A PROFILE OF SANDSTONE MINE WORKERS OF JODHPUR AND DUST BORN DISEASES

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JODHPUR

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1 PLIGHT OF MINE WORKERS LESSONS TO LEARN

— **S. M. Mohnot**
The School of Desert Sciences

I. INTRODUCTION

For over a decade we have been deliberating mining related problems of the desert, with a view to understand the environmental degradation like, water, soil, forests, pastures and germplasm. In this process, we realized, that, a more serious issue that need to be tackled urgently is the health hazards and status of mine workers in relation to their socio-economic conditions and legal provisions. Our agenda shifted from environment to humane issues as emerged out in at least half a dozen National, State and regional seminars, workshops and group meetings which we organised in the last 3 years at Jodhpur, Udaipur, Alwar, Jaipur and elsewhere in the State. It was felt in these meetings that we as NGO's must start a campaign to protect the rights of mine workers and to secure relief in terms of health, safety and ownership to lakhs of mine workers — This is how the **Mine Labour Protection Campaign** (MLPC) came into being with Justice V. R. Krishna Iyer as its patron.

Under the auspices of MLPC and several professional and social action groups, a 'Jodhpur Declaration' was made at the time of National Seminar on Mines and Mine Workers on April 16, 1993, at Jodhpur, heighlighting the problems of mine workers and our struggle against dust related health hazards.

This Round-Table on Mines, Mine Workers Problems and their Remedies at Jaipur (September 8 and 9, 1994) is yet another NGO effort to deliberate issues like **[1] Law and Mine Workers : Future Amendments and Changes [2] Illegal Mining, Loss of Resource and Joint Mines Management** and **[3] Mine Workers : Health, Welfare and Safety.** These issues, unfortunately have not received due attention at any level, for example, not even in the new Mineral Policy (1994) of the State Government announced 2 weeks ago.

We consider these issues pertinent and vital if the dignity of human resource is to be maintained. These issues were formulated as priority areas from the feedback we received from grass root workers sharing problems with mine workers and working for their redressal. For example, NGO surveys at Jodhpur, Udaipur, Alwar, Nagaur and elsewhere were the eye-openers. No health schemes, no safety, accidents and deaths, deadly diseases like silicosis, exploitation of child and women labour and sizeable workers living as bonded labour and total flouting of legal provisions by mine owners.

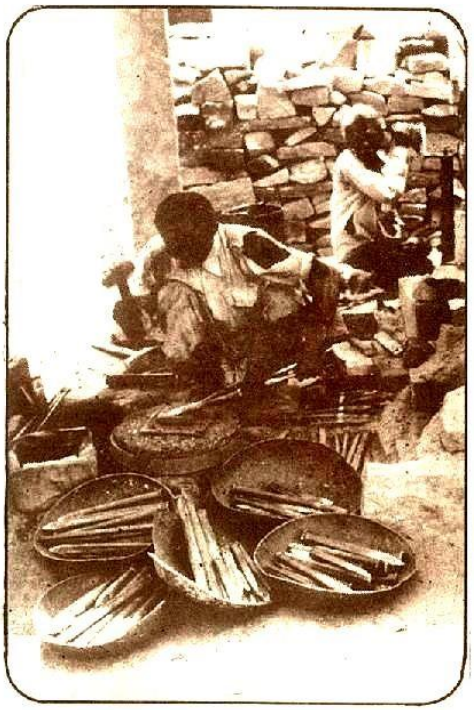
II. MINE WORKERS PLIGHT

(i) Who are the Mine Workers ?

Our survey at Jodhpur and several other studies suggest that majority of mine workers belongs to Scheduled Castes and Scheduled Tribes or belongs to poor strata of society are either landless or have little and unproductive land in their possession. These people on the one side have been uprooted from their place of origin because of resource decline in the villages and on the other hand when took to mining for survival have to die prematurely after inflicting diseases like silicosis, asbestosis, bagassosis, silico-tuberculosis as part of occupational hazards.

(ii) Economic status of mine workers

In our surveys we found that mine workers are the poorest of the poor earning only Rs. 456 per month while a agriculture labour earns Rs. 825 per month working only for four months in a year.



By and large, mine workers were found indebted with heavy loans which they cannot repay and eventually to work as bonded labour. A majority of them do not have houses and live only in small huts because they cannot effort to build even a room for living in absence of resources.

(iii) Intoxication

The hard work, illeteracy, poor economic condition and to continue working without good diet forced them to consume alcohol. This worsen their health and brings down economic status further.

(iv) Wage Issues

Mine workers are absolutely ignorant about wage records, procedures, ESI, PF, leave, group

insurance and Workmen's Compensation Act, etc. This gives mine owners free hand to exploit workers to maximum possible. This is strengthened further by lukewarm approach adopted by Government at every stage.

III. LEGISLATIVE MEASURES AND NO ENFORCEMENT

Like several countries, we do have certain legislative measures to ensure health and safety of mine workers. On the basis of coal mining report presented by S. R. Despande in 1945, silicosis was made notifiable under the Factories Act. From 1959 it was made compensable under the Workmen's Compensation Act and also under the Employees State Insurance (ESI) Act. Under the provisions of these acts workers are entitled to compensation from their employers for occupational injuries and diseases.

The Chief Inspector of Factories and Boiler is responsible for the proper enforcement of labour laws. Likewise, the Director-General of Mines Safety (DGMS) is supposed to ensure implementation of the relevant welfare and safety laws, such as Mines Act, in mines and quarries.

During our survey we did not come across a single case in which compensation claim with the Workmen's Compensation Commissioner has been filed till date. In our area no factory inspector or inspector belongs to DGMS have ever visited any mine for ensuring health, safety and welfare of mine workers. Similarly, services of institutions, like National Institute of Occupational Health (NIOH), Ahmedabad, Industrial Toxicological Research Centre, Lucknow and its Occupational Health Centre at Kanpur, Central Labour Institute, Bombay and All India Institute of Hygiene and Public Health, Calcutta was neither utilized be mine workers, mine owners or the State machinery nor any epidemiological surveys and studies of workers was made by these institutions.

The list of occupational diseases included in Workmen's Compensation Act, 1923, is given as Annexure 1.

IV. HELPLESS WORKERS AND KILLER DISEASES

In absence of conserted effort and collective support by concerned people and organisations we do not have viable suggestions and corrective measures and remedies for workers suffering from occupational diseases and injuries. The Factories and Mines Act has no meaning to State and mine owners. Interestingly most of our doctors are not aware of occupational problems and notifiable diseases. The apathy at all levels has led to rising frequency of injuries and occupational diseases suggesting increasing hazardous nature of working conditions.

