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ABC INSURANCE Ltd.,
Tel Aviv

RISK SURVEY on SILICOSIS

Subject: *Employers Liability, Silicosis Risk*
Insured: *Various Plants,*
Purpose: *Evaluation of the Silicosis Risk*
Previous Reports: Ref Zor9101 dated 6th January 1991
Date of survey: Feb- March 1998

I. INTRODUCTION

As per Insurers' we surveyed the above mentioned sites of the Insured. We met senior personnel (manpower and safety) at each site and received up to date information about the prevailing risks and the counter measures taken. We also received copies of measurements taken by authorised institutes (mandatory) during recent years.

As the Ashkelon site of Y Plant is relatively new and it constitutes a small operation although similar to the one at PH Site, we received the relevant information verbally without visiting the site itself.

II. SILICOSIS

1. General:

Silicosis is one of the worlds' oldest known occupational diseases with reports dating back to ancient Greece. Since 1800's, the Silicotic health problems associated with crystalline dust exposure have been referred to under a variety of common names.

Crystalline silica, also known as quartz, is a natural compound in the earth's crust and is a basic component of sand and granite. **Silicosis** is a disease of the lung caused by breathing dust containing **crystalline silica (SiO₂) particles**. The dust can cause fibrosis or scar tissue formation in the lungs that reduce the lung's ability to work to extract oxygen from the air.

There is no cure for this disease; thus prevention is the only answer.

In the USA, two million workers are exposed every year to crystalline silica. About 300 deaths (USA) are attributed to **silicosis** annually. The corresponding figure for the UK, is [27 death in 1983 according to a certain report](#).

Inhaling airborne crystalline silica dust also has been associated with other diseases such as **tuberculosis** and **lung cancer**.

2. Symptoms of Silicosis:

Early stages of the disease may go unnoticed. Continued exposure may result in a shortness of breath on exercising, possible fever and occasionally bluish skin at the ear lobes or lips. Silicosis makes a person more susceptible to infectious diseases of the lungs. Progression of silicosis leads to fatigue, extreme shortness of breath, loss of appetite, pain in the chest and respiratory failure, which may cause death.

Intense exposure to silica may result in disease in a year or less, but it usually takes at least 10 or 15 years of exposure before symptoms develop. The incidence is 5 out of 10,000 people. However, the incidence of silicosis is decreasing due to regulations requiring the use of protective equipment.

3. Where are Employees exposed to Crystalline Silica Dust?

The risk factors include mining, stone cutting, quarrying, blasting, road and building construction, abrasives manufacturing, and many other occupations and hobbies that involve exposure to silica

The most severe worker exposure to crystalline silica results from sand blasting.

Other exposures to dust from sand in general industry employment occur in cement and **cement related** manufacturing, asphalt pavement manufacturing and the **foundry industry**.

Work environments with activities such as sandblasting, rock drilling, **foundry work, stonecutting**, drilling, roof bolting, quarrying, **brick/block/concrete cutting**, gunite operations etc can create an airborne silica exposure hazard.

Employers are required to provide and assure the use of appropriate controls for crystalline silica- containing dust.

4. Regulations and Incidence:

The US Department of Labor, Occupational Safety & Health Administration (OSHA), has laid the standards of exposure for General Industry, Construction and Maritime.

In Israel, Safety in Work Regulations (Ministry of Labor) dated 1984 with subsequent amendments, define the risk, the maximum permissible exposure, the qualified Laboratories and Physicians, the nominated committees, safeguards and protective equipment in workplaces, the required medical examinations prior to the acceptance of a new employee, routine re- examinations, medical up dating procedures, diagnostic procedures and the mandatory periodic environmental surveys.

The National Panel for Pneumoconiosis monitors the subject.

According to general information available both from the local **Insurance Companies** and from the **Panel**, the incidence of Silicosis (reported cases) in Israel is extremely low.

In the **plants we inspected** not a single case of silicosis was reported.

