical College with 50 annual admissions. There are 173 post graduate students on the roll in various specialities.

TRAINING AND RESEARCH IN MEDICAL STATISTICS - This scheme provides for training in "Medical Statistics" at the All India Institute of Hygiene and Public Health, Calcutta and in Medical Records Keeping" at the Christian Medical College and Hospital, Vellore.

MODEL VITAL HEALTH STATISTICS UNIT, NAGPUR - started functioning in 1957.

FOREIGN SCHOLARS AND FELLOWS IN INDIA - India is providing facilities for higher training in medicine, public health and allied subjects to the students from foreign countries, mostly from Africa and Asia.

POST GRADUATE MEDICAL (INCLUDING DENTAL) EDUCATION IN MEDICAL INSTITUTIONS - This scheme envisages allotment of 23 new departments for teaching post graduate medical (including dental) students in various medical colleges in the country.The selected candidates are awarded a monthly stipend of Rs.200.

POST GRADUATE CENTRES - There is an institute of Post graduate Medical Education and Research at Chandigarh and another one at Calcutta set up by the respective State Governments. The Jawaharlal Institute of Post graduate Medical Education and Research at Pondicherry was started on July 13, 1964. With 450 beds, it started functioning from 3rd April, 1966.

POST GRADUATE MEDICAL EDUCATION: Delhi Scheme - Post graduate courses in Medicine surgery, gynaecology, paediatrics, etc. 12 courses are being conducted in Delhi hospitals, etc. The stipend for these courses are Rs.200 per month.

ADMISSION OF STUDENTS BELONGING TO THE UNION TERRITORIES TO MEDICAL COLLEGES - Arrangements are being continued for the admission of students belonging to Union Territories which do not have medical colleges and students belonging to other categories to medical colleges.

ADMISSION TO MEDICAL COLLEGES UNDER THE GOVERNMENT OF INDIA CENTRAL SCHOLARSHIP SCHEME - Students of Indian origin domiciled abroad and foreign students ar admitted to various medical colleges in the country for which seats have been reserved.

REFRESHER COURSES FOR CENTRAL MEDICAL PRACTIONERS - This schemehad been included as a central scheme in the third plan.

LADY HARDING MEDICAL COLLEGE & HOSPITAL, NEW DELHI - is a leading medical college for women in the country.

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KALAVATI SARAN CHILDREN'S HOSPITAL, N W DELHI - is a constituent unit of the Lady Hardinge Medical College & Hospital, New Delhi with 68 beds, for medical cases, with a department of Physical Medicine and Rehabilitation for ~~training~~ treating cases of paralysis and rehabilitating them.The institution imparts paediatric teaching to the undergraduate medical students of the Lady Hardinge Medical College and to the student nurses of the same College and Hospital, to the Public Health Nursing students of the Lady Reading Health School and to the students of the Midwifery Sisters' and Midwifery tutors' course of the College of Nursing.

LADY READING HEALTH SCHOOL AND RAMCHAND LOHIAINFANT WELFARE CENTRE, NEW DELHI - The school conducts certificate course in Public Health Nursing of 10 months' duration and Integrated Health visitors' course of 2½ years, duration.

PHYSIOtherapy School and Training Centres at the K.E.M. Hospital, Bombay - A physiotherapy training and service centre at the K.E.M. Hospital, Bombay has been established by the Government of India under an agreement with the WHO in collaboration with the Government of Maharashtra and the Municipal Corporation of Bombay. The centre is equipped with one ultra vibrator.

DHANVANTARI MEDICAL COLLEGE, PONDICHERRY - this college had started functioning in 1956. It is affiliated to the University of Madras.

COLLEGE OF NURSING, NEW DELHI - was established in 1964 and is affiliated to the Delhi University. It prepares students for the following courses - Master of Nursing, BSc. (Hons.) in Nursing, Ward Sisters course, Sister Tutors course, Midwifery tutors course, and nursing administration.

THE CHILD GUIDANCE CLINIC AT THE COLLEGE OF NURSING was started in 1955 as a part of psychology teaching department to provide B.Sc. (hons.) Nursing students with, clinical experience in child growth and development, with special experience in child growth and development, with special reference to emotional problems. It also provdes free service.

TRAINING OF NURSE AND AUXILLIARY NURSE-MIDWIVES, HEALTH VISITORS AND DAIS - The total number of training centres run by voluntary organisations with Central assistance was 42. Central assistance is given to the State Governments at the rate of Rs.250 per dai trained for the six month course designed to orient the indigenous dais to modern techniques of asepsis.

THE central medical library of the directorate General of Health Serviceswas declared as the National Medical Library with affect from 7th April, 1966.

MEDICAL RELIEF

The total number of institutionsunder the central government health scheme is now 61. There are 2,66,200 beds in the country.

Medical relief, Sanitation & Public health in the Union Territories - The Central Government is directly concerned with the provisions of medical relief in the Union Territories.

Health Insurance scheme which provides, inter alia, medical benefits to industrial workers under Employees' state Insurance Act, 1948, now covers over 20.18 lakhs workers in the country.

Contribution Health Service scheme came into opeation on 1st July, 1954 and was confined first to Delhi & New Delh only and serves Central Government employees. The Scheme has been extended to Bombay from November 1963.

Safdarjang Hospital, New Delhi - was taken over by the Government of India on 1st March 1954. The present bed strength of the Hospital is 1,062 and the number of medical officers 250.

WILLINGDON HOSPITAL AND NURSING HOME, NEW DELHI - was taken over by the government of India on 1st June, 1954. The present bed strength of the Hospital is 326 A course of regular general nursing was started in this hospital on 1st May, 1963. The Hospital has been recognised for Diploma in Anaesthesia and for the M.D. degree of the Delhi University.

LAL RAM SARUP T.B. HOSPITAL, MEHOZAHLI (DELHI) - is administered by the T.B. Association of India. It is being maintained largely with the grants of the Government of India.

POLICE HOSPITAL, DELHI - has 50 beds.

POOR HOUSE HOSPITAL, DELHI - caters to the inmates of the Poor House, who are detained theere under the Beggers Act, 1959.

IRWIN HOSPITAL, NEW DELHI - has 1,060 beds. The Hospital has a programme for the training of Laboratory Assistants, Radiographers, Student Nurses, Student Nurses, and Postgradute students.

GOVIND BALLABH PANT HOSPITAL, NEW DELHI - was commissioned on the 3rd June 1964 and provides for indoor treatment facilities in Neurology, Neuro-surgery, Cardiology Cardio-vascular surgery, Psychiatry, Gastroentrology and Haematology An Orientation course in Hospital administration was started on 1st July 1964. This is the first course of its kind in Asia.

HOSPITAL FOR MENTAL DISEASES, RANCHI - is one of the famous mental hospitals of India under the Government of India. The bed strength is distributed among various States.

COUNTESS OF DUFFERIN'S FUND - This Fund, vests in the Central Government under the countess of Dufferin's Fund Act, 1957. The Fund is utilised towards grant of scholarships to women students for medical and nursing education.The income derived from the assets of the Fund is estimated at about Rs.60,000.

UNION MISSIONT BERCULOSIS SAWATORIUM, AROGYAVARAM, MADANAPALLI - The Central Government met from 1956 to 1965, 50 p.c. of the recurring expenditure of the two departments of this Sanatorium. A Children's Ward and a Thoracic Surgical Unit were established with the assitance of the Government of India.

INTEGRATION OF PUBLIC HEALTH WITH The basic course in Nursing - Under this scheme nurses training schools of the state governments and voluntary organisations are getting Central assitance.

PRIMARY HEALTH CENTRES - constitute the focal points in the rural areas for providing preventive and curative health services in an integrated form. The main sevices provided b the Centres are medicalcare, material and child health services including school health, health educationo control of communicable diseases, environmental sanitation advice and assitance, collection of vital statistics and family planning.There are 5,092 such centres in the country.

FINANCIAL ASSISTANCE TO VOLUNTARY MEDICAL INSTITUTIONS are given.

NATIIONAL CLEANLINESS DAY AND CHILDREN'S DAY CELEBRATIONS were inaugurated on 2nd October, 1960 and 14th November, 1960 respectively. Anti-leprosy Day is observed on Mahatma Gandhi's martyrdom day, the 30th January.

WATER SUPPLY AND SANITATIONS--The National Water Supply and Sanitation Programme launched in 1954, is continuing. Most of the 369 urban water supply schemes, 100 urban drainage schemes and 348 rural water supply and sanitation schemes, estimated to cost Rs.102.17 crores, have been completed. A drinking water Board was set up in 1963.

INSTITUTES & TRAINING CENTRES

All India Institute of Hygiene and Public Health, Calcutta - was established in 1932 with the aid of an endowment from Rockefeller Foundation.The objects of the Institute are - 1. the training of public health personnel, 2. qualifying students for public health diploma and 3. pursuits of research on several aspects of public health, including study of diseases like malaria, etc. The Institute functions as a Yellow Fever Vaccine Centre for the distribution of vaccine to different centres.

Rural Health Unit & Training Centre, Singur (West Bengal) - functions as the rural practice field for students of the All India Institute of Hygiene & Public Health.

National Institute of Health Administration and Education, Delhi - was registered on the 24th September, 1964. A grant of $1,246,000 has been made by the Ford Foundation to the Central Government for providing intial support to this Institute and the Central Family Planning Institute over a 5-year period.

Central Family Planning Institute, New Delhi - was established in 1962 mainly for the advancement of knowledge in various aspects of the Family Planning movement in India. In order to facilitate expeditious achievement of its objects the Government of India registered this Institute on 20th November, 1964. The Institute has six divisions, such as Administrative, Education, Training and Social Services, etc.

Urban Health Centre, Chetla, Calcutta - this Health centre, apart from producing comprehensive health services, functions as a training centre for for the students of various medical institutions in its activities.

Central Research Institute, Kasauli (1906) - provides facilities for research. Vaccines and sera manufactures by the Institute are cholera, TAB., Antirabic, Antibiotic (animal) and Antirabic (dog) vaccines, Anti-venom Serum, Diphtheria Antitoxin. Normal Horse Serum, Tetanus Toxoid, Antirabic Serum and curative vaccines are also manufactured here. The Institute has following 6 sections:

(1) bacterial vaccine, (2) biochemistry, (3) biological, (4) serum concentration, (5) rabies and (6) antibiotics.

All-India Institute of Physical Medicine and Rehabilitation, Bombay - which was started as a joint venture of the Central and the Bombay Governments, Bombay Municipal Corporation and the UNICEF, was taken over by the Government of India on October, 1961. It imparts post-graduate instruction in rehabilitation of the disabled, in Physio-Therapy, Occupational Therapy and other services, etc.

All India Institute of Mental Health, Bangalore - was inaugurated on August 6, 1954. Besides promoting post graduate studies and research in mental health, it advises the Government of India and the States on the organisation of mental health service and acts in co-ordination with national and international agencies on mental health. In 1955, the course for the Diploma in Psychological Medicine and the training course in Clinical Psychology have been started at the Institute.

All India Institute of Speech and Hearing, Mysore - was established on 9th August, 1965 to provide training and research facilities for Speech Pathologists and Audiologists. It is financed by the Govt. of India.

Central Leprosy Teaching and Research Institute, Chingleput - is controlled by the Government of India. Activities of the Institute include treatment of and welfare activities for the patients and training of personnel and research.

Department of Serologist and Chemical Examiner to the Government of India, Culcutta - carries on medicolegal analysis of blood and semen and other stains on exhibits seized in connection with the prosecution of criminals and manufactures ampoules of V.D.R.I. antigen and requisite quality of buffered saline dilluent.

National Institute of Communicable Diseases, Delhi - The Malaria Institute of India was converted into this Institute on August 21, 1962. The official inauguration took place on July 30, 1963. The Institute is the main centre for research and training in the field of communicable diseases. It has 6 divisions.

National T.B. Training Institute, Bangalore - was inaugurated in 1959. It has a training course for B.C.G. workers.

Pasteur Institute of Southern India, Coonoor - manufactures influenza vaccine on a pilot basis, carries on research on the value of antibiotic serum and its production on a pilot basis and carried on studies in rabies, influenza, respirator and intestinal viruses, syphilis and small pox. The special laboratories designed for the production of live polio virus vaccine have been furnished and fitted up. The Institute was established in 1907.

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Rural Health Training Centre, Najatgarh, Delhi - performs a three-fold function: service, training and research.

Vallabhbhai Patel Chest Institute, Delhi - has been establishedmainly for conducting research in diseases of the chest and in training doctors in the line. Successful candidates receive the Diploma in Tuberculosis and Chest Diseases (D.T.C.D.) from the Delhi University.

I. ORGANISATION OF OFFICIAL SERVICES

1. Assignment of Responsibility

The Union of India comprises 17 states and nine union territories. Under the Constitution of India the legislative list is classified into three categories: the union list - subjects in respect of which legislation can be enacted and enforced only by the Union; the state list - subjects in respect of which legislation can be enacted and enforced by the states individually; and the concurrent list - subjects in respect of which both the Union and the states can legislate, but should, however, the Union enact legislation on any of these subjects, that enactment becomes applicable to all the states but the enforcement of the legislation still remains the responsibility of the states.

Factories, boilers, electricity and welfare of labour, including conditions of work and social security fall within the concurrent list. In respect of those subjects where uniformity in the application of the statutory provisions is considered essential, legislation is usually enacted by the Union, which becomes binding on the states.

(a) Industrial Establishments

The industrial establishments are governed by the provisions of the Factories Act, which is a union legislation administered directly by the state governments through the inspectorates of factories. The Act empowers the state governments to frame detailed rules for effective administration of the Act. Each state has framed its own rules under the Factories Act based on the model rules prepared by the central organisation of the Chief Adviser, Factories (now Directorate General Factory Advice Service and Labour Institutes), thus further ensuring uniformity in the application of rules.

(b) Construction Work (Building and Civil Engineering)

The building construction industry and works of engineering construction have not as yet been brought under any legislative enactment. Projects under the Five-Year Plans, comprising most of the activities which fall under the category of works of engineering construction, are government projects and are carried out under the supervision of governmental agencies. The Central Water and Power Commission, Ministry of Irrigation and Power, has issued a Safety Manual. This Manual contains detailed instructions to be followed on all construction projects for the prevention of accidents and for ensuring uniformity and safe operating procedures on all construction works. The Manual is more of a code of practice to be observed by all authorities, officers, employees and contractors of construction projects. The responsibility to see that the provisions of the code are followed is placed on the persons in whose jurisdiction the works are carried on.

The Union has under consideration a separate enactment to provide for the safety and health of workers employed in building and construction industry and to regulate their conditions of work.

(c) Shipbuilding and Ship Repairing

Constructing, repairing, refitting, refinishing or breaking up of ships or vessels are covered by the provisions of the Factories Act and the responsibility for the enforcement of the provisions covering them rests with the state factory inspectorates.

(d) Docks

The safety and health of workers employed in docks are covered by the Indian Dock Labourers' Act, 1934 and the Indian Dock Labourers' Regulations, 1948, which were enacted to give effect to the I.L.O. Convention concerning Protection against Accidents to Workers Employed in Loading and Unloading Ships. The Dock Labourers' Act is, however, limited in scope, as it applies only to work which is required for or is incidental to the loading or unloading of cargo or fuel into or from a ship when it is done on board the ship or alongside it. This left out a large number of workers employed in the docks. This lacuna has now been rectified by framing a separate set of regulations - Dock Works (Safety, Health and Welfare) Scheme, 1961 - making use of the provisions of the Dock Workers (Regulation of Employment) Act, 1948. All these measures concerning the safety and health of dock workers are administered by the Centre through the dock inspectorates under the administrative control of the organisation of the Chief Adviser, Factories (now Directorate-General, Factory Advice Service and Labour Institutes).

(e) Electrical Stations

Electrical stations are 'factories' as defined under the Factories Act but, unlike the practice in many countries, the factory inspectorates do not include electrical inspectors as a specialist service within the inspectorate. The Indian Electricity Act and the electricity rules framed under the Act, both union enactments, apply to all places where electricity is generated, transmitted, transformed, distributed or used. The Act and rules are administered by a separate body of electrical inspectors also under the administrative control of the state governments.

(f) Shops and Commercial Establishments

The working conditions of employees in shops and commercial establishments are governed by the Shops and Commercial Establishments Act enacted by the individual state governments and administered by an inspectorate of shops and commercial establishments under the control of the state government. The main provisions of the Act relate to hours of work, payment of wages, holidays and leave, and employment of children and young persons. The provisions of the Act are very limited in scope and do not specifically deal with safety and health

development of new processes of manufacture, the factory inspection services felt themselves unequal to the task before them and had to be strengthened by the addition of specialists drawn from different professions and disciplines. It was soon realised that the inspection services, however well-equipped and organised alone could not effectively deal with all the problems that they were confronted with: recourse had necessarily to be taken to obtain the co-operation of scientists and technical experts, as also the help and assistance of technical and scientific organisations, research institutions and various other agencies, including trade unions and trade associations for the evolvement of measures for mitigating the hazards met within modern manufacturing industries. This has resulted in the drawing up of specific regulations or codes of safe practices, covering a variety of industries and industrial processes. This trend of development has been brought out in the suggested headings for the note under which advance information is requested from the governments. Though this indicates the logical development to fulfil its responsibilities, the inspectorates face serious difficulties. Today, particularly in the developing countries, a more or less psychological atmosphere has been created for industrialisation. While this is good in itself, there seems to be little appreciation of the need for concurrent activities in the social field as affecting industry. So much so, there is not the same sympathy and understanding of labour problems, the emphasis being more on economic development, and often it is considered that the social aspects could take their place later. But, unfortunately, because of competing demands on the meagre resources, development towards this end has been slow. In all development projects that we see today, unless the activities are stimulated almost under forced draught, little progress is possible. If this has been the case in economic development programmes, one can appreciate what efforts would be needed to ensure development in the social sphere.

VII. POSSIBLE DEVELOPMENTS AND CHANGES IN OFFICIAL SERVICES DURING THE NEXT TEN YEARS

For this we have to consider the changing pattern of industrialisation during recent years. With the rapid technological developments there has been a breakthrough from the traditional form of manufacture: newer types of industries such as dyestuffs, petro-chemicals, metallurgical and chemical process industries have come into being. In most of these newer industries, the problem of safeguarding of plant and equipment is of less significance than the operating procedures. The accepted inspection procedures do not really and fully meet the situation. If the inspection services have to make definite contribution to the safety and health of the man-at-work, more detailed knowledge of the operating procedures would be necessary on the part of the inspection services to enable them to discuss and advice on preventive measures. Further, the hazards, mostly chemical and toxic, would not be apparent during inspections and the inspectors would have to be provided with facilities to evaluate toxic and other hazardous contaminants in the working atmosphere and other

environmental conditions. Then again, with the emphasis on productivity, perhaps an ergonomics approach to the problem of factory inspection will be more meaningful. The measures taken for ensuring the safety and health of workers should, at the same time, help to reduce the physiological cost of work so far as the worker is concerned, thus enabling him to produce more with the same effort. This in turn will mean that the inspectorates would comprise specialist services covering a variety of disciplines.

developments in the field, but also to carry out studies on its own to provide information based on conditions as they exist in the country. Further, the particular area where assistance would be welcome seemed to be in respect of specialist services which did not exist then in any of the state factory inspection services. Therefore such specialist services were gradually developed and when these services became more and more acceptable, the Central Labour Institute was set up with these specialist services forming its various divisions, so that working as units of an integrated institute they could bring to bear upon the subject a multi-disciplinary approach. The Central Labour Institute comprises the following eight divisions:

(i) Industrial Safety, Health and Welfare Centre:
(ii) Industrial Hygiene Laboratory:
(iii) Staff Training Centre:
(iv) Productivity Centre:
(v) Occupational Physiology Section:
(vi) Industrial Psychology Section:
(vii) Library-cum-Information Centre; and
(viii) Training Centre.