For silicosis, surveys conducted by the Indian Council of Medical Research (ICMR) have reported rates between 16-57%, while the ESI do not report any new case of silicosis between 1981-86. Survey by NIOH in 1987-88 of stone cutters in Lalitpur in U.P. report 22.4% silicosis. Investigations carried out by the Central Pollution Control Board at Sohna (Haryana) indicate that (i) Dust-haze impair visibility, (ii) The crushers emit 3.5 and 15-40 times the prescribed limit of SPM (suspended Particle Matter-200 μ/cubic meter for residential and rural areas), (iii) Fatal accidents are common where most of the

manual work is done by women. A survey of stone-crusher workers in Faridabad (Haryana) shows incidence of silicosis to 17.1% and tuberculosis 11.4%. Many workers in Delhi-area have complained of cough and chest pain, many are being treated for tuberculosis. Workers understand that the dust they are inhaling is causing T.B. But, they are unaware of silicosis.

The story of Alembic Glass Industries, Vadodara (Gujarat) is a unique example where the fight between workers on the one side and Management on the other side led to the emergence of leadership among workers for their rights. The workers Union in association with public interest groups became aware of the problem of silicosis. The NIOH examination revealed high incidence of silicosis to about 90% in workers. While the management consistently designated these workers as tubercular patients the Union could manage to secure justice by fighting out their cases in a very articulated manner by collecting and presenting all relevant evidences in support. Compensation and safer working condition is their major demand. Interestingly the leader of this battle is none else but a silicosis patient, 54 year old Shri Bhailal Patel.

V. THE STATE MINERAL POLICY - 1994

The much talked much awaited State Mineral Policy 1994 was made public 2 weeks ago. A exceedingly good document totally lacking humane approach tilted towards those who can manage to exploit human resource alongwith mineral wealth. Even if we ignore environmental issues for a while, the policy as its, cannot deliver devidents in its present form since it cannot be considered a balanced report. This 44 pages report the so called New Mineral Policy as a matter of fact has been formulated because of the most important contributing factor the manpower, the rural poor who work hard for the benefit of many but not for themselves except for their survival. It says under the title Welfare Amenities for 'Mine Workers' (3.6.2 p. 20), that, the ongoing State Welfare Schemes will be introduced sharing 50% of the cost. The 2-para statement is vague and doesn't really have the feeling and touch of the problem. If the Government really wants to do some good to these 1.8 - 2 million mine workers in the State, it should come out with comprehensive plans to improve the conditions of mine workers in terms of wages, health, safety, labour, welfare and revival of legal provisions.

HISTORY OF SILICOSIS IN INDIA

"First reported in India in 1947, in the Kolar Gold Fields, Karnataka. Based on clinical and radiological examination of 7,653 under-ground miners who worked over 5 years. Incidence of silicosis 43.8%."

1949	Stone-cutters in Delhi	12.5%	1953	Mica Mines in Bihar	34.1%
1955	Rofractory products in Bihar	16.8%	1956	Pottery and Ceramic Industry	15.7%
1961	Lead and Zinc Mines	30.4%	1969	Mica Mines in Bihar	34.0%
1977	Slate quarrying in Mandsur	57.0%	1990	Stone-crushers, Faridad	17.1%
1990	Glass Industry, Gujarat	90.0%	1994	Sandstone Mine Workers, Jodhpur	16.0%

SANDSTONE MINING MIRROR

Mining area	:	250 Sq. Kms.
Number of mines	:	10,000
Mine size	:	200 X 100 ft.
Mine depth	:	6-45 ft.
Annual mining	:	60 Lac Mat. Ton
Houses built	:	9,000 annually
Brisk mining months	:	November to July
Origin of workers	:	90% rural, 10% from around city

Workers strength	**Wages per day**	
1. Men : 43,000	Rs. 30-50	
2. Women : 11,400	Rs. 15-30	☐ Many as bonded labour
3. Children : 5,600	Rs. 15-20	

Workers caste	:	Predominantly Scheduled Caste
Common diseases	:	Tuberculosis, Silicosis
Injuries and casualties	:	Most frequent
Intoxicants used	:	Alcohol, Opium
Welfare Scheme(s)	:	None
Health Scheme(s)	:	None
Operation of legal provisions	:	Never
Implements used	:	Traditional & Primitive
Transportation	:	Road & Rail
Trucks used	:	410 +
Annual Consumption of Diesel	:	16 Lac litres
Supply to	:	Jodhpur, other districts of State, Haryana, Punjab, Delhi, Gujarat and M.P.
Govt. Revenue (April 1993 to March, 1994)	:	Rs. 291.06 lacs
Environmental Hazards	:	Air and Noise Pollution, destruction of water catchment, pastures, forests and top soil

[Source : Mohnot, et al. 1994]

2 SANDSTONE MINE WORKERS OF JODHPUR : A PROFILE

— S. M. Mohnot & Harsh Jaitly
The School of Desert Sciences & PRIA

I. INTRODUCTION

India is known for its mineral resources. By and large, every part of the country is provided with some kind of mineral resource. But, States of Bihar and Rajasthan figure most prominently for their contribution in terms of variety and quantum of mineral availability. Bihar tops the list while Rajasthan is the second most populous mineral resource State in the country. As many as 64 metallic and non-metallic minerals are found in Rajasthan. This is contrary to what Dr. A. M. Heron, the then Director General of Geological Survey of India (GSI), had written in Memoirs of GSI Vol. LXXX in 1935, that, Rajasthan is poor in economic mineral wealth. Since 1935, a great deal of status surveys, mineral discoveries and mineral extraction have been undertaken by the GSI, Mines and Mineral Departments of States and Corporations in different parts of the country. In spite of all this, the bulk of mineral extraction is in the hands of private sector. These efforts have helped develop major industrial base in the country as these minerals constitute major base materials for our industries. But, in the last 3 decades, ruthless mining has led to major environmental debacles and health hazards in almost every part of the country. Rajasthan is no exception to this situation (Here a wide range of non-metallic minerals like gypsum, bentonite, marble, fuller's earth, siliceous earth, white clay, glass sands, limestone, yellow orche, salenite, jaspar, lignite, asbestos, granite, sandstone, etc. are found in plenty) indifferent geographical areas of the State. Likewise, metallic minerals like, tungston, copper, zinc, etc. are also found in plenty. These together account for major share in India's mineral resource and the State of Rajasthan can safely be designated "museum of minerals". It is, probably because of this reason that the State Government has come out in a big way formulating New Mineral Policy from this year.