III. THE Y PLANTS

1. PH Site

Established:	1951
No. of Employees:	200
Products:	Light weight aggregate concrete blocks and slabs.
Raw Materials:	Milled Sand, lime, cement, small amount of aluminum
Process:	Mixing (wet process), Reaction open moulds, wire cutting, heating in autoclaves (wet process), sawing of product- blocks (dry process). Recycle of faulty products (blocks) takes place at a remote corner of the site. This is carried out by a jaw crusher (dry process) powered at 50 kW. The emitted dust is wet scrubbed by water. The handling of materials is by an enclosed payloader. Duration of operation is about two hours per day.
Dust Exposure:	Most of the workers are engaged in areas of wet processes. The main dry process is sawing of blocks and the recycle process.
Improvements in Risk:	Since our last survey the risks of exposure to silica-laden dust have been significantly improved. These are as follows: Whereas in the past all components to the mixer were fed dry, now the most important component (sand) is fed a wet slurry. This greatly reduced the level of dust. The Insured reduced by half the number of operators in the mixing section. The complete operation is by remote control, from the (control room) as against local-manual operation in the past. Sawing blocks is carried out by a new automated system while wet. In the past, odd sizes were cut manually- dry. U-blocks cutting (dry) is carried out by remote operation. A dust aspiration system is mounted directly on the machine. On the sawing machine of reinforced slabs (mobile equipment), a dust aspiration hood was mounted. This is connected to an independent dust collection system. A new central dust handling system was installed. This collects dust from all sources into an automatic filter bag system. The dust collected in Big-Bags is being recycled in the process.
Inspections:	All employees at environments at risk are checked annually by an approved occupational health Physician. Periodical surveys of exposure to dust/silica are conducted as called for by regulations.

PH Site (Cont-ed)

1.1 Results of Environmental Health Surveys:

We received copies of surveys conducted in the course of 1994-1997.

The following is an extract of the results:

Year	Conducted by	Summary of Findings (measurements)	Comments
1994	The Institute For Occupational Health, Tel Aviv University	In all departments, exposures to free crystalline silica exceeded TLV ¹ . Samples taken both, from surfaces and from operators.	Process reasons were analyzed and recommendations were made
1995	Eco- Tec. Environmental Services	In some working stations, levels were above AL ² , but all were below TLV	All samples were taken directly from operators at stations
1996	Eco- Tec. Environmental Services	In depts. 04,05 levels were below AL, in dept of shaped blocks levels were above AL, but all were below TLV.	Samples taken both, from surfaces and from operators.
1997	Ministry of Labor, Lab. For occupational safety	Exposures to free crystalline silica approached STEL ³ only in the U-blocks dept. Total Dust (not silica) exceeded STEL in dept 05-handling of slabs with crane. All other values were within limits.	Since the survey both problems were rectified.
1998			Survey due in December

1.2 General Observations:

The overall risk at this site has greatly improved since our last survey, as can be seen from the process changes instigated (see above).

In addition the following facts had a positive contribution to the risk:

The overall number of employees engaged on the production floor has been reduced to 73. Most departments operate one shift, on the average four and a half-day a week (due to present level of sales).

The "green areas" of the site have been increased significantly (irrigated lawns).

The total area of paved areas on the site has been increased.

Existing concrete floors within departments have been recast, and new floors have been added.

A full time mobile sweeping machine is engaged on the whole site, collecting any dust settled on floors pavements, roads etc.

¹ TLV = Threshold Limit Value. This is the maximum level of chemical and physical factors at the workstation of an operator to which he is allowed to be exposed.

² AL= Action Level. This is equal to half the permissible weighted average of chemical factors and a quarter of the permissible weighted average of physical factors for harmful dust.

³ STEL= Short Term Exposure Limit. This is the maximum level of chemical and physical factors at the workstation of an operator to which he is allowed to be exposed for a period not exceeding 15 minutes not more than four times during a 8 hour working day.

PH Site - General Observations (Cont-ed)

Each production dept. washes its floors during the day and at the end of the shift, using a high-pressure installation.

Green areas including (green) trees have superceded the overall impression of a dusty environment. Trees in general are the best indicator of cumulative dust conditions.

Working conditions including amenities have been greatly improved (e.g. a new air-conditioned mess hall).

1.3 Summary:

Our plant inspection and the data collected leads to an evident conclusion that the risk has improved significantly as compared to our previous survey.

There are altogether four complaints of breathing problems in recent years, handled by the Insured. All employees involved are aged over sixty and they have been employed for periods in excess of twenty years. They have been all examined by an occupational health Physician. The certificates of their examination issued by the physician confirm that they can continue working in areas not exposed to hazardous dust. It does not mention **any connection to silicosis**. For the time being none of these employees pursue any claims against the Insured.

In view of the improvements in the dust levels (especially silica dust), the Insured received an exemption from periodical X-Ray examination of all employees, except for those in the U- blocks section. The latter will for the time being undergo annual monitoring. Replacing the existing aspiration fan by a more powerful one has solved the problem in this department.

2. Ash Plant

This plant was started up in 1991. It employs 34 people including the plant superintendent.

The plant management is located at PH Site

It consists of a single production line with the same basic process steps as the mother plant namely:

- ◆ Wet milling
- ◆ Mixing
- ◆ Casting
- ◆ Wet sawing

The only product not manufactured in the plant is Reinforced Blocks.