As an extension of the activities of the Central Labour Institute, three regional labour institutes have been set up at Calcutta, Kanpur and Madras. These institutes are modelled on the pattern of the Central Labour Institute, though the facilities provided are on a reduced scale.

The central agency is a co-ordinating body but control to a certain extent is exercised indirectly by providing information on modern developments in the field of industrial safety and health, organising facilities for the training of inspectors, by convening conferences of chief inspectors of factories to discuss problems of mutual interest and carrying out industrial hygiene surveys to evaluate working conditions and specific health hazards in operations.

II. ROLE OF GENERAL INSPECTORATE

(a) Recruitment and Training

By and large the general body of inspectors are engineers by profession. Except in the case of inspectors in the very junior cadres, they are recruited through the state public service commissions and at the Centre through the Union Public Service Commission. The recruitment rules prescribe in detail the academic qualifications and experience required and applications are called through public advertisements in the newspapers.

Generally the newly recruited inspectors are attached to their senior officers as understudies for a year or two. Opportunity is also taken for further training by directing the newly recruited inspectors to attend the Factory Inspectors' Training Course organised biennially by the Directorate General Factory Advice Service and Labour Institutes.

With the increase in the tempo of industrialisation, there has been a heavy demand for engineers, and since industry offers better conditions of service and emoluments, suitably qualified personnel is not attracted by inspectorate's offers. Thus, in most of the state factory inspectorates the actual staff, to a large extent, falls short of the sanctioned strength.

A qualified engineer finds, when joining the factory inspectorate, that the experience to be gained in the department is of not much use to him elsewhere, and that opportunities for promotion are limited, compared to those in the engineering services. Thus, during the first few years of service the turn-over of the personnel is rather heavy.

(b) Delimitation of Duties

The factory inspectorates function as a general inspectorate and except for the geographical distribution based on the importance of the area as an industrial centre to which an officer may be posted, there is no specific delimitation of duties.

III. ROLE OF SPECIALIST SERVICES

The staffing in the state factory inspectorates has followed the traditional pattern. In the early stages of development of the inspection services, when mechanical power was mainly used in manufacturing operations, the emphasis was more on the guarding of machinery and general improvement of the physical working conditions and as such, mechanical engineering was obviously considered as the desirable qualification for an inspector of factories. When electricity came to be introduced in a large measure as motive power and in manufacturing operations bringing in its train various types of electrical hazards, electrical inspectors as a specialist service within the inspectorate was not thought of but a separate electrical inspectorate was set up outside the department. The same has been in the case of steam boilers and steam pressure vessels where again a separate inspectorate was set up charged with the responsibility of ensuring the safety in the operation of steam boilers and steam pressure plant. Now the need for specialist services within the inspectorate is being increasingly felt and steps are being taken to set up such services in the factory inspectorates, in the medical and some of the newer fields of activities.

(a) Recruitment and Training

The position is the same as explained in II(a) above.

(b) Delimitation of Duties

The position is the same as explained in II(b) above.

(c) Laboratory and Research Work

At present industrial hygiene laboratories exist in only two state factory inspectorates. With their meagre equipment they are

not now in a position to undertake any major field studies; they confine their activities to providing assistance to the inspectorates in their day-to-day inspection problems.

IV. DELEGATION OF SELECTED TOPICS AND DUTIES

(a) Local Authorities

So far as delegation of duties to local authorities is concerned, it is limited to the inspection of health provisions of the Factories Act and for this purpose the medical officers of the public health departments and the state medical services are qualified as inspectors of factories and/or certifying surgeons.

(b) Authorised Bodies or Associations

None at present.

(c) Authorised Individuals (Technical Experts)

None at present.

V. CO-OPERATION WITH NON-OFFICIAL SERVICES

(a) Employers' Organisations and Trade Unions

At the national level, close co-operation with employers' organisations and trade unions is maintained through the Indian Labour Conference and the Standing Labour Committee and the industrial committees covering the more important industries. The subjects discussed include problems relating to factory inspection, working conditions, safety, health hazards and welfare. This in turn helps the inspection services at the state level to follow up some of the decisions arrived at these conferences or committees. No formal machinery exists for the day-to-day contact between the factory inspectorates and the employers' organisations or trade unions, except when specific complaints or suggestions are brought to the notice of the inspectorates.

(b) Insurance Associations

The factory workers are covered by a national health insurance scheme - the Employees' State Insurance Scheme operated by the Employees' State Insurance Corporation. The Corporation as well as the Standing Committee of the Corporation are tripartite bodies in which employers, labour and the central and the state governments are represented, and matters relating to safety and health do find a place in their deliberations.

(c) Professional Associations

The Society for the Study of Industrial Medicine (India), with its branches in almost all the states maintain close liaison with the factory inspectorates.

(d) Universities and Research Associations

In recent years the vocational training and higher technological institutes have recognised the need for training in safety and assistance is being sought by teaching institutions for the preparation of syllabus for training in safety. In some of the higher technological institutes and vocational training centres regular programmes are presented by the Central Labour Institute and the regional labour institutes, in addition to the various programmes sponsored through the National Productivity Council and local productivity councils.

(e) Voluntary Associations for Safety and Health

Close contact has been maintained by the central organisation with the activities of the Indian Council of Medical Research, particularly on problems of occupational health; in co-operation with the Council, research projects have also been undertaken. There are a number of voluntary associations concerned with accident prevention, but their activities are confined to traffic safety. The Bombay Safety Council, a body which was recently set up, is doing yeoman service in the field of industrial accident prevention and works in close co-operation with the central organisation. In fact, much of their training activity has been made possible because of the facilities provided by the Central Labour Institute.

The need for a voluntary agency to supplement the activities of the official agencies has been keenly felt and a President's Conference on Industrial Safety was convened in December 1965. Following this a National Safety Council has been set up. The Central Labour Institute is providing all the assistance necessary in its formative stages.

(f) Others

The factory inspection services also maintain close contact with the various professional bodies such as the Institute of Personnel Management, the National Productivity Council, local productivity councils, and the various trade associations.

VI. MAIN TASKS AND PROBLEMS FACING OFFICIAL SERVICES AT PRESENT

The problems that the inspection services in this country face at present are the same through which the inspection services in the industrially advanced countries have had to pass through. With the changing situation in industry, the character of the factory inspection services has had to be modified from time to time. In the earlier years of industrial development, the factory inspection services were more concerned with the safeguarding of machinery, plant and equipment; it was later, with the recognition resulting from analysis of accident records that the human factor entered in a majority of accidents, thus the guarding of machinery and education in caution became the two significant factors in accident prevention. With the increase in mechanisation and the

(g) Agriculture and Forestry

There are at present no statutory provisions regulating health, safety and working conditions of workers employed in agriculture. Agricultural operations cover the entire country and most of the agricultural operations are carried on in the traditional way using hardly any mechanical equipment. However, so far as the health and welfare of workers in the plantations are concerned, they are covered by the Plantation Labour Act, 1951. The Act applies to all tea, coffee, rubber and cinchona plantations. Provisions relating to safety do not figure in the Act, since, at present, hardly any mechanical equipment is used. However, the processing establishments come under the scope of the Factories Act.

(h) Mines

Mines are a subject under the union list and the safety and welfare of workers in mines are covered by the Mines Act, which is administered by the chief inspector of mines, who is under the direct administrative control of the union government.

2. Outline of Structure of Labour Inspectorates - Arrangements for Central Control and Co-ordination

(a) Outline of Structure

(i) Factories. Each state has an inspectorate of factories with the requisite engineering and other staff for administration of the Factories Act and other labour laws. The headquarters of the inspectorates are normally located in the state capitals.

The chief inspector of factories in most states is a technically qualified officer. All the inspectorates have on their staff technically qualified engineers. In addition, there are:

- medical inspectors (ten) in seven states (none in any union territory);
- whole-time certifying surgeons - one in each state;
- women inspectors in factories - in five states;
- inspector for notified factories - in two states;
- chemical inspectors - one each in two states;
- technical inspectors of factories (textile) - in two states;
- statistical inspectors - in two states;
- legal assistants - one each in two states.

The majority of the inspection services have a decentralised administration with a headquarters office and other offices, variously designated as branch offices, district offices or circle offices. Some of the medical inspectors are officers of the state public health departments seconded to the factory inspectorates and revert back to their parent departments on completion of their tenure. The others join the inspectorates and are more or less permanent officers there.

(ii) Mines. The department is headed by the chief inspector of mines, assisted by an additional chief inspector with a fairly strong specialist staff at the headquarters office in Dhanbad (Bihar).

The field work of this organisation is conducted from 13 regional offices situated at different centres of mining activity. Each regional office is under a regional inspector assisted by one or more inspectors and/or assistant inspectors. Ten of the 13 regional offices are grouped into four inspection zones.

There are two electrical ispection circles to administer the Indian Electricity Act in mines all over India. Some survey staff is posted at two zonal offices.

The specialist staff includes:

- technical staff for processing of applications;
- special investigation staff for special mining problems of ventilation, gas, coal, dust, roof control in respect of deep and gassy mines;
- medical inspectors;
- statistical inspectors;
- law officer;
- surveyor with 12 survey teams;
- barrier survey scheme staff.

(b) Arrangements for Central Control and Co-ordination

The organisation of the Chief Adviser, Factories (now Directorate General Factory Advice Service and Labour Institutes) was set up as a co-ordinating body to deal with all questions relating to the administration of the Factories Act and the rules framed thereunder. The organisation functions as an integrated service to advise industry and other interests concerned with matters relating to health, safety and welfare of workers. However, it was soon felt that for the organisation to effectively function as a co-ordinating body for the state factory inspection services and to advise on the enforcement of the safety and health provisions of the Factories Act, it would have not only to keep itself abreast of modern

1. COMPANY NEEDS

2. PATIENT NEEDS

DOCTOR

No of Employees | No of family members | Identification of areas of residence.

timings when consultations are preferred.

location of six monthly check up points. (facilities required)

- Office
- Factory

- Paediatrician.
- Gynaec
- Physician.

+ First aid.

Provide with information brochure containing

1. Name & adress + phone number of consultants
2. Name & adress + phone number of nursing homes.

Pre-employment & Periodical check-ups

- Schedule for Bi-annual check-ups
- Specialist check-ups where needed { Optralmic / Auditory
- Referral from check-ups?
  OR only on occurence of illness.
- Criteria for employability.

NEED TO KNOW:

- Job descriptions.
- Working environment / Pollutants
- Shifts / regular hours of work.
- Ergonomics.
- Safety precautions

TO IDENTIFY.

COMPANY NEEDS.

1. What kind of coverage do they expect only OPD or house visiting also?

2. What facilities are expected from Nursing Homes?

e.g. - Pvt Rooms ? A/c.
- Gen Beds.
- Specialist Services.
- ? Ambulance Services
- Lab & X-rays.

3. What is the upper limit of payment acceptable for

(a) Class I Facilities (room rent)

(b) Class II & III (Bed charges).

4. Do all referrals need to be routed through company doctor?

5. Medical Records? [Personnel / Family] Dossiers

6. Who will pay in-patient bills?

To IDENTIFY

PATIENT NEEDS

1. Area of residence. ?
2. What specialists are most req where ?
3. Nearest nursing homes which fit into Company expected facilities bracket.
4. Timings of consultations for
   (a) Employees
   (b) Families
5. Nearest General check up points.

2. INFORMATION BOOKLET

1. List of Specialists — Area wise
2. List of Nursing Homes & facilities available — Area wise
3. List of Maternity homes where special ~~child~~ Mother & Child care facilities are available
4. List of Nursing Homes where Convalescing facilities are available.

Records

- 1) O.P.D. < Personnel / Families
- 2) Hospital Admissions < P / F
- 3) Periodical check-up.
- 4) Medical leave / absence
- 5) Accidents < work related / Otherwise.
- 6) Sanitation / Hygiene.
- 7) Preventive inoculation / immunization.
- 8)
- 9)
- 10)

Worker's Health is Industries' Wealth

Department of Community Medicine
St. John's Medical College and Hospital,
BANGALORE – 560 034.

Occupational Health aims at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers of all accupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers from risks resulting from employment factors adverse to health; the placing and maintenance of workers in occupational environments appropriate to their physiological and psychological make-up, and, to summarise, "THE ADAPTATION OF WORK TO MAN AND OF EACH MAN TO HIS JOB."

Like the very few institutions in India rendering care in the field of Occupational Health, St. John's Medical college, through its Ross Institute Unit (a branch of the Ross Institute of Tropical Hygiene, London), provide comprehensive health services to industries. These services include pre-employment screening of workers, periodical review of the health status of employees especially in relation to occupational hazards, first-aid training, advisory services to factory managements, research and training. Further, with the support and backing of facilities at St. John's Medical College Hospital, follow up and comprehensive medical care is available in almost all specialities and superspecialities of scientific medicine. The hospital is particularly well equipped and excellently staffed and provides. under one roof, many services that are not easily available elsewhere in Bangalore: echocardiography, computerised stress ECG testing, ultrasound, gastrointestinal endoscopy, cystoscopy and transurethral resection of prostate, cystometrography, kidney dialysis, retinal angiography and photocoagulation, electoencephalography, electromyoneurography, angiography, cryosurgery, radioimmunoassay, etc. In collaboration with the United Planters Association of South India, the Ross Institute has done extensive work with regard to the health status of tea plantation workers.

The following occupational health services are provided to Industries in Bangalore :

- Pre-placement Medical Examination
- Periodical Medical Examination - for workers and executives
- Safety Education
- Safety Health
- Curative health care

Medical eithcs requires that confidentiality be maintained regarding the patient's medical condition. It is therefore necessary for each employee referred for these services to submit to the Ross Institute a declaration that he has no objection to his medical data being submitted to his employer. Only then can the Department of Community Medicine send periodical reports to the management on the health status of its employees and the factors that need to be considered for improvement of health and productivity.

PRE-PLACEMENT MEDICAL EXAMINATION

Pre-employment check-up involves screening of the prospective employee's health for his suitability for employment in that industry and for the particular nature of work contemplated. The examination is arranged on specified dates fixed in consultation with factory management. Tuesday and Thursday afternoon, between 2 p.m. to 4 p.m. are preferred.

Pre-employment screening entails the following :

Physical examination	Rs. 20/-
Blood counts (HB, TC, DC, ESR)	Rs. 20/-
Urine - Routine and Micro	Rs. 10/-
VDRL	Rs. 15/-
Sr. Cholesterol	Rs. 20/-
Chest X-ray	Rs. 45/-
	Rs. 130/-

Additional tests such as ECG, Stool examination, etc. may also be undertaken on payment of an additional charge.

PERIODICAL MEDICAL EXAMINATION — WORKERS

Keeping in veiw of the report of the pre-placement medical examination, periodical medical examination of workers is advocated once a year (less or more frequently in certain industrial settings, if desired) during fixed months in a year.

The following regimen is recommended for periodical medical review of workers :

Physical Examination	20/-
Complete blood count (Hb, TC, DC, ESR)	20/-
Urine routine and Micro	10/-
Stool Micro	5/-
Serum Cholesterol	20/-
Blood Sugar-post-prandial	15/-
ECG	30/-
Chest X-ray	45/-
	Rs. 165/-

As with pre-employment check-ups, periodical medical examinations are undertaken after prior appointment, on dates convenient to the Factory and the Department of Community Medicine. The recommended days are Tuesdays and Thursdays between 2 p.m. and 4 p.m.

EXECUTIVE HEALTH CHECK-UPS

Executives in industries are particularly prone to the effects of stress insomnia, backache, duodenal ulcer, hypertension, angina, myocardial infarction. Further. several other diseases such as diabetes, cancer, glaucoma, cervical spondylities, rheumatoid arthritis, arteriosclerosis, etc. first make their appearance during the middle-age years. Many of these diseases, if detected early, can be arrested, thus reducing morbidity and permitting the executive to devote his attention to more productive issues. Beyond instituting early treatment for these diseases, periodical medical check-ups serve

to draw awareness of the executive to hazardous occupation factors and leads to change in attitudes and habits that have a long term positive effect on health and productivity.

St. John's Medical College Hospital is particularly equipped to carry out health screening programmes for executives. Beyond the regimen recommended for workers, executives may be advised to undergo some of the following investigations depending on the symptoms : glucose tolerance test, estimation of blood urea, blood uric acid and serum triglycerides, X-ray of cervical region, computerised stress ECG testing, specialised radiographic procedures. These investigations, coupled with competent medical advice, can go a long way in ensuring timely medical care, increased concentration at work and higher output of executives.

SAFETY HEALTH

This is a consultancy service extended by the occupational health specialists of our department to industries in order to ensure a healthy occupational environment. Also, consultancy services are provided to existing institutions to improve their occupational environment. These services are rendered by prior agreement. The cost varies depending on the amount of input involved from the Ross Institute Unit with respect to inspection, time and staff utilised, hours of work, investigations carried out.

These consultancy services include :

To improve General Health	**To improve Occupational Environment**
Nutrition Services	Building Design
Communicable Disease Control	General House Keeping
Environmental Sanitation	General Ventilation
Mental Health	Mechanisation
Maternal and Child Health	Substitution
Health Education	Dusts
Natural Family Planning	Enclosures

Counselling

Isolation
Local Exhaust Ventilation
Protective Devices
Environmental Monitoring
Research
Organisation of Food
Preparation, Consumption,
distribution on mass scale
Ergonomics

SAFETY EDUCATION

Education about common health problems, common industrial hazards, health facilities available for the industrial workers, etc is an integral part of any occupational health programme. Keeping this in view, the department imparts education by multi-media approach on a continued basis, coupled with pre and post evaluation to apprise the management of industries on the impact of such an education.

The services include :

— Film / Video programmes
— Pamphlet and booklet distribution
— Seminars / discussions
— Demonstration on the usefulness of protective devices in particular settings.

RESEARCH

Without research no occupational health service can be effective. The department undertakes research activities in specific industrial settings giving priority to following projects :

— Sickness, absenteeism
— Analysis of accident register — risk management
— Knowledge attitude and practice study of employees with respect to :

Health
Health facilities
Occupational Health Hazards
Family Planning
Prevention of Accidents
Use of protective devices

—Ergonomics

—Mass catering in Industries.

For further Information, kindly contact :-

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'Not So Inert After All!'

FLY ASH - an environment and health perspective.

A Toxics Link Briefing paper
September 1997

Contents

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About Toxics Link

We are a group of people working together in India for environmental justice and freedom from toxic pollution. We have taken it upon ourselves to collect and share information about the sources and dangers of poisons in our environment and our bodies, and about clean and sustainable alternatives for India and the rest of the world.

We have an information Exchange in Delhi which provides information (electronically and on paper) and networks groups working on similar toxics issues.

Why fly ash?

A city like Delhi produces more fly ash than it does municipal waste; and just from three sources, its thermal power plants. Nationally we produce 60 million tonnes of it annually compared to 13 million tonnes of municipal waste and 5 million tonnes of hazardous waste. Multiply that with the number of years we have been generating power thermally, and the quantities will boggle the mind. While urban and municipal wastes have merited the attention of all, fly ash has been literally left abandoned. Where does it go? It is dumped everywhere, on land, in water, in front of peoples homes, and is so fine that it can penetrate deep inside ones lungs.

Why is there so much apathy towards this residue of coal burning? The general belief is that it is inert, non-toxic, harmless, and an almost ready to use construction material. Is that really so? Toxics Link set out to examine the issue, especially in the light of the increasing number of thermal power plants being planned in India presently, and found the issue to be more complex than meets the eye. Not only did available research point to the potential hazards of fly ash, but also that its utilisation was not necessarily as easy as it is made out to be. The following paper is based on both national and international data and concludes that much more work is required to be done before solutions to this monumnetal problem are available.