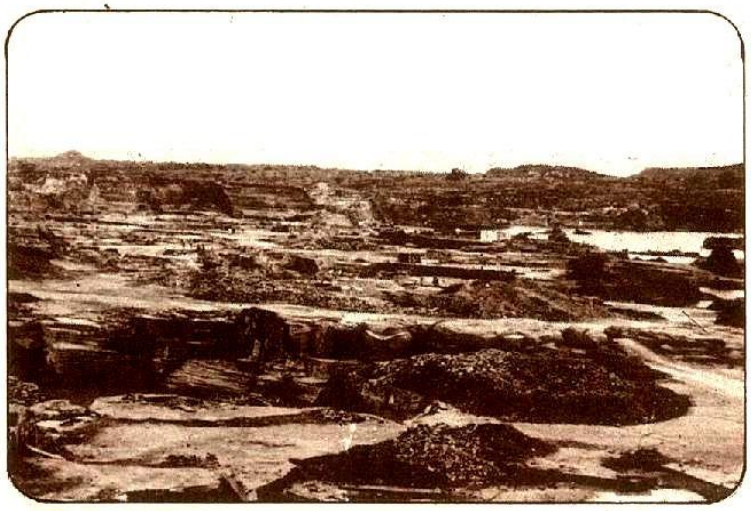
For the last over two decades, we have been observing a manifold increase in mining activities in the State in general and in the great Indian desert or western Rajasthan in particular. A region already poor in natural resource turnover for centuries because of vegaries of climate, is witnessing a major ecological setback due to unscientific, unplanned, massive mining operations of gypsum, limestone, sandstone, granite and several other minerals. These minerals are found in a very wide area of Thar desert predominately in Jodhpur division. Mohnot and his associates in a survey conducted around Jodhpur during 1986 found extensive damage to city's water catchments, high level of air and noise pollution, loss of biomass and high incidence of tuberculosis and silicosis in mine workers. Over 60,000 sandstone mine workers are engaged in sandstone mines.

II. AIMS AND OBJECTIVES

Based on our preliminary investigations on environmental and more precisely on sandstone mining problems (Mohnot and Bhandari, 1987) and to understand the dimension of this problem rather critically, experts drawn from different disciplines deliberated sandstone related issues and prepared an exhaustive questionnaire to elicit baseline data on various facets of this problem so as to workout tangible solutions of sandstone mine workers problems. Besides collecting data through this study, we have tried to expose the workers of their rights, to develop leadership, and to apprise them of rules, regulations and provisions of State and Central legislations. This study was supplemented and strengthened by the inclusion of clinical and radiological investigations by medical experts.

III. THE SANDSTONE

The major constituent of sandstone is silica. This silica based non-metallic mineral is found in and around Jodhpur in the form of tectonic rocks as an extension of the Aravalli ranges and at places the Malani and Vindhyan formations in this part of Thar desert. Jodhpur's sandstone is famous for its durability. Its heat, cold and water resistance qualities besides its strength and beauty is well known. It is probably because of these qualities that the inhabitants of this region started using sandstone in construction of buildings. The use of sandstone is known even before the city of Jodhpur and Jodhpur Fort come into existence during 1450 A.D. It seems that the characteristics of Jodhpur's sandstone were duly recognised during old times, and a large number of monuments, places and buildings were constructed using Jodhpur's sandstone. In New Delhi the Central Secretariate, Viceroy's House, Parliament House, etc. were constructed from Jodhpur's Chittar stone. The 'Chitter' and 'Ghatu' stones are the two popular and commonly mined sandstones in this region.



IV. AREA AND WORKFORCE

Jodhpur is the gatway to the great Indian desert. Founded in 1450 A.D. and located between 27.55 and 27.37 north and 72.55 and 73.52 east, 241 meters above mean sea level is the second largest city in Rajasthan with a population of over 8 lacs. Of this, over a lac of people come from adjoining areas. They are employed in different occupations in and around the city including the sandstone mines. A judicious estimate suggest that some 60,000 - 70,000 rural poor are working as sandstone mine labours in over 11,000 mines in this belt.

Our samples of over 264 mine workers belonged to various age groups, predominantly males, but women and child workers were also interviewed where possible.

V. SURVEY TEAM

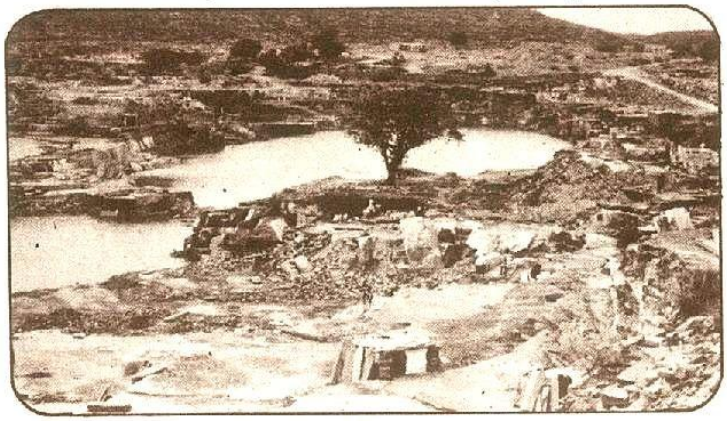
Six young workers after extensive orientation undertook survey and deliberations with mine workers in the premises of mines while they were at work. All responses were meticulously recorded, data tabulated and inferences drawn from a sample of 264 mine workers.

VI. THE QUESTIONNAIRE

Our questionnaire addressed issues like, wage pattern, age group, economic status, caste structure, child and women labour, compulsions to work in mines, period of working in the mines and any evidence of involvement of two or more generations. The workers were categorised as skilled, semi-skilled and unskilled. The employee-employer relations were also subjected to intense questioning besides accidents and health related issues.

VII. SANDSTONE MINING BELT

The Arna-Daijar plateau, a diagonal ridge running about thirty kilometers long and four to six kilometers wide constitute the major mining belt. The important locations are Chonka, Barli, Kadamkandi, Kaliberi, Soorsagar, Chopasani, Kailana, Jodhpur Fort, Kaga, Bhadasia, Balsamand, Mandore, Beri Ganga and Daijar. They are dispersed in about 140 sq. kms. in north-east, north and west of Jodhpur city.



VIII. MINING AND REVENUE

Leases, licenses and royalty of sandstone mines contribute considerably to State's revenue. It reached to about Rs. 55 crores in 1990-91 from Rs. 24 crores during 1986-87. The upward trend will continue because of phenomenal growth in mining operations. Sandstone is the second minor mineral whose revenue touched to Rs. 8-11 crores between 1989-90 and 1990-91. In Jodhpur revenue from sandstone in the year 1992-93 was 1.45 and in 1993-94 was 2.91 crores respectively.

IX. THE FINDINGS

(a) Profile of Mine Workers

Agewise distribution of workers : Workers interviewed were grouped into four categories. This categorization was done to know the presence of child labour, age and period of work. Majority of workers 229 (83%) were in the age group of 16 to 40 years—the most productive period of their lives.