Also there is no cutting of special (size) blocks. **Thus no dry cutting.**

On the whole this is a small plant, supervised in many disciplines by the Pardes-Hana plant.

For the time being we received no monitoring survey at this site, but we were told that the overall exposures are not serious.

3. CAR SITE

Established: 1946

No. of Employees: 50, only 30 in the plant

Products: Additives for concrete and plaster, finishing materials, mould treatment materials, materials, mixes, adhesives, floor coatings, surface treatment materials.

Process: In the course of our visit the plant was undergoing major changes in layout and equipment. The project will be completed within several months. An overall improvement in dust exposure is envisaged as a byproduct of the investment.
The process involves the recycling of some powders.

Dust Exposure: In mixing and bagging sections.

Improvements in Risk: Steps taken since our last survey include:
General improvement of procedures and environmental conditions at workstations as part of the ISO certification process.
Addition of aspiration filters at the filling points of gray powders.
Improvement of aspiration ducting close to the (bag) filling points.
Use of a mobile mechanical sweeping machine during work.

3.1 Results of Environmental Health Surveys:

Year	Conducted by	Summary of Findings (measurements)	Comments
1994	The Institute For Occupational Health, Tel Aviv University	Limited measurements of free crystalline silica in the mixing area. A repeated measurement was recommended.	The relevant production sections were idle on the date measurements were taken.
1995	Eco- Tec. Environmental Services	In the two working stations surveyed, levels were well below AL.	All samples were taken directly from operators at stations
1996	Eco- Tec. Environmental Services	Total Dust (not silica) in the bag filling area exceeded STEL, but was well below in the mixing section.	Samples taken directly from operators.
1997	Ministry of Labor, Lab. For occupational safety	Total Dust (not silica) exceeded STEL in both mixing and filing sections.	Since the survey improvements were introduced.
1998			Survey due in December

3.2 General Observations:

The main observation was a state of temporary measures in production activity due to the erection work-taking place simultaneously. It involves practically the relocation of all machinery, the raising of the roof and additional alterations. Under these conditions systems are not perfectly sealed, and the aspiration is not fully effective. As a result we noticed some dust accumulation.

Operators at the filling machines wore protective masks.

The level of activity is lower than during usual periods due to the slackness in building construction.

CAR Site Ltd. (Cont-ed)

3.3 Summary:

This plant is significantly smaller than the Ytong plant, and processes do not involve emission of significant quantities of free crystalline silica.

It undergoes right now an expansion program and thus the conditions are about to improve.

We were told that none of the employers sustained any lung diseases.

The health and environment monitoring is carried out together with the Ytong plant.

Survey results in the past indicated deviations in Total dust, which is not as harmful as silica.

4. Foundry Plant

Location: Galleli.

Established: 1970's

No. of Employees: 215

Products: Piping fittings and accessories made of steel.

Raw Materials: Steel

Process: The Foundry Plant consists of the following:

- › Two 3.2 ton steel melting furnaces
- › One 3 ton Induction melting furnace
- › One 5 ton Induction Casting machine (1996)
- › Moulding machines incl. a new (1996) machine.
- › Automatic pouring.
 - ◆ Automatic heat-treating (controlled atmosphere).

Improvements in Risk: The reorganization of the company by merging the two plants had a positive effect on safety in general and specifically on environmental conditions. New structures were added to house the equipment transferred.

The Insured carried out periodical recommendations included in the Health Survey Reports. These include the following:

Casting Section:

A new (1997) Aspiration system was installed. Capacity 80,000 NM²/Hr. Among others, an aspiration hood was installed above the conveyor of moulds after casting. All three furnaces are connected to the aspiration system. The conveyor of dismantling moulds was partly sealed. The project is still not completed.

Moulds Preparation Section:

The opening between the silo and the mixer was partly sealed by a partition. Project to be completed.

Foundry (Cont-ed),

Improvements in Personal Protection:

Risk (Cont-ed): All workers at exposed workstations wear certified protective masks during all hours.

4.1 Results of Environmental Health Surveys:

Surveys are conducted *every three months*. We received copies of the last two surveys. We are quoting only the relevant results i.e. those of the **Foundry**.

Date	Conducted by	Summary of Findings (measurements)	Comments
12/06/97	The Institute For Occupational Health, Tel Aviv University	In most working stations, levels were above AL, but all except one were below TLV- TWA. ⁴ The latter is at the new Loramendi core machine, refers to dust containing 24-25% free crystalline silica.	A series of recommendations are included in the report.
15/09/97	The Institute For Occupational Health, Tel Aviv University	In some working stations, levels were above AL, but none exceeded TLV- TWA.	Recommendations are included in the report.
Dec 97	The Institute For Occupational Health, Tel Aviv University		Copy not available as yet

4.2 General Observations:

At the time of our visit the plant was shut down for an annual overhaul. Thus we could not get an impression of operating conditions.