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1. Introduction

Thermal power plants and fly ash

Sixty million tonnes of fly ash is produced in India per annum from the seventy five coal fired thermal power plants (TPPs) [Vimal, 1996#1]. For every mega watt of power being generated approximately 0.6 to 0.7 tonnes of ash is created every day [Raju, 1996#2]. Delhi alone contributes nearly 5600 tonnes of fly ash every day from its three thermal power plants [Damandeep, 1997#3].

Currently India's total installed capacity for electricity generation is 83,288 mw (year 1996). Out of which, coal fired thermal power plants contribute 53,819 mw, in other words around 65%. The World Bank estimates coal-based power generation to increase by 81,000 mw by 2010 [WorldBank, 1996#4]. This amounts to an additional load of 56 million tonnes of fly ash to be dealt with per year.

Table 1: India power sector (as on 31.3.1996)

Sector	Installed capacity (in mega watt)
Thermal	53,819
hydro-electric	20,976
gas-fed	6,268
nuclear	2,225
Total	83,288

Source [BHEL (Bharat Heavy Electrical Limited,#5]

Despite this monumental generation of fly ash, it appears that international lending agencies and the Indian Government aren't fully prepared to appreciate the magnitude of the fly ash problem. The Government is drawing up plans to expand coal-based generation capacity with loans from the World Bank [World Bank, 1996#4]. Under the ninth five year plan (1997-2002) a large share of investments for the power sector will come from the private sector, both domestic and foreign. Guidelines have been suggested for "the participation of private sector in renovation and modernisation of thermal and hydel power projects"[Parikh, 1997#6].

On the other hand, investments in clean and non-fossil fuel-based technologies have been insignificant despite their low fly ash generation potential. Even the Global Environment Facility, whose mandate it was to promote non-conventional energy as a means to curbing greenhouse gas emissions, has posted an abysmal track record. During the financial year 1995-1996, the GEF approved $34.2 million in grants for fossil fuel-based projects as against $18.4 million for renewable energy technologies [Imhof, 1997#7]. In a recent report produced by Institute for Policy Studies et al reveals that "the world bank has lent close to $10 billion toward the continued use of fossil fuels just since the 1992 climate convention was signed by a majority of world's leader" [Wysham, 1997#8].

With these concerns, Toxics link started its investigation on fly ash. What happens to all the fly ash accumulating over years? How and where is it disposed? On land, in water? How much land is required for the disposal? How much water is required? Is it toxic? Does it affect ground water, surface water? Can fly ash be utilised? If so, how, and is it 'safe'?

Disposal of fly ash is extremely water- and land-intensive, leading to diversion of fertile lands and unsustainable water usage. It also causes displacement of people since large tracts of land are acquired for fly ash disposal, besides leading to air, water and soil contamination. Studies indicate ground water contamination due to leaching of heavy metals present in the fly ash.

Experts have predicted possible human health effects, like permanent respiratory disorder on inhalation of metals present in fly ash, especially by persons living in the vicinity of disposal sites.

Some experimental measures are however being tried out to utilise fly ash. Goverment is investigating schemes for manufacturing bricks, constructing buildings, embankments, roads etc., using it.

Our investigation revealed a lack of data in crucial areas--namely, the environmental and health effects associated with the disposal or utilisation of fly ash. This paper outlines some of the environmental issues concerned with fly ash and hopes to generate some debate as well as demand for further discussion and investigation.

2. What is fly ash?

Fly ash is a by-product of the coal-combustion process in thermal power plants. TPPs currently consume an estimated 150 million tonnes of coal (60 percent of total coal production in India), which is likely to increase to 187.5 million tonnes (75 percent) by 2001 [Vimal, 1996#1].

The amount of ash generated in a TPP depends upon two factors -- the ash content of the coal and the type of boiler used. The coal used in Indian TPPs usually has a high ash content, ranging between 35 percent and 55 percent.

About 20 percent of the non-combustible components of the coal is converted into bottom ash and 80 percent into fly ash [Agarwal, 1996#9]. Fly ash is carried up the chimney stack along with the combustion gas and is captured by an electrostatic precipitator [Vimal, 1996#1].

Fly ash consists of finely divided particles with sizes ranging from 120 micron to less than 5 micron. It is composed of oxides of iron, silicon, aluminium, magnesium, calcium, sodium and potassium.

Table 2: A typical composition of fly ash

Constituents	% Amount
Silicon	50-58
Aluminium oxide	16-31
Iron oxide	6-20
Titanium oxide	1.5-2
Phosphorous oxide	2-2.5
Calcium oxide	0.8-4
Magnesium oxide	1-4
Sodium oxide	0.8-2
Potassium oxide	0.7-1
Sulphur oxide	Traces
Chlorine	Traces

Source: [BHEL (Bharat Heavy Electrical Limited, #5]

Along with oxides, fly ash contains toxic trace elements such as antimony, arsenic, beryllium, cadmium, fluorine, lead, mercury, selenium, thallium and vanadium [Agarwal, 1996#9].

The oxides of iron and aluminium present on the surface of the fly ash particles attracts these toxic trace elements [Sivakumar, 1996#10]. Therefore, the trace elements are found to be concentrated largely on the surface of fly ash particles.

Table 3:
Major and Trace elements in fly ash of Indian thermal power plants

Elements	Conc. in ppm
Arsenic	11.0
Gold	1.7
Barium	828
Bromine	17
Cerium	155
Cadmium	9
Chlorine	890
Cobalt	23.6
Chromium	120
Cesium	10
Copper	100
Europium	1
Iron	47,000
Hafnium	9
Mercury	0.1
Iodine	4
Potassium	8800
Lanthanum	78.5
Lutetium	0.61
Sodium	811
Nickel	150
Lead	35
Rubidium	87
Selenium	27
Silicon	270,000
Antimony	1
Samarium	11.6
Strontium	240
Titanium	9500

Note: ppm-parts per million

[Negi & Meenakshy (1991) and Nandagaonakar (1991)]

3. Fly ash disposal

Like all waste, disposal of fly ash is expensive. It is estimated that almost as high as 2 percent of the cost of a TPP goes into disposal of fly ash [Vimal, 1996#1]. Transportation is a main

component of it. For example, the government alone spent Rs 700 crores in 1995, mainly for moving fly ash from the site of generation to the disposal site [TOI, 1995 #12].

Disposal sites may be on-site or at a distance. Normally they consist of 'custom built' ponds which require large amounts of both land and water.

Land Usage

As a thumb rule, for every mega watt of installed capacity, approximately 0.8 to 1 acre of land can be used to dispose fly ash generated over 25 years, provided the material is allowed to accumulate to a height of 8 to 10 meters. [Sahu, 1994#14].Therefore the estimated land requirement for the 75 existing TPPs amounts to nearly 54,000 acres.

In practice however, there is a lot of disparity between this 1:1 mw to acre ratio, as can be seen in Table 4-5, which lists the land required by the Super and other thermal power plants.

This could be due to various factors -

- a. The type of coal used and boiler type
- b. Ash ponds are over utilised or
- c. Dumping of ash is beyond / outside the pond.

Table 3
Actual acquired land by some of the 'super' thermal power stations in India (1985)

TPP	Installed capacity (mw)	Ash pond size (acres)	ratio
Farakka	2500	2267.46	1:1.1
Korba	2500	6570.2	1:0.3
Koradi	1080	434.72	1:2.4
Singrauli	1050	2964	1:0.3
Vindhyachal	1260	5434	1:0.2

Source: [Thakre, 1996 #11]

Table 4:

Status of fly ash production and land area required for its disposal by some of the Indian Thermal Power Plants for the year 1995-96.

Name of Plants	Installed capacity (mw)	Ash production (tonnes)	Ash pond (acres)
Kota, RSEB	850	9,72,982	1045
Hasbeo, MPEB	840	13,55,641	560
Satpura, MPEB	1142.5	23,58,466	787
Amar Kantak, MPEB	300	3,37,078	24
Sanjay Gandhi, MPEB	420	4,25,837	247
Bandel, WBSEB	530	3,61,355	79
Santaldih, WBSEB	480	2,81,610	4941
Khaperkheda, MSEB	420	8,40,000	865
Paras, MSEB	62.5	48,645	72
Parlvaijnath, MSEB	690	9,69,300	1190
Nashik, MSEB	910	15,21,545	1760

Note:
RSEB: Rajasthan State Electricity Board,
WBSEB: West Bengal State Electricity Board,
MPEB: Madhya Pradesh Electricity Board,
MSEB: Maharastra State Electricity Board.
Source: Malewar G.U, "Fly ash research at Marthwada Agriculture University (MAU) Parbhani."

In West Bengal, acute shortage of land has made it almost impossible to find adequate space for fly ash dumping [Tapan, 1997#15]. As a case in point the proposed and controversial 1000 mw Cogentrix thermal power plant in Karnataka has asked for 1,300 acres of land, out of which 46% of the land i.e. 600 acres, is marked for fly ash disposal. Because of land scarcity and the land turning unproductive, the Ministry of Environment and Forests "has become strict in granting permission to TPPs for acquisition of more land for ash disposal" [Thakre, 1996 #11].

As a way out, sanctioned lands are sought to be used further by constructing tall bunds for accommodating more ash being generated. This may have serious environmental effects since it can lead to a more concentrated leaching of heavy metals into the ground water. (see Section 4).

cogentrix - pushing environmental carrying capacity

In a recent move on the 29 August 1997, the Division Bench of the Karnataka High Court dissmissed the Public Interest Litigation against the Cogentrix thermal power project filed by Janajagriti Samithi and former environment minister Maneka Gandhi. Though it has asked the Ministry of Environment and Forests and the Karnataka State Pollution Control Board to consider the environmental concerns raised in the litigation within 3 months.

The 1000 mw Cogentrix thermal power station proposed for Karnataka's Dakshina Kannada district by the US based Cogentrix Energy Inc., has been in the eye of storm since early 90s, when the Karnataka government gave its go ahead to the company. The proposed site of the plant at Nandikur, three kilometers inland from the Arabian sea, is known for its magnificent biodiversity and lies within an area rich in marine fisheries, and known for its agricultural and horticultural productivity.

The same site, in two earlier occasions, was found unsuitable for siting of thermal power plants on the ecological and economic grounds.

In 1995, the Mangalore Power company, a subsidiary of Cogentrix Inc. acquired 2,02,401 acres in Udupi taluka for setting up 4 x 250 mw coal based TPP. When in operation, the Cogentrix plant is expected to use 5,300 tonnes of imported coal daily. The power station will generate an estimated 685 tonnes of fly ash, and 70 to 80 tonnes of sulphur dioxide will be released into the atmosphere every day [Goswami, 1995 #18].

Understandably, the project has drawn the ire of fisherfolk and horticulturalists who feel that the emissions (solid, liquid and air-borne) threatens their livelihood resource base. Dakshina Kannada, an ecologically sensitive coastal district has become a major centre of industrial investment since beginning of this decade, and it is felt that addition of any new industry, especially the ones like thermal power plant might cause irreversible damage to the already threatened ecology of the area.

For further information on Cogentrix contact
Bangalore Support Group: 153, 5th Main, 4th Block, Banashankari 3rd Stage 2nd Phase Bangalore 560 085 Telefax: 91-80-2262571 Email: admin@leo.ilban.ernet.in

BSES, threatening Dahanu ecological fragility?

Dahanu, a small and quiet taluka in the Thane district of Maharashtra, is rich in marine life and famous for its chikoo and guava production. In the late 1980's, the World Bank proposed funding Brihan Mumbai Suburban Electric Supply Ltd's (BSES) 500 mw coal based thermal power plant in Dahanu for electricity supply to the ever expanding 14 million people in Bombay, and with an expansion plan of 2000mw in future.

Alarmed locals fearing possible environmental damage to the ecologically fragile area, formed a group Dahanu Taluka Environmental Welfare Association (DTEWA) to stop the plant from being set up. DTEWA petitioned to the Bombay high court in 1989 challenging the siting of the BSES plant. A senior advisor from the ministry of environment and forests in 1991 and before that the head of the Thermal Power Plant Committee surveyed the area and found the area environmentally as well as economically unsuitable for setting up a TPP.

Despite this evidence, and the revolt of the local people, the Maharashtra State government gave the clearance, and BSES was built.

Undeterred by this blatant environmental threat, the DTEWA fought to preserve the taluka and in 1991, in a land-mark judgement, Dahanu was declared an ecologically fragile area. This meant "no polluting industries would be allowed to come up in a buffer zone of 25 km around Dahanu" Furthermore, the Coastal Regulation Zone Rules of 1991 imposed restrictions on development within the high tide line [Menon, 1997 #41]

DTEWA continued to question the environmental performance of BSES. In 1996 the matter was brought up in the Supreme Court, which ordered an independent investigation to be carried out by NEERI to determine the environmental performance of BSES.

NEERI investigations showed

- The location of the plant itself violates the sensitive area classification of the MEF's guidelines (1984) for siting of industries.
- The TPP with its construction activity was blocking the free flow of the sea water into the creeks, which had reduced the phytoplankton variety in the creek by 69%, fish variety by 64% and prawn variety by 66%. Furthermore the proportion of fish in a harvest had reduced from 41% to 12%, prawn- from 9% to 0.5%, while trash fish had increased from 38% to 84%.
- There can be accidental escape of fly ash slurry into the creeks.
- BSES's emission of particulate matter was found to be 134 mg/cubic meter and 117 mg/ cubic meter from its two units, whereas the permissible limit set by the State government is 100 mg/cubic meter, exceeding which the plant should shut down. It was also observed that BSES had not installed Flue Gas Desulphurisation (FGD) plant, for control of sulphur emission, as directed by the state and central government.

The Supreme Court took note of all these points observing the ecological fragility of Dahanu and ordered BSES

- a. to shift to natural gas from coal; b. install FGD plant; c. remove obstructions to free flow of water into the creek; d. end the practice of disposing fly ash (more than 3,000 tonnes a day) into the wetland; and e. not to expand beyond 500 mw in Dahanu.

DTEWA says to date there is no sign of any of the above being implemented. So despite the clear and strong SC ruling, they must campaign further for its implementation. [Irani,N. 1997 #13]

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The land for fly ash disposal is often prime agricultural land. Kolaghat Thermal Power Station in West Bengal reportedly dumps fly ash on adjoining farmlands at Kolaghat. "This is unique instance of inappropriate use: while fertile soil is being used for making bricks, fly ash is being used in farmlands", says Subrata Sinha, former deputy director of Geological Survey of India. [FE news service, 1996#16].

Faced with scarcity of land, thermal plants, especially those located in cities, often pump their ash slurry directly into nearby rivers or streams [Sahu, 1994#14]. For example, the Ennore Thermal Power Station in Chennai, Tamil Nadu, which generates 3, 000 tonnes of ash per day, flushes the ash out into the Ennore creek. [Subramanian, 1997#17].

The Brihan Mumbai Suburban Electric Supply Ltd's plant located in the 'eco-fragile' Dahanu taluka of Maharashtra, dump their ash in a nearby wetland. The plant is surrounded by creeks on three sides and is located on reclaimed wetlands between Savta and Dandi creeks. It produces fly ash at the rate of 2,830 tonnes day and bottom ash at around 707 tonnes /day ; both are disposed in a slurry form in 913 9 acres of wetland embanked for fly ash disposal. According to National Environmental Engineering Research Institute (NEERI), the accidental escape of fly ash slurry into the creek is also not ruled out [Irani, N. 1997 #13]. This can cause toxic effects on aquatic life. (see Section 4)

Leaking of fly ash slurry from ruptured pipes as described in a Singrauli report by Peter Bosshard can lead to even large land areas, at times agricultural land, being converted to ash ponds . "A pond of ash slurry which covered at least three hectares of rice fields near Judi village. The pond had been created by ruptured ash pipes leading from the Vindhyachal STPP to the existing ash dikes"[Bosshard, 1997 #19]

In coastal regions or flood belts, fly ash from thermal power plants is dumped in the flood plains changing their natural topography. "A far graver hazard is the dumping of fly ash in flood plains. These are low lying regions that routinely absorb rain water and reduce the intensity of floods" Dhrubojyoti Ghosh, an environmental engineer and UN Global 500 laureate, points out. "This leads to the filling up of the natural depression of the plains that contain the water, thus reducing the natural capacity of the region to mitigate floods" [FE news service, 1996#16].

Water Usage

Fly ash, along with bottom ash is disposed off using either the wet method (slurry form) or dry method into ash ponds [Vimal, 1996#1]. In India, 80 percent of fly ash is disposed off in a slurry (or wet) form. In this case water is used to aid transportation down the pipes and/or to keep it from blowing into the ambient air.

Disposal of fly ash in a slurry form requires large amount of water. Typically, the water to ash ratio in a slurry is 9:1. For example, a 210 mw TPP (Badarpur TPP in Delhi, for instance, has two units each of 210 mw installed capacity) would require a total 400 cu.m/hr of water to dispose fly ash in a slurry form [BHEL (Bharat Heavy Electrical Limited,#5]. (The remaining water is used in the boiler, auxiliary cooling water system, condenser cooling, air conditioning, coal dust suppression, ventilation, service and drinking [Agarwal, 1996#9].)

Because of the high water requirement, TPPs are usually located near rivers for easy access. In some cases, especially in the absence of other sources, tapping of ground water is restored to. This bears an additional load on the water resources by either reducing the availability of water downstream (in the case of river-based Plants) or by depleting the groundwater table.

4.Toxicity and Health Impacts

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the air. The rest 85% -90% of ash is collected in the ash ponds [Sahu, 1994#14].

Fly ash in surface and ground water

Potential ground water and surface water contamination by the leaching of the toxic metals in the fly ash from the fly ash ponds is under extensively research.

An international literature survey of the studies conducted on potential ground water contamination around ash ponds in UK, USA, Poland, done by Prof Manoj Dutta from Indian Institute of Technology (IIT), Delhi and D.S. Sivakumar from Consulting Engineering Services, Delhi, shows leaching of heavy metals into the ground water and soil [Sivakumar, 1996#10]. The major factors influencing the release of contaminants from ash and into the groundwater include quality of coal, source of water, pH, time, soil attenuation capacity, release mechanisms, solubility controlling mechanisms, long term weathering etc.

Laboratory studies reveal the possibility that toxic metals, confined to the surface of the ash particle, can be easily mobilised from the particle surface and pollute the surrounding water bodies even by mild acid rain which is characteristic of a thermal power plant region due to the emission of sulphurous gases [Sahu 1994#14].(See Annex:1 Environmental impacts of thermal power plants)

Scientist are of the opinion that field studies have to done to predict accurately the potential of groundwater contamination around ash disposal sites. Says Sivakumar and Dutta, "Field sampling of ash, soil, leachate water and groundwater are the only reliable tests for assessing potential groundwater contamination." But in case of insufficient field studies, results from laboratory tests and studies can not be ignored.

Some field studies conducted in the US and also in India reveal the possibilty of surface and groundwater contamination around ash ponds. For instance, a US field study conducted at a coal fired thermal power station adjacent to lake Michigan, revealed an increase in the concentration of heavy metals in the soil around ash ponds due to leaching of the metals from the ponds [Sivakumar, 1996#10].

Ecologists at the Savannah River Site are finding high levels of heavy metals in animals exposed to coal fly ash left over from burning coal at the federal reservation. "We have observed effects on many biological systems of tadpoles exposed to the heavy metals..... We think cadmium is causing them to have central nervous system problems" [Rowe et al 1997, #42].