The number was much less 29 (11%) in the age group of 40 to 50 years. It seems that after 40, the capacity to do hard physical work goes down considerably. We found that at the age 50 and around only a few (6 : 2%) continue to work. In this sample we found 10 (4%) child labour below the age of 15 years (Table 1). The general practice in this occupation appears to be that the young boys join mines as helpers (to remove scrap and rubble) and gradually learn the art of making holes and breaking big slabs, lifting, etc. This is the age in which these boys need to go to school, they have to undertake very hard work of breaking stones, lifting slabs, rubble removal, etc. This leads to illiteracy and exploitation besides being exposed to a variety of health hazards.

Composition of workforce : The workers, who can break big slabs from rocks or those who can run the pneumatic drill are considered as skilled labour. Those who can run the drill but cannot break slabs are considered semi-skilled and those engaged in removing hard soil, scrab, rubble, etc. are considered unskilled. In this sample of 264 workers, there were 168 (63%) skilled, 56 (21%) semi-skilled and 40 (16%) were unskilled workers (Table 2). There is no organised training to climb up on this ladder, it is only through the practice and learning that workers acquire their due status.

We picked up only one worker from one mine. In this sample of 264 mines we found over 1322 workers. Thus the average number of workers per mine comes out to be 5.

TABLE 1— **Agewise Distribution of Workers**

AGE	NO. OF WORKERS	PERCENTAGE
0 – 15	10	4
16 – 25	84	32
26 – 40	135	51
41 – 50	29	11
Above 50	6	2
TOTAL	264	100

TABLE 2—**Composition of Workforce**

PARTICULARS	NO. OF WORKERS	PERCENTAGE
Skilled	168	63
Semi-skilled	56	21
Unskilled	40	16
TOTAL	264	100

Caste composition : To understand the caste composition of the workforce a specific question relating to caste was put to know how many workers belong to which caste ! Table 3 shows that maximum workers were from scheduled caste, particularly the Meghwal (156 : 59%) and Bhil (34 : 12.8%) communities followed by Muslims (18 : 7%), Beldar and Rajputs (10 each : 3.7%) and so on (Table 3).

TABLE 3—**Caste composition**

S. No.	CASTE	NO. OF WORKERS	PERCENTAGE
1.	Meghwal	156	59.0
2.	Chokidar	2	0.7
3.	Beldar	10	3.7
4.	Garg	2	0.7
5.	Jatia	1	0.3
6.	Bhat	8	3.0
7.	Harijan	1	0.3
8.	Bheel	34	12.5
9.	Nat	2	0.7
10.	Lohar	1	0.3
11.	Mali	5	2.0
12.	Nath	1	0.3
13.	Kumhar	4	1.5
14.	Raika	6	3.0
15.	Brahmin	2	0.7
16.	Rajput	10	3.7
17.	Jat	1	0.3
18.	Muslim	18	7.0
TOTAL		264	100

Ownership of Mines : During the course of our survey a specific question was asked to all the 264 workers : Do you own a mine ? or the mine where you work is allotted to you ? Workers replied in negative.

This is contrary to the claims made by the State Mines Department that in Jodhpur area, of over 9000 sandstone mines some 2150 mines have been leased out to SC and 230 to ST.

Land-holdings : Most of the workers were from the rural sector. Majority of the workers involved are either landless or have small land-holdings. In our sample, 107 or 40.5% were landless and 91 or 34.4% had less then 5 acres of land (Table 4).

TABLE 4—**Status of land-holding**

S.No.	Caste	Landless	Below 5 acres	No. of workers		Total
				5-17 acres	Above 17 acres	
1.	Meghwal	53	62	29	12	156
2.	Beldar	6	1	2	1	10
3.	Bhat	4	4	–	–	8
4.	Jatia	1	–	–	–	1
5.	Harijan	1	–	–	–	1
6.	Garg	–	–	2	–	2
7.	Nath	–	–	1	–	1
8.	Bheel	27	4	2	1	34
9.	Nat	2	–	–	–	2
10.	Chikidor	1	1	–	–	2
11.	Lohar	–	1	–	–	1
12.	Kumhar	–	1	3	–	4
13.	Jat	–	1	–	–	1
14.	Brahmin	1	1	–	–	2
15.	Rajput	–	5	4	1	10
16.	Mali	2	2	–	1	5
17.	Raika	1	3	2	–	6
18.	Muslim	8	5	2	3	18
	TOTAL	107	91	47	194	264
	PERCENTAGE	40.5	34.4	17.8	7.1	100

Residence of workers and distance from mines : 80 workers (30.3%) of our sample belongs to villages living in the close proximity of mines where as 46 (17.0%) have come from more than 100 kms to work in these mines whereas 138 (52.1%) cover 20- 50 kms one way to reach to mines (Table 5).

TABLE 5—**Distance of workers villages from mines**

Distance (Km.)	No. of workers	Percentage
Below 20	80	30.3
20-30	30	11.3
30-50	44	16.6
50-100	64	24.2
Above 100	46	17.4
TOTAL	264	100

Annual Income : During monsoon months July-September/October most of the mines are non-functional as water get logged in these mines. Workers get employment only for 8 months in a year in such mines. The average yearly income of a worker from mines is around Rs. 3650/- or Rs. 456.25 per month during the working period. The annual income of mine workers family from agriculture and allied activities is estimated to be Rs. 3300 per year in four months when they are unemployed; average Rs. 825/- per working month which is much more than the income received from mines.

In this sample, 126 (47.7%) workers had their annual income less than Rs. 10,000/-, followed by 101 (38.25%) workers whose income ranged between Rs. 10,000/- to Rs. 20,000/-.

Housing status : Our survey revealed that out of 264 workers, 171 (64%) workers were living in small huts and only 75 (28%) had 'pacca' houses made of sandstone (Table 6).

TABLE 6—**Status of housing.**

S.No.	Caste	Jhonpa	Pucca	Mixed	Total
1.	Meghwal	102	44	10	156
2.	Chokidar	1	1	–	2
3.	Beldar	6	3	1	10
4.	Garg	1	1	–	2
5.	Jatia	1	–	–	1
6.	Bhat	7	1	–	8
7.	Harijan	–	1	–	1
8.	Bheel	24	10	–	34
9.	Nat	2	–	–	2
10.	Lohar	–	1	–	1
11.	Mali	3	2	–	5
12.	Nath	–	1	–	1
13.	Kumhar	3	1	–	4
14.	Raika	5	1	–	6
15.	Brahmin	1	1	–	2
16.	Rajput	3	2	5	10
17.	Jat	–	–	1	1
18.	Muslim	13	5	–	18
	TOTAL	171	75	18	264
	PERCENTAGE	64	28	8	100

Reasons for working in mines : Out of 264 workers interviewed, 258 (98%) reported that since they do not have any other choice or alternative employment in their villages they have to work in mines. They further stressed that in our villages scopes of craft, cottage and earnings is decling fast because of destruction of vegetation.