We checked the extent of enforcement of safety regulations, specifically wearing protective masks in designated areas. In all these areas warning signs, (in Hebrew only) are posted.

Despite the fact that the plant was not operating, we found stocks of masks in workstations such as the sand mixing area and in the preparation of cores section.

Infringement of these regulations follows warning notices and a record in the personal file. More than 2-3 violations carry a fine penalty. The local workers' union is informed of such violations and their representatives fully cooperate with the plant management.

Periodical training in general and in personal safety is being held twice a year. Sessions include demonstrations. Attendance is obligatory and records are kept.

⁴ TLV-TWA= Threshold Limit Value- Time Weighted Average. This is the maximum level of chemical and physical factors at the workstation of an operator to which he is allowed to be exposed during an 8 hr. working day.

Foundry (Cont-ed),

Every new employee undergoes a medical examination (including X- ray of the lungs, pending department allocation), by an industrial physician. Personal health records are kept by Manpower and at the respective Health Insurance.

Periodical examinations are held as per regulations (Ministry of Labor), the frequency depends on age, department etc. The average frequency is once per year. Results of all periodical checkups are listed in the personal files.

IV. SUMMARY

As mentioned in the general section of this report, foundries are considered relatively hazardous i.r.o. exposure to silica. (Moulds and cores are made of types of sand.)

The Insured are following in general recommendations included in the health survey reports. Some are technically difficult to implement. Some of the recommendations not implemented as yet are in design phases. A minority of recommendations has not been considered or scheduled as yet.

A fringe benefit of the **Foundry** plant transfer from *the previous location* to the present site was the improvement in safety. This concerns regulations, better management control, process and technical improvements of new installations.

One of the main improvements is the installation (at a significant investment) of a new aspiration and dust collecting system with a 65 kW suction fan (radial ventilation, make CE).

The addition of this modern ventilation-aspiration system greatly improved the potential of a cleaner atmosphere.

Several points of suction have been already connected. More are due.

On the whole, the results of surveys, conducted at relatively high frequency (see other plants in this report) are reasonable. The main point is to ensure the use of protective masks in hazardous areas.

We checked with the Insured the status of health claims of employees. The number of claims is negligible, mainly i.r.o. loss of hearing etc. None are associated with lungs. All claims have been referred to the National Health Insurance.

V. INSURER'S RISK

As mentioned earlier there are virtually no reported cases of silicosis in Israel, and certainly no reported deaths attributed to the disease. Thus it is impractical to talk about the **exposure of Insurers**. There are many reasons for this situation, to mention just a few:

The highest incidence of silicosis is considered to be associated with sand blasting operations (this is a metal surface preparation for painting). Contractors and subcontractors mostly employ workers in this occupation, and there are no records on health damages, due to the temporary state of their employment. (High mobility of employees.)

INSURER'S RISK (Cont-ed),

There are no mandatory **follow-ups** (medical examinations) of **retired** workers, or those who switched to another job, with no exposure to silica dust.

Since the development of silicosis requires a **long incubation period** (many years), once lung disease is detected, there is a slim chance that it will be diagnosed as originating from occupational hazards.

Lung cancer is one of the possible developments of patients that sustained **silicosis**. However there are **other carcinogenic** materials in industrial environments which have a contribution of their own to the disease, besides silica. It is most difficult to isolate the individual effect.

Another most prevalent factor in lung cancer is **smoking habits**. This again makes the distinction most difficult.

Summary of the Insurer's risk:

1. During the decade 1985-1994, only 8 cases of Silicosis were recorded in Israel.
2. There may have been pulmonary diseases caused by Silicosis that were not identified or assimilated as Silicosis. This is probably due to very low incidence.
3. Based on present knowledge and level of records, it is very difficult to prove the direct connection between the exposure to dust and the disease.
4. Most of the cases identified as Silicosis in the USA and UK were related to occupations such as Mining, Quarrying and Sandblasting.
5. The plants surveyed comply (at present) with mandatory regulations of monitoring the hazard. Nevertheless one should not ignore possibility that in the past exposures of silica exceeded the presently permissible levels. The manifestation of the disease is after many years of exposure.
6. The number of employees that were probably exposed in the past to crystalline silica dust is less than 10% of the total number of employees, namely, less than 50.
7. We cannot rule out the possibility of a future claim. Based on present knowledge and level of assimilation we estimate the risk of incidence of claims per year at 1 permille.

Sincerely Yours,

Yours faithfully,

Dan Arbel

DAN ARBEL RISK ENGINEERING Ltd.