In India, a study by Prof K C Sahu from IIT, Bombay on the Talcher thermal plant in Orissa, which generates 3,000 tonnes of ash every day, found: ". . .even if only 15% of the toxic metals are leached out, the adjacent Nandira river will receive 208 kg of iron, 56 kg of zinc, 45 kg of copper, 5 kg of cadmium, 56 kg of nickel, 4.6 kg of uranium, 16.5 kg of thorium, 60.6 kg of chromium and 11.2 kg of cobalt per day, all in a mobile state". Prof K C Sahu concluded "The long term impact of such an addition is little understood" [Sahu, 1994#14].

Another ground water test conducted at Motera ash pond site and other surrounding areas near the Sabarmati thermal power station near Ahmedabad, recorded fluoride content of over 1.85 ppm as against the permissible limits of 0.6 ppm to 1.2 ppm [Misra, 1997 #20]. Chronic or acute exposure to fluorides is known to cause fluorosis. [Sax,#21] a debilitating ailment that usually weakens the bone structure, especially among children.

A report by Peter Bosshard on Singrauli--The Singrauli Experience' also acknowledges the potential groundwater contamination by heavy metals from the fly ash slurry [Bosshard, 1997 #19].

The above mentioned problems are further aggravated by repeated dumping of ash on the same land. It will "intensify the leaching into ground water stratum. But, unfortunately, this problem has not yet attracted the attention of researchers in India" [Thakre, 1996 #11].

Fly ash in ambient air

Inhalation of metals present in fly ash released into the air is said to be more harmful than

ingestion by way of food or water [Khare, 1996 #22].

Ash collected in the ash ponds spreads in the ambient air in the form of fine particles by surface wind as the pond starts drying up. As a rule, the ash ponds are supposed to be kept moist, but often TPPs do not maintain the moisture content of the ash ponds.

These finer particles of fly ash are a greater source of concern. The concentration of the metal increases as the size of the fly ash particle becomes smaller. On inhalation the 1 to 10 micron size particles are trapped in the nasal mucus, 75% of which is normally swallowed. When these particles reach the stomach most of the metals are extracted by the gastric juices and could easily enter the body fluids.

Submicron or particles smaller than 1 micron enter deep into the lungs and are deposited in the alveolar walls where the metals could be transferred to blood plasma across the cell membrane. Silica in the fly ash particle can cause silicosis [Sahu, 1994#14].

The health effects range from permanent respiratory disorders, aggravation of ailments like asthma, bronchitis and even lung cancer due to prolonged inhalation of fly ash [Misra, 1997 #20].

Toxicity of heavy metals, some of which are known to be present in fly ash are given in the following table.

Table 6: Threshold Limit Values (TLV) and Toxicity of some Heavy metals

Elements	TLV (air) mg/cu.m	TLV (water) mg/l	Toxicity
Copper	0.2	< 1	Wilson disease, liver problem
Lead	0.15 in 8 hours	0.05	Nephritis (Kidney disease), convulsion, insomnia, headache, muscle pain, encephaliopathy
Zinc	Chloride 1 Zn fume 5 Zn-stearate 10	5	Fever, Tremor
Cadmium	0.1 to 0.05	0.01	Kidney damage, high blood pressure, Cd-ring teeth, 'itai-itai, skeletal deformation, impairment of bone marrow, aging, carcinogenic.
Mercury	0.005	0.005	Neurological and kidney damage, Minamata disease (crippling)
Molybdenum	5 to 10	< 0.005	Pulmonary disorders
Arsenic	0.002 to 0.25	< 0.03	Dermatitis cancer, perforation of nasal septum, conjunctivitis, hearing loss, black foot disease, Hyperkeratosis.
Nickel	carbonyl 0.007 Metal 1.0	< 0.005	Carcinogenic (skin), Carbonyl poisoning
Chromium	0.1 to 0.5	< 0.05	Dermatitis, Skin cancer
Manganese	0.3 to 10	< 0.05	Parkinson disease, Manganism, Respiratory disorder, Pneumoconiosis
Vanadium	dust 0.05	< 0.1	Respiratory irritation, cardiovascular disease, may be carcinogenic
Tin	organic 0.1 Sno2 inorganic 2		Pneumoconiosis, Stannosis, Neurological damage.

Source: [Sahu 1992#23]

Singrauli - energy capital, future desert

Singrauli is a remote area on the border of Madhya Pradesh and Uttar Pradesh, and until the early 1960s, it was richly forested with abundance of wildlife. People living there were self sufficient, tribal groups, living off the land. In 1970's the region experienced a spate of 'intensive economic development'. Since 1977, the World Bank has extended loans for setting up TPPs, transmission lines and a coal mine in Singrauli. With the construction of a large Rihand reservoir, followed by eleven coal mines, six thermal power plants, and several industrial complexes, Singrauli today is considered to be the energy capital of India.

This rapid development of power plants, mines, factories and influx of migrant workers led to severe rupture of social ties and physical environment of Singrauli. So far, about three lakh people have been involuntarily resettled in the area. A World Bank report in 1992 observed, "unemployment, particularly of the original local population, inadequate resettlement and rehabilitation compensation, inadequate sanitation and pollution of drinking water sources and degradation of forest resources."

Since 1980s many NGOs - Indian and international - have been involved in Singrauli, campaigning for the social justice of the local people, trying to get them fair and just compensation. They have documented many cases of polluted rivers and streams, contaminated wells, and widespread sickness among locals and their cattle. According to them, "an analysis of food crops in the Singrauli area revealed mercury (See Annex 1) contamination above levels of concern and high fluorine and chromium levels."

The World Bank and the power plants have done and are still doing environmental studies in the area, but their results are hardly ever revealed to the NGOs [Bosshard, 1997 #19]

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5. Let's find a solution

Rather than wean ourselves away from fossil fuel and move towards renewable energy alternatives (see Annex 2), or look at ways of not producing fly ash and eventual elimination of these problematic wastes, we seem to be investing more and more in answering the wrong question--- "How to deal with fly ash?", rather than "How not to generate fly ash?".

Clean it

The Indian government is experimenting with the much touted "clean coal" technologies peddled by northern mining interests. One such technology involves the use of washed coals: claimed to reduce the ash content in the coal. But how much ash content is reduced by coal washing, and at what costs is left unanswered. Some experts are of the opinion that "ash content, which is an intrinsic property of coal, is reduced marginally by coal washing". And also the other obivious problem of effluent from coal washries has been left unaddressed.

In fact the central Ministry of Environment and Forests plans to issue directives for use of only washed coal in thermal power plants.However, nothing to that effect has happened as yet. Moreover at present there are no washeries for washing non-coking coal (coal used in TPPs) in India. "In 1988, the Ronghe Committee appointed by the Planning Commission had recommended that coal to be supplied to new power stations located more than 1000 km away from the coalfields, should be beneficiated to reduce the ash content to about 34%. Based on this recommendation, the government has sanctioned five non-coking coal washeries with a total capacity of 24 metric tonne (MT) per annum"[Parikh, 1997#6].

Other 'clean coal' technologies, like 'gasification' also claims to lower the ash content of coal. The Department of Science and Technology (DST) of the Government of India is working on different clean coal technology projects. "India will be implementing clean coal technologies by 21st century," says Dr Malti Goel of DST. On the economics of it, she said, "Though it's expensive.... we still have to adopt them. Apart from ensuring cleaner production it would mean higher efficiency of the coal which in turn means less coal consumption" [Goel, 1997 #24].

However, these technologies, still represent a back-end approach to pollution. And they are not cheap.

Use it

The promotion of fly ash as a construction material has been around in the North for over 10 years, and is now gaining momentum in India. At present only 3 to 5 percent of fly ash is used for construction in India, compared to 20% in the US (the rest is disposed in landfills or surface impoundments) [Wysham, 1997 #25].

Annex 3 lists some examples of international usage of fly ash in construction.

The Fly Ash Mission was set up in 1994 as a technology project undertaken by Technology Information Forecasting and Assessment Council of the Department of Science and Technology (DST), to advise government and help form policies for 'gainful utilisation' of fly ash.

According to the DST, the Fly Ash Mission is working with the Central Road Research Institute and both are "engaged in various projects for gainful utilisation of fly ash. These include – land-filling; manufacture of fly ash bricks, portland pozzolona cement, fly ash blocks, light- weight aggregates and concrete."

With the Supreme Court directive for the closure of all brick kilns in Delhi using top soil by June 1997, there might be a possibility of rising demand for fly ash, at least in Delhi. [Damandeep, 1997#29]. Annex 3 also lists some of the current uses for fly ash in India, which range from: Okla flyover and Nizamuddin bridge embankments; human dwellings in Panipat; fly ash bricks for roads; and in agriculture for its micro-nutrients.

Is fly ash utilisation environmentally safe?

Fly ash utilisation is being promoted as an "eco-friendly solution". It is certainly a use of an otherwise useless and potentially hazardous waste. We have not found any data to indicate

any environmental problems with fly ash utilisation. This could be a result of inadequate focus on the problem. But nor have we found any data that actually absolves fly ash products of potential environmental contamination. In fact, most proponents of fly ash products do not seem to have given this aspect any serious thought. Studies examining the environmental and health effects due to leachates from such applications are hard to come by. "At the moment we are in the process of studying whether utilisation of fly ash will have any human health or environmental effects or not. We are generating data for 3 years after which we can confidently say that fly ash is environment friendly" says Vimal Kumar Director of Fly Ash Mission [Vimal, 1997#36].

Strangely, without having enough scientific data to back up their claims, fly ash mission and other such agencies are promoting the use of fly ash extensively ! "Whatever data we have indicates that fly ash utilisation will not have any adverse effects whatsoever" [Vimal, 1997#36]. And "whatever studies and data" is being generated is inaccesible as they are yet to be published.

The Bureau of Indian Standards (BIS) has formulated some basic standards for fly ash utilisation in bricks, cement, admixture for structural mortar and concrete, which gives specifications for strength and durability of the products but none of them give any specification for radiation; or leaching of heavy metals from fly ash.

"We are formulating radiation standards of fly ash for different usage which will be incorporated in the already existing BIS standards", informed Kumar [Vimal, 1997#36]. Countries like Denmark have already set rules which stipulates putting a 0.2 meter layer of gravel over fly ash when used as foundation to reduce radiation from fly ash [Póvl, 1997#37]. "But in India radiation from fly ash is not really a problem" [Vimal, 1997#36]. No official standards exist for dumping of fly ash in landfills, despite scientific studies strongly indicating the leaching of heavy metals from ash ponds into the ground water.

Surprisingly, the US Environment Protection Agency (EPA) has no guidelines on fly ash from coal combustion. Regarding the use of fly ash, a 1993 US EPA report notes that "fly ash is a legitimate concern if applied directly to agricultural soil, but when used as a constituent of concrete it tends to become immobilized" [Kniffin, 1997#44].

Or economically viable?

Economically, fly ash bricks are said to be 10% - 15% costlier than the usual bricks. Transportation costs are a major impediment to fly ash usage. The brick manufacturer has to pay not only the transportation cost of fly ash from the thermal power plant but also service charges to the power plant authority [Krishna - -murthy, 1997#38]. So much for the 'polluter pays' principal, this actually taxes the user instead of the polluter!

Or constructively stable?

One study points out potential construction problems associated with fly ash-based bricks or mortar. When fly ash comes in contact with water, the alumino-silicate along with sodium, potassium and calcium in the ash particle forms a thin layer of polysialate (zeolite structure) -- mineral layer -- over the ash particle over a period of time. This formation of mineral layer on the ash particle surface in the brick is likely to decrease the inter-particular cohesion between the ash particles leading to the weakening of the brick in due course. Structures built with such bricks may collapse as the bricks start losing internal strength. Experiments are continuing to confirm this phenomenon [Sahu, 1997#34].

A EPA report (1983) says that fly ash has been used in construction of very large buildings in the United States, including the Sears Tower in Chicago. In contrast, Maria Pellegrano, a researcher for Rachel's Environment and Health Weekly, says "eventually the ash will leach out of the bricks (especially the toxic components). The bricks will eventually come apart." Going further, she says "the use of ash in bricks is another example of placing the problem on the next generation" [Kniffin, 1997#44].

Annex 1

Environmental Impacts of Coal Fires Thermal Power Plants

Studies and research world wide has shown coal fired thermal power plants cannot generate electricity without creating environmental pollution in one form or another, be it air, water or soil.

The major impact of TPPs are to the climate change caused by emissions of carbon dioxide. Other impacts are from particulate matter (fly ash), sulphur dioxides, nitrogen oxides, carbon dioxide, carbon monoxide, hydrocarbons and trace elements.

a. Sulphur dioxide and Nitrogen oxides.

"Sulphur dioxide and nitrogen oxides from power plants combine with moisture in the atmosphere to produce acid rain, which can reduce crop yield, slow tree growth, kill fish and amphibian species, and destroy vital organisms in the soil" [Salzman, 1994#39]. Estimates reveal that a super thermal power plant using even normal or low sulphur coal will emit about 100 tonnes of sulphur dioxide a day [Sahu, 1994#14]

b. Carbon dioxide

Carbon dioxide, a heat trapping gas, causes the earth's temperature to rise, "triggering increases in the intensity and frequency of tropical storms, floods and droughts, as well as rising sea levels." In the US power plants emit more carbon dioxide than vehicles or any other single source. Interestingly, the existing regulations relating to power plants in the US have not even regarded carbon dioxide as a pollutant [Salzman Jason, 1994#39]

The amount of carbon dioxide emitted from TPPs depends upon the carbon content of coal. "With 65% carbon content in the coal, a 500 mw TPP would release 8,500 tonnes of carbon dioxide per day" [Agarwal, 1996#9].

c. Nitrogen Oxides, hydrocarbons and particulates

Nitrogen oxides, hydrocarbons, and particulates can increase already existing respiratory illness, impair breathing and cause coughing in humans apart from reducing visibility in specific locations.

d. Mercury emisions

Coal fired TPPs are a major source of mercury emission in the air.TPPs are " the largest anthropogenic source in the US of airborne mercury pollution, with an estimated emission rate of 117 tons per year [US EPA 1993] Mercury is a deadly heavy metal that accumulates in the body and causes birth defects. A report prepared for the International Joint commission formed between the US and Canada lists mercury as a persistent toxin and calls for "virtual elimination of mercury emissions because of its potential for poisoning of great lakes and the food chain therein" [Salzman, 1994#39].

Reports from Singrauli, which has six TPPs, reveal "average mercury concentration in food crops to be sixfold higher than the maximum level as defined by the US Fish and Wildlife Service. The TPPs release 720 kg of mercury per annum" [Bosshard, 1997 #19].

e. Temperature change etc in surrounding water

The intake and outflow of cooling water from TPPs is also a cause of concern as they threaten aquatic life by altering water temperatures and decelerating river flow.

f. General wastes

Waste from TPPs contain ash laced with arsenic, barium, cadmium, chromium, lead, mercury and radioactive isotopes that can potentially contaminate aquifers [Salzman, 1994#39].

Annex 2

Renewable Energy Scenario

The estimates of Ministry of Non Conventional Energy Sources show India has a potential for generating 126,000 mw of energy from renewable sources. This would feed 1.5 times the amount of energy presently required (84,000mw). That's the theory. In practice at present the total installed capacity of renewable energy in India is 919.2 mw or 1.5% of the total power generation capacity of the country. Installed capacity of renewable energy is projected to rise to 1,400 mw by end of 1997, in fact the Government of India has an ambitious plan under the ninth five year plan (1997-2002) to increase this figure to 3,000mw.

Estimates of potential for Renewable Energy

Sources/Technology	Approximate potential
Biogas Plants(no.)	12,000,000
Biomass	17,000
Improved woodstoves (no.)	120,000,000
Solar Energy	20 mw/sq.km
Small Hydro	10,000
Wind Energy	20,000
Ocean Thermal	50,000
Sea wave power	20,000
Tidal Power	9,000

Source:(MNES,1997#40)

Unfortunately, the laws and regulations governing power generation and distribution, (namely the Indian Electricity Act 1910; Electricity (supply) Act 1948, together with the periodic modifications of these acts), do not mention explicitly or encourage renewable energy sources. Funds for the promotion of renewable energy technologies are meagre compared to conventional energy sector. In the eighth five year plan (1992-97) renewable energy sector was allocated Rs 857 crores, which was about 0.8% of the total funds allocated to the energy sector.

Cumulative capacity of renewable sources (till march 1996)

Sources/Technology	Units
Wind	732 mw
Small hydel	121 mw
Biomass through cogeneration	29 mw
Biomass through combustion	–
Biomass through gasifier	22 mw
Solar photovoltaic	5.2 mw

Source:(MNES, 1997#40)

Experts feel the development of renewable energy sources has suffered from many institutional, technical, financial and economic constraints. Lack of awareness among the people due to limited information flow from the government agencies has led to a pre conceived notion that renewable energy technologies are only meant for demonstration projects and are not feasible for power generation in large scale. The case is quite similar in the US, where the electricity producers show reluctance to invest in clean renewable energy sources and "are proposing to build massive new generation of fossil fired power plants over next 20 years." Renewable energy sources accounts for only 5% of the new and proposed power plant capacity between 1990 and 2014 in the US. "The addiction to fossil fuels is as intense as ever with renewable being ignored" [Salzman, 1994#39].

Annex 3

Examples of uses of fly ash - a) International

- ReUse Technology, Inc , a wholly owned subsidiary of Cogentrix Energy, is one of the major companies in the US promoting ash utilisation. It has an installed capacity for taking and converting coal ash into commercial products to the tune of over one million tonnes per year [India Ash Products, #26].
- A proposal by a US based company to make houses using fly ash in the Philippines is under consideration at the moment. Basic Industry Technology Inc , a California based company in the US, has proposed to build low income housing in the Philippines using coal fly ash. Its being promoted as house for the poor, jobs for the unemployed etc. The plan is to mix the ash with wheat, rice, straw and cotton waste to make the housing material [Leonard, 1997#27]
- Israeli scientists have developed a park near Tel Aviv using fly ash and waste water from a thermal power station. "A 17 meter high embankment built from coal ash shields the park from the ugly sight of the thermal power station..... Some 4.20 lakh cubic metres of ash has gone into making the barrier, which has now been covered with soil and landscaped with shrubbery, waterfalls and promenades" [TOI, 1997#28].

b) India

- Central Road Research Institute (CRRI), Delhi along with Fly ash Mission has constructed embankments using fly ash at the Okhla flyover bridge, Hanuman Setu and plans are also underway to use fly ash for building the embankment at the Nizammuddin bridge in Delhi. CRRI has also constructed road at Raichur (Karnataka) using fly ash.
- CRRI plans to construct human dwellings over the abandoned ash ponds in Panipat. A two room dwelling unit has already been constructed as a part of a demonstration project by the Fly ash Mission [Fly ash Mission, #30].
- India is getting financial and technical assistance from countries like Germany, Holland and Japan for making fly ash bricks. For example in West Bengal there are proposals to set up plants for manufacturing fly ash bricks with foreign assistance which "would have wide application in the constructions of walls, footpaths, platforms, paving of roads.....", [Tapan, 1997 #15].
- The Institute for Solid Waste Research and Ecological Balance has recently modified its Fal-G technology, a small scale technology which is widely used to make fly ash bricks using fly ash, lime, gypsum and ordinary portland cement [Chandrashekar S., 1997 #32].
- CRRI has come up with a new "interlock block" technology for construction of roads, service lanes and pavements. It is described as, "these square or rectangle shaped concrete blocks, which are made of fly ash or concrete and are easy to use, economical and environment friendly, are laid in such a manner that they get interlocked" [TOI, 1997#31].
- DLF, one of India's major real estate and construction company has recently developed a building material using fly ash. Claiming it to be 'eco-friendly, lighter and cost effective than bricks', the 'cellular lightweight concrete', as it's called, uses some "unique" foaming agent imported from Germany for mixing fly ash with cement, sand and water. This material uses more than 25% of fly ash. The company further claims that due to its lighter weight, this material accounts for nearly 40% reduction in the weight of the construction, the buildings made of this material are earthquake resistance even in highly seismic zones [DLF Press release. 1997 #33].
- Fly ash is also being promoted for use in agriculture as it contains micro nutrient heavy metals like nickel, cadmium, zinc and also macro nutrients such as potassium, oxides of nitrogen, phosphorous, sulphur. But all this is presently restricted to laboratory or field studies [Sahu, 1997#34].
- The Thappar group of industries has submitted a proposal worth Rs 70 lakhs to the Fly Ash Mission for using fly ash in Eucalyptus plantation in Orissa. The proposal is under consideration at the moment [per. comm.#35].