Problem of indebtedness : Since these workers are from the lowest strata of the society and that their wages are very low, these workers have to take loans. During the survey, the team found that the mine owners do provide **loans for non-productive purposes.** In this sample, we found 179 (45%) workers took loan from their employers for domestic purposes including medical treatment, 45 workers (26%) for marriages and 33 (10%) for ritual and rites to be performed after death of a kin in the family (Table 7).

The study reveals that out of 264 workers, 172 (65%) took loans from owner. The amount of loan varied from Rs. 1,000/- to Rs. 20,000/-. Maximum workers 56 (32.5%) were found to have taken loan between Rs. 6,000/- to Rs. 10,000/- and 37 (21%) workers between Rs. 11,000/- to Rs. 20,000/-. There were 16 (9.3%) workers who took loans of more than Rs. 20,000/- (Table 8). In order to ascertain the effects of indebtedness and their status in employment, it was found that 135 (51.5%) cannot quit their jobs because they have taken loan, 40 workers (15.15%) said that their wages were reduced due to loans and 65 (25.62%) workers were frightened hearing this question and refused to give their opinion on the issue (Table 8).

TABLE 7—**Reasons for indebtedness.**

S.No.	Reason	No. of workers	Percentage
1.	Domestic	79	45.0
2.	Marriage	45	17.0
3.	Rituals	33	12.5
4.	Medical treatment	8	3.0
5.	Others	10	1.8
	TOTAL	175	100

TABLE 8—**Status of indebtedness.**

Amount in rupees	No. of workers	Percentage
Below Rs. 1000	2	1.1
Rs. 1000 – 3000	28	16.3
Rs. 4000 – 5000	33	19.0
Rs. 6000 – 10000	56	32.5
Rs. 11000 – 15000	23	13.3
Rs. 16000 – 20000	14	8.0
Above Rs. 20000	16	9.8
TOTAL	172	100

Generation of workers and work-span : In this sample of 264 workers, there were 68 (25.7%) workers whose fathers or sons have been employed in the mines.

The maximum working-span averaged 20 years for hardy individuals.

Use of intoxicants : During this survey it was found that as high as 237 (90%) cases were found to consume alcohol daily. The shops of country liquor were located in and around the mining area. Workers consuming alcohol said they consume liquor to get rid of pain and fatique because of very hard work they do every day in mines.

(b) Working Conditions and Implementation of Laws

Working Hours : No regular working hours are observed. 197 (75%) workers said that they work for eight hours, but, 57 (21%) said that they work for 10 hours and 10 (4%) said more than 10 hours.

Mode of wage payment : Out of 264 workers, 183 (69%) were working on daily wages and 81 (31%) on piece work basis.

The wage related problems : Records of attendance are not kept properly. 26 (10%) workers said that their names do figure in the attendance register. 53 (20%) had their names on rough note books and names of remaining 132 (50%) workers do not figure any-where. The remaining 53 (20%) workers were employed on piece work basis.

168 (63.6%) workers said that their wages are fixed by the mine owner and in 89 (33.7%) cases, it was found that both the parties fix wages by negotiations. It is seldom done by the workers alone.

The whole lot of workers expressed their ignorance about the minimum wages, labour laws, health safety, etc. stipulated by the Government and said that there is no health facility, group insurance, ESI, PF, Gratuity, etc.

Women workers : Large number of women workers do work in these mines on daily basis. Their wages are low compared to men. Maternity leave or any other leave is not given to women workers. Almost all workers showed serious concern on the exploitation of women workers.

Absence of facilities and weekly off : 66 (25%) workers reported that we do not have shade to rest and not even a first aid box in case of injury. Almost all workers said that basic eminity like drinking water is not provided by the mine owner.

Workers informed that there is no system of holiday or weekly off. 250 (94%) workers reported if they fail to turn up no leave is given and wages deducted. As such there is no question of any leave applicable to mine workers.

Compensation : It was reported that according to their knowledge, not a single legal case of compensation or for providing any other facility for which they are entitled have ever been made or filed in any of the courts. It is also strange that not a single case of silicosis or silicosis-cum-tuberculosis has been reported and no compensation given. This was cross verified from the State Labour Department.

(c) Silicosis : A Serious Health Hazard

The radiological investigations coupled with socio-economic and other aspects worked out in this sample survey (see part 3) of mine workers revealed a very alarming health scenerio of mine workers. A large number of workers were found suffering from silicosis, silico-tuberculosis and tuberculosis. These findings commensurate with a startling fact that there are villages in which young widows of mine workers out number the women population since their men have died after working in sandstone mines. It is probably because of this extraordinary health hazard to which mine workers are exposed, the State Government have framed strict legislation to protect and compensate the sandstone mine workers way back in 1955 called Rajasthan Silicosis Rules, 1955. If the health problems of sandstone mine workers is assessed under the existing situation the incidence of silicosis, silico-tuberculosis and pure tuberculosis is much high compared to normal situation.

(d) Health and Accidents

In this sample survey, 189 (71.6%) workers complained of respiratory problems. Some of them were either under treatment for tuberculosis or were suffering from perennial cough syndrome. 34 (12.87%) workers said they have no health problem, while remaining 31 workers (11.74%) did not respond. Accidents are frequent as most of the work is done manually with the help of heavy hammers, chisel and other primitive tools. Many times, heavy slabs, stones, etc. fall on workers resulting into serious injuries. During recovery period, workers neither get wages nor leave reported by 250 (94.6%) workers. Regarding the medical treatment 237 (89.7%) workers said that they themselves have to bear the cost of treatment and also to pay for medicines and other expenses. But 24 (9.3%)

workers did mention that their employers pay for their treatment. Even in the case of accident, 170 (72.7%) workers reported that no treatment support is provided by the employer. Only 69 (26%) workers said that first aid is given but there is no hospital in the mining area said 176 (66.6%) workers, and felt that dispensaries or medical care units be established in the mining belts. On being asked what per cent of their earnings do they spend on the medical care, it was reported by 80 (30.3%) workers that they have to spend 10-25 per cent of their wages and 76 (28.8%) said 25-50 per cent of their wages.

In a survey conducted by Jay Bharat Sarva Kalyan Nyas of Keru village, it was found that 90% of the blindness was due to accidents in mines.

(e) Steps Toward Organising Workers

Although 194 (73.5%) workers were of the opinion that there is an urgent need of developing some organisation of workers while 56 of them (21.2%) remained quiet on this issue. Till date, no sincere effort have been made in this direction. The reason came out to be as follows : 142 workers (53.7%) admitted lack of knowledge and guidance on the subject. 31 (11%) workers felt that lack of unity amongst them is the cause of this apathy. Some 28 (11%) workers reported hostile reaction of mine owners.

3 PREVALENCE OF SILICOSIS AND TUBERCULOSIS IN SANDSTONE MINE WORKERS OF JODHPUR

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"When you come to sick person, says Hippocrates, it behoves you to ask what uneasiness he is under, what was the cause of it, how many days he has been ill, how his belly stands and what food he eats; to which I'd presume to add one interrogation more : namely what trade he is of"

Bernardino Ramazzini
'De morbis artificum diatriba', 1700.

I. INTRODUCTION

The dust borne diseases are common to Thar desert. Of which, the respiratory illnesses resulting from exposure to silica is undoubtedly the oldest, commonest, best known and most extensively studied of all occupational diseases of lungs.

The silicon dioxide (silica) exists in two forms, amorphous and crystalline. The sandstone is comprised of almost pure silica. Workers engaged in tunneling, miniming, quarrying or chiselling are often exposed to silica dust. Expesure to high concentration of silica over a long period of time may results into silicosis.

The effects of silica has been known since the time of Hyppocrates as early as 460 A.C. and earlier to Eqyptians. But the seriousness of the silicosis was emphasized by Agricole in 1556 A.D. Since then a large number of publications have come out on this problem. An extraordinary high incidence of silicosis have been reported amongst the workers of sandstone quarries in northern Nigeria (Worrell et. al. 1975) where 30% of sample had X-ray evidence of silicosis.

Silica particles, 0.5 to 5 micron in diameter are likely to produce the disease. Most of the coarse particles of the size 5 to 10 micron or above in diameter are removed in the upper respiratory tract. The U. S. Public Health Service Statements have described concentration of dust particles in the atmosphere as primary and secondary thresholds. The primary threshold consists of $5x10^6$ particles less than 10 micron in size per cubic feet. Exposure to concentration below this level does not cause silicosis. The secondary threshold consists of $100x10^6$ particles of the same size per cubic feet, those exposed at or above this level will develop silicosis.

The small particles that are deposited in alveoli of lungs are eaten away by cells called macrophages where they are acted upon by lysosomal enzymes that liberate the dust and allow it is to enter the cell cytoplasm resulting into death of cell. Silica particles are acted upon by protein and act as antigen and antibodies are produced. The reaction of antigen and antibody causes complex tissue reactions resulting into death of cells. This is why silicosis progress even after person had stopped working in sandstone quarries.

Exposure of approximately for 40 to 48 hours to silica dust in a week and as long as 8-10 months in a year making mine workers vulnerable to the complications produced by silica.

The present pilot survey-cum-study was aimed at understanding various facts of mining operations and more so on silica related disorders. The present report is based on radiological examination of 82 X-rays of persons exposed to silica in sandstone mines.

II. AIMS AND OBJECTIVES

The aim and objectives of this preliminary study was to assess the extent of silicosis, silico-tuberculosis and tuberculosis in mine workers exposed to silica dust in and around sandstone mines of Jodhpur district.

III. METHODOLOGY

A randomly selected sample of 82 persons comprised of this study. All subjects were questioned on the basis of exhaustively designed proforma covering aspects like, number of years working in mines, type of jobs performed in the mines, economic status and such other aspects relevant to this study. The details were recorded in a proforma.

In all subjects, standard X-ray chest P. A. projection was taken. X-rays were interpreted by two different viewers separately and in case of difference in opinion a group of 3 doctors sat together to arrive at a acceptable conclusion. X-ray findings were classified according to the standard adopted by International Labour Office u/c 1971, Classification.

Silicosis and Clinical Features

Silicosis was named differently associating it with silica exposure. Like grit consumption, dust consumption, grinder's asthma, mason's disease, miner's asthma, potter's rot, rock-tuberculosis, stone-mason's disease, slate-workers lung, and so on.

A worker with simple silicosis is often asymptomatic. Silicosis is generally divided into three stages. First stage symptoms include shortness of breath, slight cough and little sputum. In the second stage shortness of breath and cough become established with pain in chest. Impairment of working capacity begins. In the third stage total incapacitation takes place. Blood in sputum, chest pain and weight loss are characteristic features. Infections are common.

IV. OBSERVATIONS AND DISCUSSION

82 persons engaged in sandstone mines were subjected to radiological examination. Age of the persons varied from 11 years to 60 years. Maximum number of workers belonged to age group 21 to 40 years (75.5%), with mean age 34 years as shown in Table 1. Out of 82 persons, 64 (78%) were engaged in chiselling and cutting stones. Out of them, 35 (7.7%) had silicosis of different grades, 6 (9.3%) had tuberculosis and 6 (9.4%) silico tuberculosis. Persons engaged in other jobs like stone removing, etc. were also exposed to silica dust present in the atmosphere showed that 3 (16.6%) out of 18 persons had silicosis, 4 (22.2%) had tuberculosis and 2 (11.1%) had silico-tuberculosis.

TABLE 1—**Showing age distribution of sample studied (n-82).**

S.No.	Age Group	No. of person
1.	0-10	0
2.	11-20	3 (3.65%)
3.	21-30	29 (35.36%)
4.	31-40	33 (40.24%)
5.	41-50	15 (18.29%)
6.	51-60	2 (2.46%)
	TOTAL	82

TABLE 2—**Incidence of silicosis, tuberculosis and silico-tuberculosis found in different age groups.**

S. No.	Age Group	Total no. of persons		Silicosis	Tubercu-losis	Silico-tubercu-losis
1.	0-10	0		0	0	0
2.	11-20	3		0	1 (33.3%)	0
3.	21-30	29	65 (79%)	0	1 (3.4%)	2 (6.8%)
4.	31-40	33		3 (9.0%)	5 (15.1%)	2 (6.0%)
5.	41-50	15		0	4 (26.6%)	1 (6.6%)
6.	51-60	2		0	2	0
	TOTAL	82		3 (3.6%)	10 (12.1%)	5 (6.0%)

The prevalence of silicosis in persons engaged in both the type of jobs is not comparable but a high prevalence out of tuberculosis and silico-tuberculosis was found in persons engaged as casual labour as shown in Table 3. The difference in the prevalence of tuberculosis may be explained on the basis that later group belongs to low socio-economic status. Those engaged in chiselling are better paid in comparision to persons engaged as unskilled labour.

Silicosis and Risk Factor

— Tuberculosis is a major cause of death and morbidity among persons with silicosis.
— Risk of tuberculosis is higher in silicotics.
— The risk is heigher among those with 'pure silicosis' than among those with 'mixed pneumoconiosis'—anthracosilicosis.
— Frequency of co-existing tuberculosis is heigher among those patients with more advanced forms of silicosis than among those with minimal radiographic changes.

Out of 82 persons 8 (9.6%) had silicosis and silico-tuberculosis. Of these 8 patients, 3 (3.6%) had silicosis and 5 (6%) had silico-tuberculosis as shown in Table 2.