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OH-4

Preliminary enquiry into the health problems of the people of the villages living in and around the SIPCOT Chemical Industrial Estate, Cuddalore.

Report of the visit to Cuddalore SIPCOT.

Dr R Sukanya. MD (Community medicine). Public Health specialist

Two villages Sonnanchavadi and Eachangadu were visited on 21st and 22nd,October 2002. The purpose of the visit was:

1. to establish perceived morbidity of the villagers and the kind of problems attributed to environmental pollution
2. to understand the impact of any such environmental hazard on the lives of the people.

Men and women in the villages were interviewed either in groups or as key informants. The findings based on the preliminary interviews are presented.

Sonnanchavadi, Semmankuppam Panchayat, Cuddalore

Sonnanchavadi a small village with about 80 households is situated about 15 km from Cuddalore town, on the Chennai-Chidambaram highway, and on the banks of the Uppanar River. The units situated nearby are :

a) Pioneer Miyagi Chemicals (P) Ltd.: They manufacture Ossein and Di-calcium phosphate using crushed bones, hydrochloric acid and lime.
b) Atofina Peroxides India Ltd: Manufacture organic peroxides, phosphorous acide (by product), lauroyl chloride, benzoyl peroxide, using as raw material lauric acid, dimethyl phthalate, methyl ethyl ketone, benzoyl chloride, 2-phenoxyethyl chloroformate, methane, secondary butyl and 2-ethyl hexyl chloroformate.
c) Bayer Sanmar Ltd: Manufacture thermoplastic polyurethane using as raw material polyester polyol, polyether polyol, dianol, 1,4 butane diol, dimethyl diphenyl diisocyanate, adipic acid

Sonnanchavadi is a fishing village. The villagers make their living by fishing in the Uppanar river and selling in the nearby villages and town. Most of them have thatched houses and use firewood for fuel. Most of the women are housewives but some of them also sell fish. The families are of poor socioeconomic status and even the women's self-help groups are defunct.

Occupational health problems among fishermen

Since September 18, 2002, the men in the village are without work after they developed scalding skin lesions while fishing in the river. From September 1, 2002, the fishermen of Sonnanchavadi and nearby Sangolikuppam started experiencing severe itchy skin lesions on both their upper limbs and on their chest and abdomen. From the respondents' descriptions, the lesions progressed from reddish papular itchy lesions to bleeding, eczematous skin with the skin peeling off in severe cases. On the day of visit, almost a month later, examination revealed that the lesions were healing with black pigmentation, scaling and wrinkling of skin. They were distributed on the flexural aspects of both the arms (more on one side for some people), near the elbow and on the dorsal aspect of the feet.

One fisherman, who is handicapped, complained of skin lesions on his thighs and buttocks. Unlike other fishermen, who cast their nets standing, this person sits crosslegged on the kattumaram while fishing.

An elderly fisherman had thick blackish plague-like skin lesions (lichenification of lesions) at similar sites on the limbs and body. The lesions have persisted for more than 6 months despite the fact that he has stopped fishing and hasn't entered the river during the period.

According to the villagers, the skin lesions appeared insidiously and was aggravated upon repeated contact with the contaminated river sludge and water from the fishing nets during their fishing activity. The lesions occurred on sites when the nets comes in contact with the body as it is removed from the water.

Two women, who had entered the river to help in fishing, also had similar lesions.

The nature, onset and distribution of the skin lesions in the fishermen suggest that, it is *Irritant Contact dermatitis* quite likely caused by some chemical(s) in the polluted river. The fact that only those who had entered the river – predominantly men and two women -- have these symptoms, and that the lesions are located on those places on the body which comes in contact with contaminated sludge or water from the nets, leaves little room for doubt that the condition is caused and aggravated by the pollutants in the river.

Pioneer, which manufactures Ossein by dissolving bones in hydrochloric acid, has been identified by the villagers as a point source of the pollution that caused the recent episode of skin diseases. According to a New Jersey Department of Health factsheet, "Contact [with Hydrogen Chloride] can cause severe skin burns and severe burns of the eyes, leading to permanent damage with loss of sight. Exposure to dilute solutions may cause a skin rash or irritation." [Source: Factsheet on HCl from the New Jersey Department of Health, Occupational Health Services, New Jersey, USA, February, 1989. See Annex 1]

HAZARD SUMMARY

* Hydrogen Chloride can affect you when breathed in.
* Breathing the vapor can irritate the lungs, and cause bronchitis. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
* Continued contact with dilute solutions may cause a skin rash or irritation.
* Hydrogen Chloride is a CORROSIVE CHEMICAL and contact can cause eye damage that could lead to blindness. It can also cause severe skin burns.
* Exposure can irritate the mouth, nose, and throat. Long-term exposure may cause erosion of the teeth.

[Source: Factsheet on HCl from the New Jersey Department of Health, Occupational Health Services, New Jersey, USA. February, 1989]

The villagers reported that they hadn't gone fishing in over a month (since September 18) after the district Collector expressed his inability to help them and asked them to quit fishing in the river.

Quality of Medical Care

Medical care offered to the affected victims was far from satisfactory. On perusal of the few prescriptions given at the PHC, Karaikadu, it was obvious that the history and diagnosis were not noted. Only *Silver sulphadiazine* (given for burns) and *Povidone iodine* (antiseptic) have been given as local application. Some antihistaminics (for itching) and vitamin tablets were also given. None of the villagers had gone to a private practitioner due to the expenses involved. It is obvious that the PHC was not fully equipped to treat this occupational health problem and the lack of medical documentation of such an incident in the prescriptions is cause for grave concern.

State of General Health

Sonnanchavadi villagers consume fish caught from the Uppanar and report strong smells from the cooked fish. The smoke and associated stench from the nearby factories also cause respiratory difficulty, suffocation and headache among women and men. Mothers say that their children are undernourished and weak. They notice remarkable improvements in their children's health whenever the children stay in a relative's house even two villages away.

The environmental impact on the children's health is compounded by the fact that younger children are unable to adequately express their problems.

Eachangadu is sandwiched between SPIC Pharmaceuticals on one side and many other smaller chemical units on the other side, including Asian Paints, Vanavil Dyes, Tagros Chemicals and Shasun Chemicals. There is a continuous stench from the nearby factories. Depending on the source and type of emission, the smells vary –rotten–egg, burnt material, paint thinner or nail polish etc. Most of the villagers are daily wage labourers, earning a livelihood from agriculture, construction or through temporary contract work in nearby factories. Men usually find work on an average for 10-15 days in a month.

There are 150 households living in mostly thatched and tiled houses and use firewood for fuel. There is a high rate of indebtedness with average debts ranging upto Rs15,000 per family.

Two women from two self-help groups were the key source of information. They spoke about the general health problems of all age groups. General complaints included burning and watering of eyes in all age groups, diminishing vision, headache, dizziness and feeling of suffocation and respiratory difficulty among the women and men.

Children are not healthy and are plagued by frequent episodes of Upper Respiratory infections (cough and cold). The general well being of the children under 5 years old is not satisfactory. Some houses with children under 5 were visited. Mothers complained that their wards suffered from frequent colds, especially running noses every other week. Every episode of an Upper Respiratory infection poses an increased risk of spread to the lower respiratory tract and ears leading to deafness. At least two companies in the near vicinity of the village manufacture antibiotics and other drugs, including penicillin. Given that these companies have been identified as among the notorious polluters (air and water) by the villagers, the risk of antibiotic resistance to penicillin and cephalosporins among the children is a matter of grave concern. The cost of medical treatment for the children ranged from Rs.100-500 for every episode.

A 40-year old woman supplying tea to a nearby factory for the last fifteen years is suffering from symptoms of acute onset breathlessness relieved only with treatment in a hospital. This is a probable case of asthma. A more thorough investigation may be conducted to see whether more cases of similar asthma are reported in the village. *Occupational or environmental exposure to discharges from pharmaceutical factories – like the Penicillin unit -- could increase the chance of allergic drug-induced asthma.*

Case Studies

Mr.Pachaiappan, age 50, was a contract worker in SPIC when he developed progressive skin lesions on his Right foot and the toes started shrinking. His work involved standing in effluent treatment plant sludge and loading it into a truck. He

was operated and his toes removed. The company through the contract agent met his hospital charges and gave him Rs.10,000 as compensation. No proper rehabilitation was attempted and presently, he has lost his ability to earn a livelihood and is in need of physiotherapy and crutches.

Ms. Anjalai, employed previously at SPIC, suffered a fall that injured her neck and paralysed her right upper and lower limbs. SPIC met her hospital charges and provided some monetary compensation. Currently, she is house-ridden, has developed contractures of both lower limbs and the suture wound on the right side of the neck is infected. Anjalai reports that she was sent back without proper treatment at the Cuddalore General hospital as she lacked previous medical records.

Conclusion and Recommendations

Chemical pollution of the River Uppanar and of the general environment has clearly degraded the quality of life of the villagers of the two hamlets visited – Sonnanchavadi and Eachangadu.

In the fishing village of Sonnanchavadi, chemical contamination of the river poses a serious and ongoing occupational health threat. The fact that the villagers have been forced to stop fishing – and suffer wage losses – is a violation of their fundamental and constitutionally guaranteed right to livelihood.

Immediate steps need to be taken to compensate the fisherfolk for their loss due to their inability to fish. Steps also need to be taken to prevent any further pollution of the river and to make the polluters pay for its clean-up.

Health problems among people due to exposure of environmental toxins is an important public health problem. Threat of emerging antibiotic resistance, eye problems, chronic compromise of lung functions, high morbidity among children, lack of proper medical care and rehabilitation, medical apathy are all highlighted in the case studies from Eacahngadu.

The health effects among women remain difficult to account for. As caretakers of the men and children, the health of the family takes priority over their personal health.

There is a need for a comprehensive health assessment of the villagers and workers of the SIPCOT industries. Accessibility, Availability and Quality of medical care for the people in the villages and factories are important issues to be addressed. The findings of any Environmental impact assessment done should be shared with all people. There is a need for all local doctors to be proactive in identifying occupational and environmental health problems and providing care and seeking justice for those impacted by pollution.

There is an urgent need to take active measures to stop the contamination from the nearby factories and to restore the quality of the water to prevent further damage to health of all.

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*****************************************
*     HAZARDOUS SUBSTANCE FACT SHEET    *
*        RIGHT TO KNOW PROGRAM          *
*     NEW JERSEY DEPARTMENT OF HEALTH   *
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Common Name: HYDROGEN CHLORIDE

CAS Number: 7647-01-0
DOT Number: UN 1050 anhydrous
UN 1789 solution

RTK Substance number: 1012
Date: February 1989 Revision: First

HAZARD SUMMARY

* Hydrogen Chloride can affect you when breathed in.
* Breathing the vapor can irritate the lungs, and cause bronchitis. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
* Continued contact with dilute solutions may cause a skin rash or irritation.
* Hydrogen Chloride is a CORROSIVE CHEMICAL and contact can cause eye damage that could lead to blindness. It can also cause severe skin burns.
* Exposure can irritate the mouth, nose, and throat. Long-term exposure may cause erosion of the teeth.

IDENTIFICATION

Hydrogen Chloride is a colorless gas with a strong odor. It usually exits in a solution named Hydrochloric Acid. It is used in metal processing, analytical chemistry and making other chemicals.

REASON FOR CITATION

* Hydrogen Chloride is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DEP, DOT, NFPA and EPA.
* This chemical is also on the Special Health Hazard Substance List because it is CORROSIVE.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from you employer. If you think you are experiencing any work-related health problems, see a

doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
* ODOR THRESHOLD = 0.77 ppm.
* The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

WORKPLACE EXPOSURE LIMITS
OSHA: The legal airborne permissible exposure limit (PEL) is 5 ppm not to be exceeded at any time.

ACGIH: The recommended airborne exposure limit is 5 ppm which should not be exceeded at any time.

WAYS OF REDUCING EXPOSURE
* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to Hydrogen Chloride.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Hydrogen Chloride to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to Hydrogen Chloride:

* Contact can cause severe skin burns and severe burns of the eyes, leading to permanent damage with loss of sight.
* Breathing the vapor can irritate the mouth, nose, and throat. High levels may irritate the lungs, causing coughing and/or shortness of breath. Higher exposures can cause a buildup of fluid in the lungs (pulmonary edema), a medical emergency.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to Hydrogen Chloride and can last for months or years:

Cancer Hazard
* There is limited evidence that workers who are manufacturing Hydrogen Chloride have an increase of respiratory cancers.

* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard
* According to the information presently available to the New Jersey Department of Health, Hydrogen Chloride has not been tested for its ability to affect reproduction.

Other Long-Term Effects
* Hydrogen Chloride may cause erosion of the teeth.
* Exposure to dilute solutions may cause a skin rash or irritation.
* Very irritating substances may affect the lungs. It is not known whether Hydrogen Chloride causes lung damage.

MEDICAL

Medical Testing
For those with frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

* Lung function tests.

If symptoms develop or overexposure is suspected, the following may be useful:

* Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures
Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically pump liquid Hydrogen Chloride from drums or other storage containers to process containers.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by Hydrogen Chloride should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Hydrogen Chloride.
* Eye wash fountains in the immediate work area should be provided for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with Hydrogen Chloride, immediately wash or shower to remove the chemical.
* Do not eat, smoke, or drink where Hydrogen Chloride is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing
* Avoid skin contact with Hydrogen Chloride. Wear acid-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends natural rubber or neoprene as protective materials.

Eye Protection
* Wear splash-proof chemical goggles and face shield when working with liquid, or gasproof goggles when using the gas, unless full facepiece respiratory protection is worn.

Respiratory Protection
IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account

workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over 5 ppm, use an MSHA/NIOSH approved full facepiece respirator with an acid gas canister which is specifically approved for Hydrogen Chloride. Increased protection is obtained from full facepiece powered-air purifying respirators.
* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect Hydrogen Chloride, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters, to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposures exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode.
* Exposure to 100 ppm is immediately dangerous to life and health. If the possibility of exposures above 100 ppm exists use a MSHA/NIOSH approved self contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health
Occupational Health Service
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health physician who can help you find the services you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-5627.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

CAG is the Carcinogens Assessment Group of the federal EPA.

A carcinogen is a substance that causes cancer.

The CAS number is assigned by the Chemical Abstracts Service to identify a specific chemical.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A miscible substance is a liquid or gas that will evenly dissolve in another.

mg/m3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A reactive substance is a solid, liquid or gas that can cause an explosion under certain conditions or on contact with other specific substances.

A teratogen is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The vapor pressure is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>E M E R G E N C Y I N F O R M A T I O N <<<<<<<<<

Common Name: HYDROGEN CHLORIDE
DOT Number: UN 1050 anhydrous UN 1789 solution
DOT Emergency Guide code: 15/60
CAS Number: 7647-01-0

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	0
CORROSIVE		
CONTAINERS MAY EXPLODE IN FIRE		
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Hydrogen Chloride is non-combustible, but contact with metals produces Hydrogen gas, which will increase, the chance of an explosion.
* Extinguish fire using an agent suitable for type of surrounding fire.
* POISONOUS GASES ARE PRODUCED IN FIRE including Chlorine and Hydrogen Chloride.
* CONTAINERS MAY EXPLODE IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Hydrogen Chloride solution is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.

* Collect material in a convenient manner and deposit in sealed containers. If necessary, dilute and/or neutralize the material before collection.

If Hydrogen Chloride gas is leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of leak until clean-up is complete.
* Ventilate area of leak to disperse the gas.
* Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
* It may be necessary to contain and dispose of Hydrogen Chloride as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172
Other:

HANDLING AND STORAGE

* Prior to working with Hydrogen Chloride you should be trained on its proper handling and storage.
* Hydrogen Chloride must be stored to avoid contact with ZINC, BRASS, GALVANIZED IRON, ALUMINUM, COPPER and COPPER ALLOYS since violent reactions occur.
* Hydrogen Chloride is not compatible with bases. Store cylinders at temperatures under 125 degrees F (52 degrees C).
* Store in tightly closed containers in a cool, well-ventilated area away from WATER and HEAT.
* Hydrogen Chloride ignites in the presence of fluorine and metal carbides.

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253
Other:

Eye Contact
* Immediately flush with large amounts of water. Continue without stopping for at least 30 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact
* Quickly remove contaminated clothing. Immediately wash area with large amounts of water. Seek medical attention immediately.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.
* Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Vapor Pressure: Greater than 1 mm Hg at 68 degrees F (20 degrees C)
Water Solubility: Highly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Hydrochloric Acid

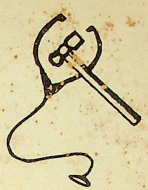
Other Names and Formulations:
Anhydrous Hydrochloric Acid; Chlorohydric Acid; Muriatic Acid

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

OH-4.

health and the work-place

medico friend circle
[organization & bulletin office]
326, V Main, Ist Block
Koramangala, Bangalore-560 034



COUNTERFACT NO. 4 A CED HEALTH CELL FEATURE MAY 1983

The health of workers in the country, be they urban or rural, organized or unorganized, housewives or clerks, has been largely ignored. In the press one finds only occasional reports on isolated cases of mining accidents or pesticides poisoning of agricultural workers. Information on the prevalence and extent of occupational diseases is also insufficient and cases are grossly under-reported.

This May Day "Counterfact" takes up the question of occupational health, and focusses on the conditions of factory workers. We shall first examine the legislation covering worker's health, its implementation and the reality of occupational health in India today. This is followed by a case study on one of the commonest work-related diseases: occupational dermatitis.

Rapid industrialisation has its biproducts. One of these is the deterioration of occupational health. In a system where labour is but a commodity to be purchased, new products and processes can only result in worker's facing fresh risks of work-related disease. Preventive health measures are naturally opposed by industry as they cut into profitability. Existing legislation, while setting some safety standards, concentrates on providing medical benefits and compensation for damage done. A factory inspector usually comes in while checking on accidents or cases already reported, rather than implementing preventive measures.

Besides exposure to specific occupational hazards, the factory worker is the victim of a larger degenerating health environment. He or she normally stays in a crowded chawl or filthy slum, and is therefore, exposed to all kinds of communicable diseases. Undernourishment, a direct consequence of subsistence living, further increases vulnerability to disease. At the factory a worker is exposed to at least one or two of the following health hazards:

* Physical hazards from heat, pressure, light, noise, vibration, radiation, electricity etc.
* Chemical hazards from dust, gases, vapours, acids, alkalis solvents etc.
* Biological hazards from infective and parasitic agents. For example, workers may contract anthrax - a disease of horses, goats and sheep that is transmitted by tiny spores in animal products and by contact with the animal itself.
* Mechanical hazards from protruding and moving parts of machines.

The Law and Occupational Health.