It is evident also that out of 8 cases who had silicosis and silico-tuberculosis, 7 (87.5%) belonged to age group of 21 to 40 years. Considering tubercular disease only out of total 10 cases, 6 (60%) belonged to this age group, therefore, persons between age group 21 to 40 years are more vulnerable to developing stone mining related disorders. It is not possible to know exactly how many workers develop silicosis because of the difference in notification procedure while at many places it does not exist at all. Further, many workers at risk are never surveyed by radiography. However, records in some countries, notable in U. K. and Scandivania allow some overall estimate to be made. In Britain, with a population of 50 million workers being awarded disablement pension each year for silicosis, it fluctuates between 100 to 170. This figure, however, excludes unknown but certainly larger population with radiological changes but no disability. The workers are predominantly from foundaries, mines and quarries. It is likely that silicosis as it occured in first half of century is very rare in developed countries. The reason is that disease has been modified by an increased awareness of risk and legislative action leading to better dust suppression.

TABLE 3—**Job performance based silicosis, tuberculosisand silico-tuberculosis.**

S. No.	Type of work	No. of persons	Persons prevalence		
			Silicosis	Tuberculosis	Silico-tuberculosis
1.	Labour	18 (21.95%)	1 (5.5%)	4 (22.2%)	2 (11.1%)
2.	Chiselling	64 (78.04%)	2 (3.1%)	6 (9.3%)	3 (4.6%)
	TOTAL	82	3 (3.6%)	10 (12.1%)	5 (6.0%)

TABLE 4—**Showing prevalence of silicosis in relation to period of working.**

S. No.	Perio d of working (years)	No. of persons		Silicosis including Silico-tuberculosis
1.	0-5	12		1 (8.3%)
2.	6-10	15	61 (74%)	3 (20.0%)
3.	11-15	34		3 (8.8%)
4.	16-20	19		1 (5.2%)
5.	21-25	2		0
6.	26-30	0		0
	TOTAL	82		8 (9.7%)

Table 4 shows prevalence of silicosis and the relation with the period of working. Considering the period of working it is evident that maximum number of persons, 61 (74%) had worked upto 15 years. Thereafter, there is a sharp decline in the number of persons continuing this job. While beyond 21 years the number of persons continuing their job is negligible and prevalence of silicosis and silico-tuberculosis is 87.5% with this period of working.

If it is considered in respect of the findings of Table 2 which shows number of persons in different age groups, it is evident that 65 (79%) persons are between the age of 21 to 40 years. It can, therefore, be hypothesised that if a person join the job at the age of 20

Occupations involving silica exposure

* Abrasive - blasting where sand is used
* Boiler scaling
* Cement Production
* Ceramics, pottery making
* Refractory products
* Metal and non-metal mining and milling
* Coal mining and milling
* Ferrous and non-ferrous foundry work using quartz
* Glass manufacturing and flint crushing
* Filler using silica
* Quarrying of sandstone, slate and granite
* Tunnelling
* Vitreous enamelling using quartz powder
* Making mill-stone/grinding-stone using sandstone

years, and perform this job for 20 years which is maximum (as maximum number of persons have worked upto 20 years) he is going to be invalidated or has to quit the job at around 41 years of age. There are few persons who have worked for more than 20 years. This indicates that persons quit their jobs after maximum working for 20 years. As observed out of 82 persons, 18 (22%) had silico-tuberculosis and tuberculosis which is a very high prevalence as compared to prevalence of tuberculosis in general population which is 18 persons per thousand population (National Sample Survey on Prevalence of Tuberculosis in India, 1957-1959). Meaning thereby that stone workers are exposed to 100 times more risk of developing tuberculosis as compared to general population. It is worthwhile to mention that in disease like AIDS the recorded prevalence of tuberculosis is 500 times more than the general population. Which together are a fatal combination. It will not be unfair to equate the silicosis as with AIDS and levelling it as 'mini-AIDS' for the stone working population in respect to tuberculosis.

Correlating distribution of silicotics in relation to the period of working it is observed that a high prevalence was recorded in the persons who have worked for 6-15 years, i.e. 6 out of 8. Thereafter the prevalence drops also for persons working beyond this period.

While observing Table 5 which indicates the prevalence of silico-tuberculosis and tuberculosis in relation with the period of work, it is evident that distribution of persons suffering from silico-tuberculosis is almost similar in all the period of working while the prevalence of tuberculosis gradually increases in the persons who have put up more period of work and thus shows a line or relationship. It may be possible that these patients might have had effect of silica, but not visible in X-rays. Thus lowering in the local resistance would have made them more vulnerable to the tuberculosis. High opportunity of getting infection cannot also be ruled out.

TABLE 5—**Prevalence of tuberculosis and silico-tuberculosis in relation to period of working.**

S. No.	Period of working (years)	No. of persons	Prevalence of pul. tub.	Prevalence of silico-tuberculosis
1.	0-5	12	1 (8.3%)	1 (8.3%)
2.	6-10	15	0	1 (6.6%)
3.	11-15	34	5 (14.7%)	2 (5.8%)
4.	16-20	19	4 (21.0%)	1 (5.2%)
5.	21-25	2	0	0
6.	26-30	0	0	0
	TOTAL	82	10 (12.1%)	5 (6.0%)

TABLE 6—**Showing radiological grade of silicosis in relation to age groups.**

S. No.	Age group	Total No. of persons	Grade of silicosis			
			1/1	1/2	2/3	3/4
1.	0-10	0	0	0	0	0
2.	11-20	3	0	0	0	0
3.	21-30	29	1 (3.4%)	0	1 (3.4%)	0
4.	31-40	33	1 (3.0%)	2 (6.0%)	2 (6.0%)	0
5.	41-50	15	0	0	0	1 (6.6%)
6.	51-60	2	0	0	0	0
	TOTAL	82	2 (2.4%)	2 (2.4%)	3 (3.6%)	1 (1.2%)

Table 6 shows a correlation of grade of silicosis with age. It reveals that as the age advances, there is a rise in the number of persons with higher grade of silicosis. A similar comparison is made with period of working which does not reveal any difinite correlation as 8.5% person who has worked for 0-5 years had 2/3 grade of silicosis while those who have worked for 16-20 years had 2/3 grade of silicosis. Correlating prevalence of tuberculosis with the period of work, there is a gradual rise in prevalence of tuberculosis with period of working which can be explained on the basis of damage caused by silica without radiologically manifesting while it is obvious that greater risk of silicosis attain heavier exposures and very heavy exposures leads to acute silicosis and moderate to heavy exposure to subacute disease. The risk of clinically important silicosis can be virtually eliminated by introduction of dust standard of approximately 100 ug./^{m3}. While other study has suggested that approximately 50% risk still exist if workers are engaged for 20 years with aforesaid dust standard (See Tables 7 and 8 of this sample).