The Directive Principles of State Policy, in the Constitution of India calls on the government to direct its policy "towards securing that the health and strength of workers are not abused and the citizens are not forced by economic necessity to enter avocations unsuited to their age and strength." It also directs the states to "make provisions for securing just and humane conditions of work."(1)

However, there is no comprehensive legis-

lation which deals in detail with problems of occupational health in the country. The 3 Acts, which come anywhere near translating these principles into practice are:

1) The Factories Act of 1948.
2) The Employees State Insurance Act of 1948 (ESIA) and
3) The Workman's Compensation Act of 1923 (WCA)

A review of these 3 Acts shows that a large number of workers are not included in its purview and therefore can be exposed to any amount of hazards without hindrance. The Factories Act covers manufacturing units using power with 10 or more workers, or units not using power with 20 or more workers (Miners come under a separate Act; restaurant and hotel workers now come under the preview of the Factories Act). The ESIA which does not distinguish between powered and non-powered units, covers those having 20 or more workers. The Workmen's Compensation Act includes, besides the above, others such as miners, shipcrew, construction workers, firemen and plantation workers.

From the coverage of the Acts, it is evident that workers in small sweatshops all over the country, construction workers and those contracted by outside contractors within the larger units are not protected at all by the Factories Act or the ESIA.

The agate workers of Khambhat, Gujarat, who cut, grind, polish and carve agate stones into ornamental items, are one example of this. Every year they produce finished goods worth 10 to 12 lakh rupees which are exported to the USA and Africa. As they work at home, the entire family is exposed to silica dust, which is responsible for the high incidence of various lung diseases. One such survey of agate workers puts the incidence of these diseases at 63.5% compared to 35.6% in the control group. Even children as young as 11 years were found to be suffering from serious lung diseases. Because their workplace does not get qualify as a "factory" as defined in the Acts, agate workers cannot even hope for any legal aid or compensation.(2)

The Factories Act

Chapters III, IV & V of the Act prescribe certain broad guidelines for preventive health care in those manufacturing units specified earlier. However, they set no specific standards and regulations for protecting the health of workers. This and the granting of exemptions in some cases has been left to the discretion of the state governments. Thus the guidelines are more like general recommendations.

In the sub-section on dusts and fumes, for example, the Act states that "effective measures shall be taken to prevent its inhalation and accumulation in any workroom, and if any exhaust appliance is necessary for this purpose, it shall be applied as near as possible to the point of origin of the dust, fume or other impurity.."(3) The specific "effective measures" and the number of exhaust fans required are determined by the Factory Inspectorates of each state.

Similarly on the subject of "disposal of wastes and effluents", the Act states that effective arrangement shall be made in every factory... so as to render them (wastes and effluents) innocuous and for their disposal".(4) The regulations prescribing the "effective arrangements" are again left to the state governments. In its chapter dealing with special provisions, the state governments are left to devise and apply specific rules to "any factories, or class or description of factories in which the manufacturing process exposes workers to "serious risk of bodily, injury, poisoning or disease."(5) The Maharashtra government in its Facto-

ries Rules of 1963 (considered to be one of the most rigorous among the various states) has classified 21 processes as "dangerous operations" (See table 1), and detailed regulations pertaining to each of these have been prescribed.

Enforcement of the Factories Act.

Although the rules are rigorous, the enforcement mechanisms, the personnel and their functioning leave much to be desired. The Factories Act provides that each state is to have a Chief Inspector of Factories, who is the primary enforcing authority. Chief Inspectors, advised by the Directorate General of Factory Advice Service, may propose amendments in addition to the existing legislation. The Chief Inspectors staff comprises Certifying Surgeons and Inspectors.

Cerifying Surgeons examine all factory workers and supervise the diagnosis and treatment of occupational diseases. They are also responsible for determining the health hazards in any new manufacturing process or of any new substances used on the shop floor. For Maharashtra, there are only two Certifying Surgeons and one of them is also one of three Medical Inspectors in the state.(6)

Within the category "Inspectors" there are those responsible for enforcing safety standards, working hours and ensuring the general welfare of workers, and there are Medical Inspectors, specifically responsible for monitoring the health of workers.

Inspectors are supposed to visit every factory in the state at least once a year. They may conduct spot-checks, tests and interviews with workers out of the ear-shot of managers. They may also examine any document relating to the factory.

In most states, Factory Inspectorates are chronically under staffed and ill-equipped to inspect and maintain occupational health and safety standards. While the Labour Minister Conference ten years ago recommended that there be an inspector for every 150 factories in a state, today an inspector has to cover at least doubt this number. In certain states like Bihar, one inspector has to visit 1,100 factories per year.(7)

In Maharashtra, the most induatrially advanced state with about 19,000 factories, there are only 96 inspectors.(8) In addition there are three medical inspectors and a fourth post is still unoccupied (of the three filled posts, one had been vacant for over ten years has been filled only recently).(9) According to Dr. Surendra Nath of the Central Labour Institute, Medical Inspectors are poorly paid and there are few avenues for promotion - Medical Inspectors are hardly ever promoted to the post of Chief Inspector.(10)

Furthermore, workers, doctors and social workers allege that there is little commitment, on the part of inspectors to improving the health status of workers. Workers often complain of collusion between the management and inspectors, and have even levelled changes of corruption. In one asbestos company, workers claim that for many years now, a certain high ranking official in the state health administration has been passing off cases of asbestosis as tuberculosis, and other lung ailments.(11) The obvious conclusion is that the management finds it cheaper to purchase the official concerned, than to pay the heavy compensation that an honest verdict on his part would entail.

Some multinational corporations have taken advantage of our lax enforcement of occupational health standards. In mid-1981, **New Scientist** reported on poor working conditions in the asbestos units with multinational corporation connections. Though they took "every

precaution for workers safety and health in their own countries (asbestos workers in the West have been active in pressing for more stringent regulations), the units in India had undertaken very few anti-pollution or dust control measures".(12)

Another important trend is the farming out of certain dangerous parts of the manufacturing process to the ancilliary or small scale sectors. Being small unorganised units, these escape the umbrella of the Factories Act.

The Employees State Insurance Act and The Workers Compensation Act.

These two Acts of the Union of India as well as the Insurance Acts of the states deal with the curative and compensation aspects of the problem of occupational hazards.

The Employees State Insurance Act (ESIA) established the Employees State Insurance Corporation (ESIC) to provide certain benefits in case of sickness, maternity and employment injury to workers whose monthly income is less than Rs.1000(in the kinds of units specified earlier). Sick leave without loss of wages is also ensured in case of employment injury, in which are included physical injuries, the 22 occupational diseases in the Factories Act (Table 2) and

1. Coal Miner's Preumoconiosis - accumalation of coal dust in the lungs.
2. Telegraphists cramp.
3. Bagassosis - accumulation of sugar cane fibres in the lung during the processing of sugar cane.
4. Compressed air illness - as a result of working in factories using processes with air under high pressure.

Occupation dermatitis is not included in this Act's list of diseases for which medical benefits are obtained, although other skin diseases including chrome ulceration (formation of holes and cracks in the skin due to chemical-chromate and bichromate-exposure) and skin cancer are mentioned. Given that occupational dermatitis is included in the Factories Act's list of diseases, its omission in the ESIA is puzzling.

The ESIA consists of member nominated by the central government, those representing each state government and union territory, representatives of employees and employers, and the medical profession. A smaller group, chosen from the members of the Corporation listed above, constitutes the "Standing Committee". This Committee implements the ESIA with the help of officers at the state level. Its finances are drawn from compulsory monthly contributions by employers and employees.

Those not covered under the ESIA (such as miners, ship crew construction workers, firemen and plantation workers) but earning less than Rs. 1000/- per month can claim compensation for 'injury during employment' (as defined in the ESIA) under the Workmen's Compensation Act of 1923.

Occupation Health - The Reality.

Laws and enforcement mechanisms notwithstanding, occupational health levels in India have barely improved. Dr. Surendra Nath, Deputy Director (Medical) of the Central Labour Institute (CLI) has discussed current studies in his paper "Occupational Diseases in Industries- a review."(13) The results of over a dozen research projects on noise levels, silicosis, dermatitis and benzene poisoning, to mention a few, present a very sobering picture of occupational health in India. In the dermatitis study, for example of 2,129 workers examined, 63.17% were affected with "various types of skin lesions". Research involving 3,792 textile workers reveal that 29% suffer from various grades of byssinosis, as against the earlier figure of 12% obtained in a study conducted by two hospitals and the CLI in Bombay during 1970-75.(14)

Reasons for the low levels of occupational health are not difficult to find. We have already seen how existing legislation is not comprehensive and how implementation of the law is a farce.

In addition, information about work-related health hazards is not freely available to workers, either because it does not exist or is concealed, or because it is not considered sufficiently important to educate workers. In several cases, the effects of a particular chemical or of dust in the workplace may not appear for years. Sometimes, as in the case of the nuclear industry, radiation effects may only appear much later, in the offspring.

Moreover, in a country like India, where workers may suffer from ill health due to poverty, it is difficult to distinguish between a work-related disease and one connected to the workers living environment. What is clear, however, is that occupational health hazards exacerbate already existing low levels of health. Thus the condition of a textile worker, already suffering from tuberculosis, may deteriorate further because of exposure to cotton dust.

While managements, medical inspectors and others are quick to assert that "education" will do much to improve existing occupational health levels, the very information required for this education is not made available to workers. Investigatory and advisory institutions like Bombay's Central Labour Institute (CLI) conduct detailed research on health hazards in certain factories (often at the management behest). The results of such research, along with recommendations made by the CLI are strictly confidential. One copy is sent to the management and another to the Inspectorate of Factories of the state concerned. The latter then determines which recommendations are realistically enforcable. Copies of research reports, with the name of the factory neatly deleted, are made available to the public later.

In addition, knowledge of certain chemicals and manufacturing processes are considered "trade secrets" and the management is reluctant to divulge these. Workers are rarely informed of the potential hazards of their work before deciding to take up a job. And even if they were, it is unlikely that this would influence their acceptance or rejection of a job. A job applicant makes the decision to accept a job for reasons of economic need, job availability and his or her capabilities and preferences, rather than on the basis of health and safety considerations.

Some studies have even shown that workers are aware of the health hazards at their workplaces, but feel they have no option. In Mandsaur district Madhya Pradesh, workers in the state pencil industry have a high incidence of silicosis. They admitted that they knew of the dangers of their jobs, but were forced to work in this industry as there was no alternative means of livelihood.(15)

Workers are also given incorrect information on the prevention of occupational health hazards. Milk is provided to workers exposed to lead as a means of countering lead poisoning. Milk was once thought to help accumulate and immobilise lead in the bones. However, Mr. Chakravorti and Dr. Bhar of the Directorate General of Factory Advice and Labour Institutes have written : "The prophylactic efficiency of milk as an antidote for lead poisoning has never been demonstrated unequivocally; on the other hand, some studies rather indicate that milk may facilitate lead absorption... As a general principle in the prevention of occupational poisoning, no beverage or medicament (for example vitamin C for benezene exposure.. jaggery for dust exposure, etc.) should

ever be considered an adequate substitute for effective technical control of the hazard".(16)

All of the above, point to a lack of commitment to the health of working people. And with labour such a cheap and readily available commodity, why should a manager care if a worker was coughing all night? There is a head-on collision between the management's primary quest for profit and the interests of workers.

Preventive measures to minimise health hazards like masks and special clothing are an added expense and if managements can cut corners, they will --unless challenged.

The challenge will have to come from workers and their unions. Support action by health groups and concerned professionals including journalists is also necessary. They could form citizens and workers health and safety groups to monitor risks on the shopfloor and demand legal action. Major demands could be the 'right to know' the kind of toxic substance used in the workplace and legislation to tackle the problem of occupational hazards comprehensively. On the other hand, workers will also have to be vigilant to ensure that their demands for better health and safety provisions do not lead to increasing mechanisation followed by retrenchment.

Ultimately, the only lasting solution lies in actual workers' participation in the management of the shopfloor, if not collective ownership. Organising workers around occupational health may prove to be one more effective way to do this.

Case History - Occupational Dermatitis.

A few months ago a male patient came to the skin department of a public hospital for treatment. The skin on his entire face and body was rough, dry and full of scales. When exposed to sunlight, it would itch. He suffered from no other disability. He had been working as a watchman at a chemical factory for over fifteen years. He reported that the gate he guarded was near the chemical processing unit of the factory, and that he had a history of occupational dermatitis. He had come to the hospital without the knowledge of his employers. He reported that there were other people at his work place who had the same skin diseases. As the watchman's condition was severe, he was hospitalized and after a while his skin cleared up. He asked the management if he could be paid compensation, since he was not provided safety measures. The management was unwilling to pay compensation and asked him to resign if he did not want to work under the given circumstances. The watchman chose to continue at his job.

What is occupational dermatitis?

Occupational dermatitis, the disease which the watchman was suffering from, is an inflammation of the skin. The skin becomes swollen, red, tender and itchy. It oozes and later becomes scaly. Sometimes bacteria invade the affected skin and produce boils and spots. Dermatitis only involves the skin and is not contagious.

How is it caused?

Occupational dermatitis is caused as result of the handling and exposure to thousands of chemicals. Some of these, called primary irritants (alkalis and acids, for example) affect that part of the skin with which they come into contact.

There are also certain substances that remove natural oils from the skin. These include certain solvents; thinners; degreasers like paraffin and turpentine

and tars and coal products.

In addition there are certain substances that produce an allergic reaction in a particular worker, although others may not be affected by it. Physical agents can also harm the skin, causing disease. These include heat, cold, water, sunlight, X-rays and other radiation, soot, dust and grit (especially when this gets between the skin and clothes and causes friction).

Mechanical damage is yet another cause of occupational dermatitis. At work the skin is subject to the formation of thousands of little punctures and minute injuries.

Certain oils and watery fluids make the skin soft and permeable and the cells below the outer layer of the skin lose their protective function and become vulnerable to bacterial invasion and disease.

Industries in which occupational dermatitis occurs

Occupational dermatitis is one of the commonest industrial diseases. Workers in chemical and plating factories and in the textile mills are very susceptible to the disease. In paint factories, solvents in the paint cause dermatitis. This is also true in printing presses, and the skin is further irritated by the use of lead, tin, and antimony types.

In addition, workers in engineering units are highly prone to dermatitis because of their exposure to cutting and lubricating oils and degreasers. Finally, with the increasing use of chemical additives in the food and confectionery industries, there is a high incidence of dermatitis among workers in these factories.

Workers in these factories will have to be vigilant about any new substances or process used on the shopfloor and obtain information about the possible health hazards. If any infection of the skin or allergic reaction occurs, medical authorities must be consulted at once. At the same time legal action can be taken as dermatitis is included in the list of occupational diseases in the Factories Act.

Workers suffering from occupational dermatitis are not entitled to any medical benefits and sickness leave by the Employees State Insurance Corporation. Nor are they eligible for any remuneration under the Workmen's Compensation Act. Thus, workers have to resort to either private doctors or government dispensaries for treatment and like the watchman, they are forced to return to work as soon as possible or face unemployment.

Accidents at the workplace

* *According to latest figures, (See graph)*
No of fatal accidents increased from 248 in 1950 to 806 in 1980
No of nonfatal accidents increased from 76,000 in 1981 to 3,55,000 in 1980.

an increase of 393%

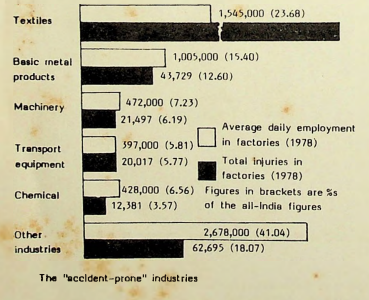
* *Most of the increase **cannot** be attributed to the greater numbers of factories & workers. Accordingly to Mr. Nair of the Central Labour Institute, while daily employment went up by 120% between 1951 to 1980 fatal accidents went up by 225%*
and non-fatal accidents by 393%

* *The Factories Act provides that all injuries that keep workers from work for over 48 hours must be reported to the inspectors. In reality, only 65% of such cases are reported.*

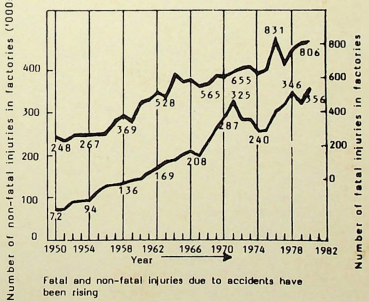
* *The Act also asks managements to provide*
- *One first aid box for 150 workers*
- *Separate Ambulance Room, with nurse where there are 500 workers or more.*
- *Safety Officers where there are 1000 workers or more.*

* *Despite all this,*
- *The workers Compensation Board pay out 1.5 crore Rs. a year as compensation for injuries.*
- *The ESIC pays Rs. 120 crores a year*
- *Other insurance companies pay Rs. 30 crores*

Adding other costs like damage to machinery & loss of production. The loss works out to Rs. 2000 crores a year (according to the Loss Prevention Association of India).



The "accident-prone" industries



Fatal and non-fatal injuries due to accidents have been rising

*Abstracted from: "Workplace accidents are increasing" by R.R. Nair in **Science Today**, September 1982, p. 35 - 37.*

Table 1.

"Dangerous Operations" according to the Maharashtra Factories Rules, 1963.

1. Manufacture of aerated waters and processes incidental thereto.
2. Electrolytic plating or oxidation of metal articles by use of electrolyte containing chromic acid or other chromium compounds.
3. Manufacture and repair of electric accumulators.
4. Glass manufacture.
5. Grinding or glazing of metals.
6. Manufacture and treatment of lead and certain compounds of lead.
7. Generation of gas from dangerous petroleum as defined in the petroleum Act.
8. Cleaning or smoothing of articles by a jet of sand, metal shot or grit or other abrasive propelled by a blast of compressed air or steam.
9. Liming or tanning of raw hides and skins and processes incidental thereto.
10. Manufacture of chromic acid or manufacture or recovery of the bichromate of sodium, potassium or ammonium.
11. Manufacture or manipulation of nitro or amino compounds.
12. Handling and manipulation of corrosive substances.
13. Manufacture of bangles and other articles from cinematograph film and toxic and inflammable solvents.
14. Processes involving manufacture, use or evolution of carbon disulphide and hydrogen sulphide.
15. Manufacture and manipulation of dangerous pesticides.
16. Compression of oxygen and hydrogen produced by electrolytic process.
17. Manufacture and manipulation of asbestos.
18. Manufacture and manipulation of manganese and its compounds.
19. Carbon-disulphide plants.
20. Benzene.
21. Process of extracting oils, wax and fats from vegetable and animal sources in Solvent Extraction Plants.

Table 2.

The Occupational Disease included in the Factories Act.

1. Poisoning by Lead and its compounds.
2. Lead tetra-ethyl poisoning.
3. Phosphorous poisoning.
4. Mercury poisoning.
5. Manganese poisoning.
6. Arsenic poisoning.
7. Poisoning by nitrous fumes.
8. Poisoning by benzene and its compounds.
9. Carbon disulphide poisoning.
10. Poisoning by chromium.
11. Anthrax - a disease transmitted by contact with animals and animal products; often contracted by workers in the glue and fertilizer industries.
12. Silicosis - accumulation of silica dust in the lungs.
13. Poisoning by chlorine, fluorine, iodine and bromine gases and their compounds.
14. Diseases due to radioactive substances - e.g. those contracted by X-ray technicians.
15 Skin cancer.
16. Toxic anaemia.
17. Toxic jaundice due to poisonous substances.
18. Oil acne or dermatitis (skin diseases) due to mineral oils and their compounds.
19. Byssinosis - accumulation of cotton dust in the lungs.

20. Asbestosis - accumulation of asbestos fibres in the lungs.
21. Dermatitis caused by contact with chemicals and paints.
22. Deafness caused by high noise levels at the workplace.

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8) Personal communication with Dr. G.G. Davay - see note (6)
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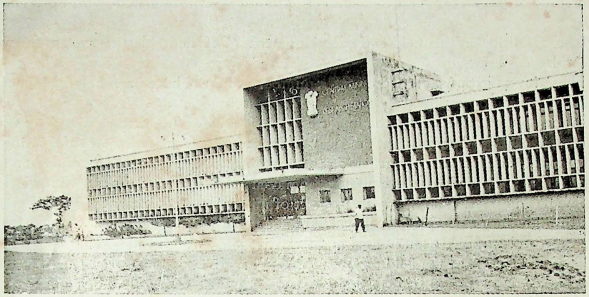
With the compliments of [redacted] *Director, CMRS*



KNOW YOUR RESEARCH CENTRE

CENTRAL MINING RESEARCH STATION, DHANBAD, 1972

(Council of Scientific & Industrial Research)

The need for a centralised agency for systematic research in the varied problems of mining industry in India was felt long before independence. The enlarged activities in the field, after independence, necessitated the establishment of a separate research unit for co-ordinating and undertaking research into all the aspects of efficiency, safety and health in mines. A formal proposal for setting up of a mining research station was mooted out in 1948. The proposal was duly considered and supported by the CSIR and the Coal Board of India and finally the Central Mining Research Station came into existence towards the end of 1955. It started functioning actively in 1961.

Central Mining Research Station at Dhanbad is concerned with all scientific research and development work associated with mine working, mining methods, safety in mines, efficiency of mining operations and health hazards of mine workers. This includes work on development of equipment and appliances useful for mining industry and standardisation of products going in the mining operation CMRS engages itself into the research of both coal and metal ore mining. The work of the Station is undertaken on the basis of project oriented programme, broadly divided into four fields, viz. (i) Mine Technology; (ii) Mine Safety; (iii) Mine Engineering; and (iv) Mine Health Studies.

Brief Description of Work in Progress

In the field of mine technology, some of the main research and investigational problems are on (a) mine subsidence by *in situ* measurements and equivalent material model study; (b) strata movements and strata control in mine roadways in connection with longwall workings and bord and pillar workings; (c) behaviour of rocks under compression and instrumentation for the measurement of stress *in situ*; (d) introducing roof bolting in Indian mines as an effective system of roof support; (e) study of the strength and workability of coal; (f) possibility of improving the operating efficiency and economy of hydraulic sand stowing installation in mines; (g) introduction of pneumatic stowing in mines for the first time in India; (h) adjustment in the stock of sand of different ropeway schemes of Coal Board; (i) operational research on different aspects of mining to increase

the efficiency of mining operations and (j) loss of coal associated with Bord and Pillar workings

Latest addition in this field is the development of efficient blasting system for winning the minerals.

These investigations, carried out in a number of mines, have been helpful in increasing efficiency of mining operations.

In the field of mine safety, the major activities includes (a) investigation of ventilation conditions in mines and reorganisation of ventilation system with a view to ensuring better working condition for mine workers; (b) investigation of mine fires and spontaneous heating of coals; (c) study of gas emission from coal seams and coal dusts; (d) investigation, development and testing services in respect of mine safety equipment; (e) collection and analysis of mine air/gas samples, samples of mine dust, stone dust, mine water etc., (f) studies on corrosion and its prevention in coal mines, pyrite mines, zinc mines, etc.

The programme in the field of mine engineering covers (1) investigation, development and testing of wire ropes; (2) testing of roof supports such as hydraulic props, friction props and timber props; (3) non-destructive testing of colliery equipment; (4) metallographic and chemical analysis of steel wire ropes and mining components; (5) investigation on suspension gear components; (6) testing of mine cables and (7) study of earthing for electrical systems in mines.

Work in the field of mine health includes investigations into occupational diseases among mine workers. Electrophoresis of serum-proteins and study of sickle cell traits in coal miners form a part of the investigations to determine the effects of coal mining on human system. Investigation in this field also cover (a) physiological studies on environments and work-stresses on the miners in connection with different mining operations; (b) air-borne dust survey in coal mines and other metal mines such as manganese, zinc, iron and gold mines; cement factories, refractories and coal washeries etc. where dust in the air is a problem; (c) dust loading and particle size measurements in kilns of cement factories; (d) studies on air-pollution around chemical plants due to Nitrous fumes, Sulphur dioxide fumes etc and (e) studies of pneumoconiotic lungs using Electron Microscope.

Know-How Developed

There are 66 items (processes/products) designed/developed at CMRS and 36 patents have been filed. Three patents namely— (1) Remote convergence indicator; (2) Remote indicating hydraulic load cell; (3) Process for the manufacture of Carbon Monoxide Detector Tubes have got Invention Promotion Board's Award. The last mentioned patent has also gone into commercial production. A bench model Methanometer, useful for very quick and accurate estimation of minute quantities of Methane gas in mine air samples has been developed and a few instruments have been fabricated for the industry on request.

Most of the processes developed by CMRS are being utilised by the scientists in their research/investigation programmes in mines.

Know-how for the following items developed by CMRS, some of which are noted below may be usefully utilised by the industry :

1) Methanometer for detecting methane gas
2) Device for measurement of displacement between two points I P No. 98143
3) Suspension type convergence indicator I. P. No. 98144
4) Improved type convergence recorder I. P. No. 98145
5) Friction prop—I. P No.100489

6) Modified expansion shell type roof bolt—I. P. No. 104389.
7) Remote indicating hydraulic load cell—I. P. No. 104524.
8) Lever-roller extensometer—I. P. No 104525.
9) Remote indicating convergence indicator—I. P. 104526.
10) Remote indicating hydraulic load cell using electrical resistance strain gauge—I.P. No. 104527.
11) Vernier type convergence indicator—I. P. No. 104864.
12) Improved wedge and split type roof bolt—107830.
13) Mechanical area integrator – I. P. No. 69619.
14) A safety device for cages or lifts in case of winding rope—I. P. No. 97123.
15) Electrical relay tester—I. P No. 113744
16) Cable fault locator—I. P. No. 113745.
17) Mine ventilation slide rule—I. P. No. 11-541
18) Automatic lubricator for winding rope in service—I P. No. 122718.
19) A hydraulic prop incorporating a load indicating device—I. P. No. 124957.
20) A process for the preparation of Hydrogen-sulphide detector tube—I. P. No. 110409.

Sponsored Investigations :

Most of the projects undertaken at the CMRS are aimed at helping the industry, directly or indirectly, in increasing the production of coal and other minerals. In addition to its own projects the Station has been taking up specific problems at the instance of and with the financial participation of industries. The stability of mine pillars at Zawar mines for the Hindustan Zinc Ltd., Strata Control investigations in pyrites mine for M/s. Pyrites, Phosphates and Chemicals Ltd., Strata Control investigations in tunnels for the Yamuna Hydel Project, Dehra Dun and Giri Hydel Project, Nahan, study on the suitability of coir matting as barricading material during sand stowing for Coir Board, Ernakulam, are some of the projects undertaken on behalf of industry and other organisations.

Consultation and Advisory Service :

Consultation and advisory service to industry with regard to mine working, roof bolting, ventilation studies, dust problem etc. has been a regular feature of Research Station. Some of such consultation services provided recently are reported below :

(a)	Strata Control	1. Surakachar Colliery 2. Amjhore Pyrite Mines 3. Bhurkunda Colliery 4. West Chirimiri Colliery.
(b)	Roof Bolting	1. Monidih Project 2. Manganese Ore (India) Ltd., 3. Hutti Gold Mines Co. Ltd.
(c)	Efficient blasting system	1. Rajhara Iron Ore Mines (H. S. L., Bhilai).
(d)	Investigation of winding shaft	1. South Kujama Colliery 2. Girimint Colliery.
(e)	Gas emission	1. Amlabad Colliery.
(f)	Reorganisation of Ventilation system	1. Kargali Pits. 2. Kustore Colliery (Raniganj Coal Association Ltd., Dhanbad.
(g)	Dust and particle size measurements in kilns of Kymore Cement Works.	1. M/s. Associated Cement Co. Ltd., Bombay.
(h)	Dust survey in Reclamation tunnels of Bailadilla Iron Ore Project	1. M/s. National Mineral Development Corporation Ltd.

Other than the above, CMRS has also offered consultancy and advisory services on model study, strength of coal, barricading materials for stowing, subsidence, hydraulic and pneumatic stowing, mine fire, in situ non-destructive testing of wire ropes and other mining components, airborne dust survey in mines, refractories and other industries and air pollution around mines and factories for NCDC, NMDC, PPC, HZL, HCL, Bharat Gold

Mining Pvt. Ltd., Bharat Coking Coal Ltd., IBM, Indian Copper Corpn., Manganese Ore India Ltd., TISCO, IISCO, Bird & Co., Andrew Yule and Co., Indian Detonators Ltd., Indian Explosives Ltd., Fertilizer Corpn. of India Ltd., ACC and manufacturers of indigenous flameproof equipment, intrinsically safe equipment, wire ropes and other mining components and others.

CMRS conducted investigations regarding Mine Subsidence at Sudamdih Colliery during 1969 and 1970 on behalf of National Coal Development Corporation. The mine has large quantity of coal below the railway line, the extraction of which presented a problem. On the basis of the report provided by the CMRS, the extraction is being done safely below the railway line since the last six months.

Analysis and Testing Facilities :

CMRS has developed admirable facilities for testing of material and equipment for mining industry. This has become helpful not only in the efficient and safe working in mines but also has been instrumental in developing indigenous industries for the manufacture of standard mining equipment and allied products which hitherto had to be imported. The laboratory is fully equipped to carry out tests on flame proof electrical equipment for use in gassy mines and other such locations. Equipment tested include motors, transformers, switch gears, fans, etc. Electrical appliances and circuits are tested for intrinsic safety. Dust-tight electrical equipment are tested for safety against hazards from inflammable and explosive dusts. Facilities for gallery testing of permitted explosives as also new developed explosives for use in coal mines, are available. Delay detonators for use in gassy mines are tested for their incendiary, storage and electrical characteristics. Prototypes of electrical detonators manufactured in the country are investigated and approved for use. Testing for fire resistance property of conveyor belt, ventilation ducting and brattices as per the standard specifications is undertaken. Assistance is rendered by way of testing, calibrating and servicing of miners' safety torches, methanometers, miners' helmets, flame safety lamps, cap lamp bulbs and batteries and testing of mine fans, anemometers, velometers, etc.

The 500 tonnes horizontal tensile testing machine, available at CMRS is utilised for development and testing of wire ropes used in mining and allied industries. It has also been helpful in promoting the indigenous production of wire ropes by improving their quality. Recently, the facility has been utilised by the industry in the manufacture of "Stud Link Chains" of 54 mm. dia with a breaking load of over 200 tonnes for ocean-going vessels and ports and "Short Link Chains" of 63 mm. dia with a breaking load of 275 tonnes for heavy duty cranes of Indian Railways.

Training :

CMRS has facilities for training of personnel from Mining Industry particularly for testing and analysis of mine gases, mine dust and stone dust.

Publications and Dissemination of Information :

Besides the annual report, the CMRS has been releasing technical reports and research papers from time to time containing information regarding the results of research done and the achievements of the institution. 52 such papers/reports have been published so far. The papers are circulated to concerned organisations in research, industry and trade. Press releases on CMRS activities are issued and write-ups are sent to journals and souvenirs.

The research and development work is also published in Indian and foreign scientific and technical journals. Due publicity is also done through the media of Press and participation in symposia, seminar, etc Annually two "Open Days" are organised when the laboratory is open to visitors to acquaint themselves with the activities and achievements of the Research Station (Adapted from Information Newsletter, Industrial Liaison & Extension Service, Council of Scientific & Industrial Research Rafi Marg, New Delhi, Vol. 10, No. 1, June 1971, p. 7.)

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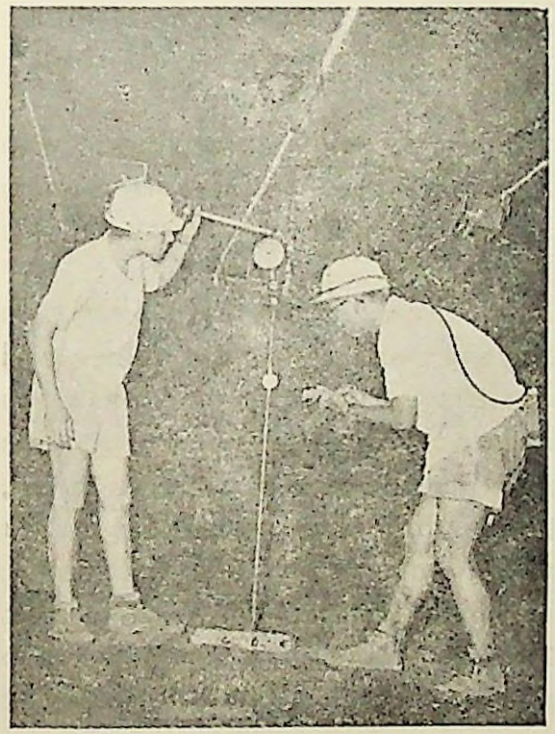
With the compliments of [redacted] *Director, CMRS*

MAKING MINES SAFER AND PRODUCTIVE

MINERALS play an important role in the industrial development of a country. The progress of mineral industry is very much dependent on safe and efficient mining which in turn is based on improved techniques, better equipment and appliances and safety and health of the miners. A formal proposal for setting up of a Mining Research Station was mooted in 1948. The proposal was duly considered and supported by the CSIR and the Coal Board of India, and finally the Central Mining Research Station came into existence towards the end of 1955. It started functioning actively in 1961 at Dhanbad.



Investigation work on Roof Bolting for making a mine safer and productive.

CMRS is concerned with all scientific research and development work associated with mine working, mining methods, safety in mines, efficiency of mining and health hazards of mine workers. This includes work on development of equipment and appliances

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(Extracted from "Science Aids Industry" published by the CSIR, New Delhi, on the occasion of celebrating Twentyfifth Independence Jayanti).

useful for mining industry and standardisation of products going in the mining operation. The research covers problems of coal and metal mines. The work of the station is undertaken on the basis of project-oriented programme, broadly divided into four fields, viz, (i) Mining technology, (ii) Mine safety, (iii) Mine engineering, and (iv) Mine health.

Activities

Roof bolting has been introduced in Indian mines as an effective system of roof support. Studies have been made in 52 mines covering coal mines, copper mines, gold mines, pyrites and manganese mines. Besides a large measure of safety factor, the economic benefits due to bolting are quite substantial and encouraging.

Investigations have been done on the performance of hydraulic stowing plant in various mines and suggestions made to increase the efficiency of various operations in stowing and eliminating pipe jams or barricade bursting thereby reducing the cost of stowing. Suitability of other materials such as boiler ash, fly ash, pyrite cinders, etc., for stowing has been studied as a substitute for sand. CMRS investigation on blasting in an iron ore mine in public sector undertaking has made it possible to increase the productivity per drill hole from 550 tonnes to about 1150 tonnes of ore which would be a considerable saving in drilling and blasting cost.

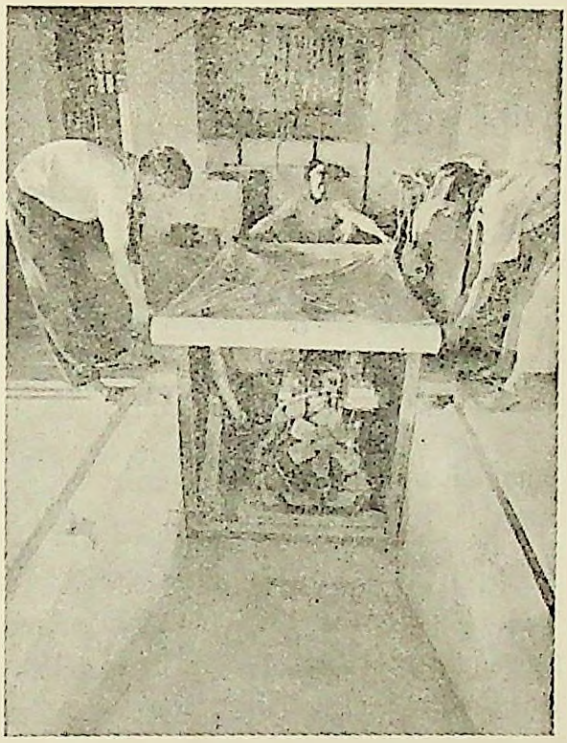
CMRS investigations on the use of coirmatting as barricading material during stowing operations in a mine revealed its suitability with a saving of 63 percent in cost of barricading materials. CMRS has also designed a suitable support system for the barricades.

Bearing Strength of Mine Floor and Roof

CMRS has been conducting studies on strength characteristics of coal and rocks. A new method for determining the strength of coal and rock has been developed. The data will be useful in the design of mine pillars, selection of suitable coal getting machines and improving efficiency of blasting.

Mine Safety

In the field of mine safety, the major activities include (a) investigation of ventilation conditions in mines and re-organisation of ventilation system with a view to ensuring safety of mines and better working conditions for mine workers, (b) investigation of mine fires and spontaneous heating of coals, (c) study of gas emission from coal seams, (d) development and testing services in respect of mines safety equipment and miners' safety equipment, (e) collection and analysis of mine air/gas samples, mine dust, stone dust and mine water samples and (f) studies on corrosion and its preventions.



Flameproof testing of electrical equipment for use in mines

The programme in the field of mine engineering covers (i) investigation, development and testing of wire ropes, (ii) testing of roof supports such as hydraulic props, friction props and timber props, (iii) non-destructive testing of colliery equipment, (iv) metallographic and chemical analysis of steel wire ropes and mining components, (v) investigation on suspension gear components, (vi) testing of mining cables and (vii) study of earthing for electrical systems in mines.

Work in the field of mine health includes (i) assessment of airborne dust during various industrial operations in collieries and around factories, (ii) pollution of air around factories and chemical plants due to sulphur dioxide fumes, nitrous fumes, etc., (iii) dust loading and particle size measurements in kilns of cement factories,

(iv) investigation into the incidence of pneumoconiosis amongst mine workers, (v) physiological studies on environments and work stresses on the miners in connection with different mining operations and (vi) study of pneumoconiotic lungs using electron microscope.

There are 66 items (processes/products) developed at CMRS and 40 patents have been filed. Three patents namely, (1) Remote Convergence Indicator, (2) Remote Indicating Hydraulic Load Cell, (3) Process for the manufacture of carbon monoxide detector tubes, have got Invention Promotion Board's Award. The item mentioned at No. (3) has gone into commercial production.

Analysis and Testing Facilities

CMRS has developed facilities for testing of materials and equipment for mining industry. The 500 tonnes horizontal tensile testing machine available at CMRS has heen helpful in the development and testing of wire ropes, and heavy duty chains useful for mining and allied industries.

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OH-4.

Project Proposal by OHSA

Introduction

OHSA (Occupational Health and Safety Association) is a registered non-governmental organization engaged in occupational health and safety of workers. Set up by Raghunath Manwar, a mechanical technician in a Gujarat power station in 1998, the organization is building multiple coalitions among factory workers, health officials and lawyers to raise awareness of preventive measures and to lobby for reform of worker health and safety laws. Raghunath Manwar is an Ashoka Fellow.

There are more than 1.5 million workers in India engaged in the generation and distribution of electricity. Despite being branded as a "hazardous industry" by the Factory Act of India, power plants have yet to define health and safety regulations for their workers. Nor has there been any organized citizen action to get the industry to account for the health and environmental costs of its profit making operations. Through OHSA, Raghunath Manwar is building an environment where workers are both aware of occupational health risks and able to influence their working conditions.