TABLE 7—**Showing radiological grade of silicosis and silico-tuberculosis in relation to period of working.**

S. No.	Period of working	Total No. of persons	Grade of silicosis			
			1/1	1/2	2/3	3/4
1.	0-5	12	0	0	1 (8.3%)	0
2.	6-10	15	0	2 (13.3%)	1 (6.6%)	0
3.	11-15	34	2 (5.8%)	0	0	1 (2.9%)
4.	16-20	19	0	0	1 (5.9%)	0
5.	21-25	2	0	0	0	0
6.	26-30	0	0	0	0	0
	TOTAL	82	2 (2.4%)	2 (2.4%)	3 (3.6%)	1 (1.2%)

TABLE 8—**Prevalence of tuberculosis and silico-tuberculosis in relation to period of working.**

S. No.	Period of working (years)	No. of persons	Prevalence of pul. tub.	Prevalence of silico-tuberculosis
1.	0-5	12	1 (Active) 8.3%	1 (Active) 8.3%
2.	6-10	15	0	1 (Active) 6.6%
3.	11-15	34	5 (4 Active) 14.7%	2 (Active) 5.8%
4.	16-20	19	4 (2 Active) 21.0%)	1 (Active) 5.2%
5.	21-25	2	0	0
6.	26-30	0	0	0
	TOTAL	82	10 (12.1%)	5 (6.0%)

Diagnosis and Treatment of Silicosis

A history of significant exposure to free silica supported by chest X-ray is indispensable in the evaluation of workers with pneumoconioses. The International Labour Organisation (ILO) has developed classification of radiographs of pneumoconioses to be used as standard for comparison through investigation of respiratory system, frequent sputum samples in larger numbers for bacteriological proofs.

There is no specific treatment for silicosis. Therapy is directed at accompanying complications. Tuberculosis among pneumoconioses victims respond much less satisfactorily to standard chemotherapy than that among uncomplicated ones. Use of isoniazid has been recommended.

Prevention of Silicosis

The determination of a safe threshold limit value (TLV) for silica is difficult because of multitude of unknown variables. The WHO recommends a health-based occupational exposure limit of 40 microgram/cubic meter for respirable dust of free crystalline silica. This is achieved by—

- dust suppression by proper ventilation at work place,
- using substitutes of silica,
- wet-rock drilling,
- electro-static precipitation,
- industrial hygiene,
- filter respirators to workers,
- air-line breathing appartus, and
- medical surveillance.

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ANNEXURE I

Workmen's Compensation Act, 1923

SCHEDULE III

(See section 3)

List of Occupational Diseases

S.No.	Occupational Disease	Employment	
(1)	(2)	(3)	
		Part A	
1.	Infectious and parasitic diseases contracted in an occupation where there is a particular risk of contamination.	(a)	All work involving exposure to health or laboratory work;
		(b)	All work involving exposure to veterinary work;
		(c)	Work relating to handling animals, animal carcasses, part of suc carcasses, or merchandise which may have been contaminated by animals or animal carcasses;
		(d)	Other work carrying a particular risk of contamination.
2.	Diseases caused by work in compressed air.	All work involving exposure to the risk concerned.	
3.	Diseases caused by lead or its toxic compounds.	All work involving exposure to the risk concerned.	
4.	Poisoning by nitrous fumes.	All work involving exposure to the risk concerned.	
5.	Poisoning by organo phosphorus compounds.	All work involving exposure to the risk concerned.	
		Part B	
1.	Diseases caused by phosphorus or its toxic compounds.	All work involving exposure to the risk concerned.	
2.	Diseases caused by mercury or its toxic compounds.	All work involving exposure to the risk concerned.	

3.	Diseases caused by benzene or its toxic homologues.	All work involving exposure to the risk concerned.
4.	Diseases caused by nitro and amino toxic derivatives of benzene or its homologues.	All work involving exposure to the risk concerned.
5.	Diseases caused by chromium or its toxic compounds.	All work involving exposure to the risk concerned.
6.	Diseases caused by arsenic or its toxic compounds.	All work involving exposure to the risk concerned.
7.	Diseases caused by radioactive substances and ionising radiations.	All work involving exposure to the action of radioactive substances or ionising radiations.
8.	Primary epitheliomatous cancer of the skin caused by tar, pitch, bitumen, mineral oil, anthracene or the compounds, products or residues of these substances.	All work involving exposure to the risk concerned.
9.	Diseases caused by the toxic halogen derivatives of hydrocarbons (of the aliphatic and aromatic series).	All work involving exposure to the risk concerned.
10.	Diseases caused by carbon disulphide.	All work involving exposure to the risk concerned.
11.	Occupational cataract due to infra-red radiations.	All work involving exposure to the risk concerned.
12.	Diseases caused by manganese or its toxic compounds.	All work involving exposure to the risk concerned.
13.	Skin diseases caused by physical, chemical or biological agents not included in other items.	All work involving exposure to the risk concerned.
14.	Hearing impairment caused by noise.	All work involving exposure to the risk concerned.
15.	Poisoning by dinitrophenol or a homologue or by substituted dinitrophenol or by the salts of such substances.	All work involving exposure to the risk concerned.
16.	Diseases caused by beryllium or its toxic compounds.	All work involving exposure to the risk concerned.

17.	Diseases caused by cadmium or its toxic compounds.	All work involving exposure to the risk concerned.
18.	Occupational asthma caused by recognised sensitising agents inherent to the work process.	All work involving exposure to the risk concerned.
19.	Diseases caused by fluorine or its toxic compounds.	All work involving exposure to the risk concerned.
20.	Diseases caused by nitroglycerin or other nitroacid estsers.	All work involving exposure to the risk concerned.
21.	Diseases caused by alcohols and ketones.	All work involving exposure to the risk concerned.
22.	Diseases caused by asphyxiants : carbon monoxide and its toxic derivatives, hydrogen sulfide.	All work involving exposure to the risk concerned.
23.	Lung cancer and mesotheliomas caused by asbestos.	All work involving exposure to the risk concerned.
24.	Primary neoplasm of the epithelial lining of the urinary bladder or the kidney or the ureter.	All work involving exposure to the risk concerned.

Part C

1.	Pneumoconiosis caused by sclerogenic mineral dust (silicosis, anthracosilicosis, asbestosis) and silico-tuberculosis provided that silicosis is an essential factor in causing the resultant incapacity or death.	All work involving exposure to the risk concerned.
2.	Bagassosis.	All work involving exposure to the risk concerned.
3.	Bronchoplulmonary diseases caused by cotton, flax hemp and sisal dust (Byssinosis).	All work involving exposure to the risk concerned.
4.	Extrinsic allergic alveelitis caused by the inhalation of organic dusts.	All work involving exposure to the risk concerned.
5.	Boronchopulmonary diseases caused by hard metals.	All work involving exposure to the risk concerned.