Background to the earlier project

Thermal power is India's chief energy source. The total installed capacity stood at 101,153.6 MW. Most of this installed capacity is under government control. The use of coal for electricity generation in India is projected to rise by 2.1 percent per year. Thermal power plants (TPPs) need large tracts of land, which has led to serious issues of agricultural land acquisition and displacement.

Coal burning has adverse effects on environment and health. Smokestacks of thermal power plants spew a broad range of toxic substances into the air. Included among these are known carcinogens such as mercury, heavy metals, dioxin, furans and PCBs. Also, fly ash generated from thermal power plants has large environmental impacts, leading to leaching of trace elements, in particular heavy metals, into surface water and ground water. For every megawatt of power being generated approximately 0.6 to 0.7 tonnes of ash is produced every day and needs acres of land for disposal.

Worker's face ongoing and severe occupation hazards from noise, coal dust, and other toxic fumes. Their homes and families on the other hand are subject to the plant's environmental impacts. Also many workers are not on regular rolls, and do not enjoy health and insurance benefits. They are often retrenched, left to fend for themselves to suffer the effects of poor health and no savings. Women are worse sufferers, both owing to dual burdens of managing home and livelihoods but also owing to poorer nutritional status. The continuing dependence on the power plant becomes an unhealthy cycle, which becomes difficult to break out of.

What are the multitudes of impacts, which emanate from such an activity? To study this using a multi-disciplinary approach and with the participation of the affected community OHSA has partnered with 3 organizations. The study: ' Occupational Health in the Coal-Power industry of India: An Innovative Approach To Change Industrial Systems For Economic Growth With Social Justice' will look at the health, environment, socio-economic and legal impacts of coal- based thermal power plants on workers and the surrounding community. The location of the study is Ahmedabad and Gandhinagar

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Occupational
Health file
18/11/09

Gujarat at two power plants: Gujarat Electricity Board and Ahmedabad Electricity Company.

Project Details:
The research, *"Occupational Health in the Coal-Power Industry of India: An Innovative Approach To Change Industrial Systems For Economic Growth With Social Justice"* was a collaborative effort of 4 organizations that were working in related areas of socio-economic rights issues. They all had pooled together their skills, perspectives, experiences and resources to make the study rigorous and multi-dimensional.

Outputs:
- A comprehensive study of occupational health and safety, community health and environmental impacts around coal based thermal power plants
- Recommendations to policy makers, enforcement agencies for taking affirmative steps for implementing and improving the working conditions within the plants, mitigating health and environmental impact around the thermal power plants
- Recommendations for shifting to cleaner fuels for power generation

Objectives:

- To survey and study Health, Safety and Environment and working condition affecting the workers of some more Thermal Power Plants and pollution impact by these power plants on community at large.

- To make a set of recommendations to improve the working conditions inside the power stations and minimize the pollution effect.

- To disseminate the findings of the study to the communities, and policy makers and as well as to the workers and trade unions in the other thermal power plants in India.

Methodology:
The project will have two main components:

- Research, Data collection and documentation

- Training and dissemination of findings through meetings and workshops and awareness camps

In past we had surveyed two thermal power plants of Gujarat and revealed number of inside workers prevailing inside power plants and indirect polluting effect in workers and community. This was survey created an impact. After the publication of this study, GEB has introduced medical examination for their workers. Till today about 500 workers have already undergone medical examination and 86 workers of AEC, who were found suffering from one or the other diseases, have requested to ESI for medical compensation. An important trade Union organization having 54,000 members, have shown interest in this study and promise to help for further study.

For environmental pollution, we will take the help of environmental experts and for health of workers and safety of workers. We will take the help of medical professionals and safety expert.

The workers would be interviewed through a model questionnaire based on health, environment and safety questions. This may bring awareness among workers and members of community regarding their health and safety and these workers and members of community can bring pressure on employers and the government to take remedial action.

Estimated expenses to run training center

Administration		**Amount**
1. Office rent		Rs. 2500.00 per month
2. Office Staff		
(a) Coordinator	Rs.5000.00	Rs. 15000.00 per month
(b) Office in charge	Rs 2500.00	
(C) Computer operator	Rs. 2500.00	
3. Electricity, Telephone internet etc.....		Rs. 3000.00 per month
4 Train, Transport expenses of coordinator		Rs 10000.00 per month
5. Stationary, Xerox etc...		Rs. 1500.00 per month
		Rs. 30000.00
Rs. 30000.00 per month x 12 months.		Rs. 3,60,000.00
For 36 month (Three year)		
Rs. 30000.00 x 36 =		Rs 10,80,000.00

Projects:-

Estimated expenses in respect of projects to be under taken.

1. Workers training : 12 programme
   During 36 month : Rs.4,000.00 per programme for
   12 programme Rs. 4,000.00 x 12 = Rs. 48,000.00

2 Training of lawyers and agents insurance company
corporation 6 programme during 36 month

Rs. 4000.00 per month
Rs.4,000 x 6 Rs. 24,000.00

3. For medical professionals 6 programme during 36 months Rs.5,000.00 per programme.
Rs. 5,000 x 6 Rs. 30,000.00

Total Rs.1,02,000.00

Summary of estimated expenses

1 Administrative [illegible] Rs. 10,80,000.00 for 3 years,[illegible] for 3 years.

2 Project Rs 1,02,000.00 for 3 years

Total Rs. 11,82,000.00 for 3 years.

N.B. This training centre will cover two states named, Gujarat and Rajasthan

Proposal for Financial Support for Asbestos Victim's Travel

Background: Asbestos related deaths are beginning to emerge an epidemic in United States and Europe but in India due to lack of registration of workers, one fails to gauge the seriousness of the toll it is taking on our workers. Asbestos has been manufactured and used indiscriminately for decades till the Supreme Court of India intervened.

In 1995, in the case of Consumer Education & Research Centre (CERC) and Others Vs. Union of India, the Supreme Court gave directions to the effect that asbestos factories have to maintain health records of all the workers for forty years, membrane filter test at the work place at all stages, insure health coverage with Employees' State Insurance Act or otherwise, protect health hazards of small-scale factories and compensation to the affected of rupees one lakh. The court's order is yet to be implemented

A newsletter published by Directorate General Factory Advice Service & Labour Institutes (DGFASLI), the ministry of Labour, Government of India says, no safe use of asbestos is possible because even after safety gears were provided there was no material difference observed in the condition of asbestos workers. It is a notifiable disease under the Factories Act, 1948.

Present status:
Civil society groups are gathering evidence of workers suffering from asbestos related diseases to highlight the plight of workers. There are numerous workers who have already succumbed to this disease. Some are still alive with general physical discomfort due to adverse occupational safety and health conditions, the workers in these units encounter with several types of respiratory ailments. The National Human Rights Commission (NHRC) has been approached to take into cognizance the plight of the workers and provide remedy.

To drive home the message of an asbestos free world, **Global Asbestos Congress** is being organized in Tokyo (GAC2004), Mr. Mangabhai Patel, a victim person is being taken to the Congress to represent the case of asbestos workers. The GAC-2004 is being organized during 19-21 November 2004 as an international forum to discuss the present and future issues of combating asbestos-related health risk.

Intervention required: The victim requires financial support to reach Tokyo for GAC-2004

Budget:

Estimated expenditure for Mangabhai

1. Air tickets To and fro New Delhi to Tokyo	Rs.46, 000. apprx.
2. Train Tickets to and fro Ahmedabad to Delhi	Rs. 2, 000.00 "

3. Local Conveyance	Rs. 300.00	"
4. Lodging & Boarding at New Delhi	Rs. 1,400.00	"
5. Expenses to obtain VISA at New Delhi. This includes Rly. fare etc. We do not know exact VISA fee.	Rs. 3,000.00	"
Total	Rs. 53,200.00 apprx.	

Total estimated Rupees fifty three thousand two hundred only.

Mr Mangabhai Patel
C/O Raghunath K MANWAR
(ASHOKA FELLOW)
C-6, AKSHARDHAM SOCIETY,
NR.MADHAVBAUG, NIRNAYNAGAR,
AHMEDABAD-382481 (GUJ)
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Issues of Concern to Workers in the Readymade Garment Sector and Some Aspects of Cividep's Intervention

The Garment Industry at a Glance

'Globalisation' is the increasing interaction of domestic economies with the world economy. We get an idea of the importance of globalisation in the world today from the rising share of international trade in the world output. World trade in clothing was of the value of $ 199 billion in the year 2000. Asia as a region dominates world trade in clothing having the largest share, 44.9% (2000), of world trade. Western Europe, the second largest region accounted for 28.8%. Within Asia, China is the undisputed leader with 18% share in world exports (2000). India ranks ninth largest exporter in the world (2.8% in 1999) and third largest exporter in Asia.

India's readymade garment industry contributes around 16% to total export earnings and is the largest net foreign exchange earner for the country. It has reached this position in just over four decades, with most of this growth occurring since the eighties. Garment exports have been continuously rising, from a mere $2 million in 1960-61 to $696 million in 1980-81, and then sharply to $2236 million in 1990-91 and to $4765 million in 1999-2000.

The driving force behind the globalization of the garment industry is the vast disparity in wage levels. The hourly wage of a British garment worker is over twenty times that of an Indian or Chinese worker. Clothing production continues to be labor intensive and wage levels are crucial in determining the cost of the final product. Whereas the average hourly wage of a British worker is about Rs.420, in our estimate, a garment worker in Bangalore earns about eight rupees per hour.

Women Garment Workers of Bangalore – Some Statistics

The garment industry is the employer of the largest number of women workers in Karnataka after, perhaps the beedi industry. The garment industry is considerably well organized in Bangalore unlike other centres and the large majority of employees here work in factory settings. Officially, there are 788 garment-manufacturing units in Karnataka out of which 729 are in Bangalore. The total number of workers statewide is 1,53,978 out of whom 1,46,835 are working in Bangalore units. The number of women workers statewide in the industry is 1,10,019 out of which 1,03,039 are in Bangalore. The figures were accessed from the department of labour of the Government of Karnataka. There could be many more casual and contract workers who have not been accounted for here. The garment industry is famous for rapidly altering production capacity of different units, size of the labour force and even location of units to get round quota regulations and other legal provisions. Hence statistics related to the garment industry must be treated cautiously.

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Living and Working Conditions of Women Workers

Exploited as workers and as women: The women garment workers of Karnataka, especially the large majority of whom are in Bangalore, experience all the vulnerabilities of women as a gender and workers as a class. Paid very low wages, living often in crime prone neighborhoods, holding insecure jobs, their life is marked by uncertainties. Many women garment workers are pushed into sex work.

Effects of low wages: The consequences of unfavourable terms of employment, low wages and inadequate social security on the lives of women garment workers are pervasive. Unable to afford decent housing, most of them live in squatter's colonies or slums, which have scanty civic amenities like water supply and sanitation. Many of them live in constant fear of eviction and are at the mercy of 'slum lords' and hoodlums in the neighborhood. Frequent lay off in the factories and sometimes retrenchment compound the experience of insecurity in their lives. Most of the men in their households are also workers in the informal sector and hence many families live on the brink of poverty and deprivation. Domestic violence is prevalent. Desertion of married women is very common and the number of women-headed households is very high.

Harassment at workplace: Sexual harassment at the work place is reported to be rampant. Supervisors, many of whom are male, take advantage of the vulnerability of women workers. Abusive behavior is very common and workers are penalized for even minor infractions of workplace rules. Anybody who questions such high-handed behavior is either humiliated or even removed from her job. Lack of effective unionization allows many of the unfair labour practices and abusive behaviour of supervisors and managers go unchallenged. Participation in union activities itself often serves as sufficient ground for dismissal.

Issues of migrant workers: A considerable number of women garment workers are migrants from the neighboring districts of Bangalore. A good number of workers are also from the drought prone, arid districts of Northern Karnataka. Hence many of them are subject to problems typical of migrant workers such as lack of proper housing and the absence of community support. This makes migrant women workers in garment industry all the more vulnerable to exploitation. A large number of women workers commute to work from their villages in the suburbs of Bangalore.

Inadequate medical attention: The garment industry being categorized as non-hazardous, there are no compulsory health checkups in the factory premises. Many workers avoid going to hospitals designated by the Employees State Insurance (ESI), due to the cumbersome procedures involved. Most of them, during illness, approach quacks, who pose as medical practitioners in their neighborhood. The chances of early detection of reproductive tract infections and sexually transmitted diseases among the workers, therefore, are very little. We have to remember that a very high percentage of women garment workers are in the age group of 18-40 years.

Overwork and ill treatment: Hours worked in garment factories also are excessive. Often workers are required to work for many more hours than the mandatory eight hours when there is surplus of orders. There are many instances of abusive treatment meted out to

women workers by supervisors and others. Women are humiliated if they use the toilets more often than the number of times the supervisor believes to be warranted.

Vulnerabilities as women: All other vulnerabilities applicable to women as a gender is true in the case of women garment workers also. Their occupation has low social status. Access to social services is minimal. Educational attainment is very low and there are huge numbers of illiterate workers as well. Awareness of rights has not developed especially because of the inactivity of trade unions and their limited influence among garment workers. Most of them have no other marketable skills. Early marriage is the rule than the exception. Their working and living conditions expose them to various occupational hazards and gynecological problems.

Expected Impact of Cividep's Intervention

The crucial test to gauge the impact of the programme is the extent to which it succeeds in persuading policy-makers in the government, manufacturers' associations and workers' organisations to form a national institution to monitor labour standards in the garment industry on the model of Ethical Trade Initiative (ETI) of UK and similar models elsewhere.

Another measurable impact would be the level of acceptance and implementation of codes of labour practices that ensure minimum standards, by garment manufacturers and retailers. Women garment workers are expected to gain organizational strength to exercise their core labour rights such as freedom of association and right to collective bargaining. The immediate gains would be the curtailment of violations such as compulsory overtime, denial of leave, verbal and physical abuse and sexual harassment. One more facet of the impact of the programme would be a favourable disposition among civil society formations towards the rights of women garment workers. Networking, lobbying and advocacy efforts would bring together workers, trade unions, NGO groups, labour researchers and women's organisations in solidarity with the cause of the women workers.

The database built by the small research initiative of the programme on the nature of voluntary codes accepted by manufacturing and retailing companies in India and abroad and the extent of adherence to the codes would help trade unions to re-formulate their strategies to claim labour rights of garment workers. It would also help lobbying with legislators to persuade them to raise questions related to labour practices in the garment industry in the legislature and other forum. Research results could induce the ministry of labour and the ministry of textiles to consider policy changes to address issues of garment workers.

Consultation workshops would hasten alliance building among workers, their organisations, NGOs and statutory bodies like the women's commission in the interest of women workers. Communication of initiatives here to retailing companies abroad doing business with manufacturers in Bangalore, might encourage the former to intensify monitoring of labour practices of their suppliers. The workshops would help workers and trade unions to be conversant with the concept of clothes codes.

Mobilisation and organisational efforts of the programme would develop confidence in women workers enabling them to exercise their rights. It will also result in the greater capacity of women workers to address individual and family issues as well as those of the locality where they live. Civic authorities can be expected to respond more favourably to demands raised by the workers concerning civic amenities and welfare schemes when their organisation is more visible.

The intervention of the programme would result in greater awareness among the public and opinion leaders about the labour practices in the garment sector and working conditions under which this large section of women workers labour. We expect the women's commission to play a pro-active role to address gender issues of women garment workers like sexual harassment at workplace. Greater willingness among civil society organisations to support women garment workers in their struggle for labour rights and better working conditions is another spin off expected from the programme. A concrete gain in this direction would be the inclusion of rights of women workers on the agenda of the consumer rights groups.

Main Challenges for the Intervention

One of the major objectives of Cividep's intervention with women garment workers is to provide legal assistance to them to assert or claim their legal rights.

We encounter some problems in actually delivering legal services to the workers. Very few women workers are willing to take recourse to legal action. Some of them know that their employers are violating labour laws and legal rights as workers. This is primarily due to the fear of dismissal from work and harassment in case they complain to authorities. It is obvious that the workers are unable to do anything to safeguard their rights as there are no unions or other collectives within the factories. The absence of unions makes it impossible for them to represent their individual or collective grievances to even higher management, let alone labour authorities. Women workers in the garment industry are at the mercy of the all powerful production manager. Owners of the enterprises largely rely on these functionaries to 'manage' labour.

When it is obvious that there is rampant violation of workers rights as well as other laws related to labour, why is it that there is very little litigation? We have come across a few cases through contacts in the labour courts. We need to have a more accurate assessment of the extent of litigation between employers and workers in the garment industry.

Issues of Concern in Brief

The main issues that concern workers in the ready-made garment sector are:

- Payment of wages below statutory minimum wages
- Stagnant wages
- Disadvantageous terms of employment (Arbitrary dismissal etc.)
- Retrenchment when about to qualify for gratuity

- Work hours (compulsory overtime)
- Denial of legitimate leave
- Verbal and physical abuse by supervisors/managers
- Sexual harassment
- Excessively high targets of production arbitrarily set by management without consultation with workers
- Corruption and inefficiency of the authorities of Employment State Insurance
- Difficulty to claim Provident Fund dues

Some Aspects of Cividep's Intervention

Faced with the absence of workers' collectives within the factories and the victimisation of workers for attempts at organisation or for raising objections to the highhanded behaviour of supervisors and the management, we as an NGO have to seek other ways of addressing workers' issues. We are currently moving in the following directions-

- Investigating and documenting the violations of labour rights within the factories with reference to the provisions of the Law along with the possible administrative and legal remedies
- Exploring ways of holding the labour department of the state government accountable to rights violation and urging it to act according to its mandate.
- Advocacy with the political leadership in the government responsible for the ministry of labour.
- Study the nature and extent of voluntary codes of labour standards accepted by garment manufacturing units and assess the effectiveness of their implementation.
- Holding Legal awareness workshops for workers as part of our mobilisation efforts, so that, worker gain the confidence to assert their rights through legal means.

OH-4

Main Identity

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Sent: Wednesday, April 27, 2005 6:49 PM
Attach: ATT00007.txt
Subject: 'Dharna' to Protest Night Shifts for Women Workers in the Garment Sector

'Dharna' to Protest Night Shifts for Women Workers in the Garment Sector

Thursday the 28th of April 2005, 6.00pm to 7.00pm
Town Hall, Bangalore.

Organised by 'Garments Mahila Karmikara Munnade'

'Garments Mahila Karmikara Munnade' strongly oppose the move to remove legal restrictions on night work for women workers. The Government has taken this measure without considering the social and economic reality of women workers in this country. We are in particular concerned about the impact that such a move will have on women workers in the garment sector.

The garment sector in Bangalore has very low levels of regulation of work. Workers are already made to work extra hours, often without any compensation. There are many reports of harassment at the workplace of women workers. If the legal protection is removed, the harassment of women workers at the workplace will only increase.

We also fear that permission for night shifts for women workers will become a punitive weapon in the hands of employers. Women workers who protest harassment or become part of trade unions may be victimized by employers by repeatedly assigning them to night shifts. This will be a huge step backward in a sector that is just beginning to organise itself for better regulation and more humane working conditions. This can in fact create hindrance to increasing the participation of women in economic activities.

We would like to clarify that we are not per se opposed to women working at night, provided enabling conditions are put in place like housing, transport and adequate child care. However, in the present social and economic condition it will be disastrous to remove restrictions on night work for women.

We appeal to all individuals and organisations who believe in a just and equitable society, rights of workers to safe and healthy working conditions and the need for an enabling environment for women to play a constructive role in society, to express solidarity by attending the protest programme.

In solidarity,

28/4/05
Occupational health / workers health folder (Lib)
4/28/2005
13/5/05

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